Shoemaker Bridge Replacement Project

Noise Study Report

07-LA-710 PM6.0/6.4
EA: 27300
SCH No. 2016041007

June 2019

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City of Long Beach

April 2019

Prepared By: _____ Date: April 19, 2019

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Summary

The City of Long Beach (City), in cooperation with the California Department of Transportation (Caltrans), is proposing to replace the Shoemaker Bridge (West Shoreline Drive) in the City of Long Beach, California. The Shoemaker Bridge Replacement Project (Project) is an Early Action Project (EAP) of the Interstate 710 (I-710) Corridor Project, which is located at the southern end of State Route 710 (SR-710) in the City and is bisected by the Los Angeles River (LA River).

The Project purpose is to provide a structure and highway facility that meets current structural and geometric design standards and provide a facility compatible with planned freeway improvements and downtown development projects.

The proposed Project is considered a Type 1 project because it would use federal aid to substantially alter the horizontal and vertical alignment of Shoemaker Bridge. A noise analysis is required for all Type 1 projects.

Existing noise sensitive land uses in the area of the Project limits include single-family and multi-family residences, a recreational vehicle (RV) park (Golden Shore RV Park), two schools (Cesar Chavez Elementary School and Edison Elementary School), public parks, and hotels. Other land uses include office buildings, commercial buildings, and industrial uses. Land uses within the area of the Project limits are similar in elevation compared with the adjacent local roadway. The primary source of noise in the Project limits is traffic on Shoreline Drive, Ocean Boulevard, Broadway Avenue, 3rd Street, 4th Street, 5th Street, 6th Street, 7th Street, Maine Avenue, Golden Shore Street, Golden Avenue, Magnolia Avenue, and Anaheim Street.

Short-term noise level measurements were conducted at 25 locations to document the existing noise environment and used to calibrate the noise prediction model with concurrent traffic counts and measured vehicle speeds. Two simultaneous exterior and interior noise level measurements were conducted to evaluate five classrooms associated with the Cesar Chavez and Edison Elementary Schools. A total of 189 receptors were modeled and evaluated for potential noise impacts resulting from vehicular traffic. These receptor locations represent land uses associated with Activity Categories B through F. The results of the modeled noise levels for existing, future no build, and Alternative 2 (Design Options A and B) are shown in Table C-1 in Appendix C of this noise study report (NSR). The results of the modeled noise levels for Alternative 3 (Design Options A and B) are the same as Alternative 2 (Design Options A and B).

When traffic noise impacts have been identified, noise abatement measures must be considered. Traffic noise impacts result from one or more of the following occurrences: (1) an increase of 12 decibels (dB) or more over their corresponding existing noise levels, or (2) predicted noise levels approach or exceed the noise abatement criteria (NAC).

Implementation of the proposed Project would result in potential short-term noise impacts during construction and long-term noise impacts from the completed project. No substantial noise increase of 12 dB or more over the corresponding existing noise level would result under either Alternative 2 or 3 (Design Options A and B). Of the 189 modeled receptors, 45 receptors would approach or exceed the 67 A-weighted decibel (dBA) equivalent continuous sound level (L_{eq}) NAC for Activity Categories B or C under both Alternatives 2 and 3 (Design Options A and B). Alternatives 2 and 3 (Design Options A and B) have the same number of impacted receptors because the proposed alignments are the same, except that Alternative 3 proposes to reuse the existing Shoemaker Bridge for non-transportation uses.

The potential interior noise impacts for classrooms at the Cesar Chavez, Edison, and the International Elementary Schools, as well as four churches within the noise study area (NSA) were evaluated under Activity Category D, which has an interior NAC of 52 dBA L_{eq}. No classrooms or churches would approach or exceed the 52 dBA L_{eq} NAC under either Alternatives 2 or 3 (Design Options A and B).

Noise abatement measures were evaluated for receptors located within the Project limits that would be, or would continue to be, exposed to traffic noise levels approaching or exceeding the NAC. However, because of the configuration and location of the Project, abatement in any form is not considered feasible.

The closest sensitive receptors are located within 50 feet (ft) of the Project construction area. Therefore, these receptor locations may be subject to short-term noise higher than the 91 dBA L_{eq} generated by construction activities along the Project alignment. Compliance with construction hours specified by the City Municipal Code would be required. To minimize construction noise impacts on sensitive land uses adjacent to the Project limits, construction noise is regulated by Caltrans Standard Specifications in Section 14-8.02, “Noise Control” and also by Standard Special Provisions (SSP) S5-310. The noise level from the contractor’s operations between the hours of 9 p.m. and 6 a.m. would not exceed 86 dBA maximum sound level (L_{max}) at a distance of 50 ft.

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List of Abbreviated Terms

µPa	micro-Pascals
°F	degrees Fahrenheit
ADA	Americans with Disability Act
Caltrans	California Department of Transportation
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
City	City of Long Beach
CNEL	community noise equivalent level
dB	decibels
dBA	A-weighted decibels
EAP	Early Action Project
EB	eastbound
EW	existing wall
FHWA	Federal Highway Administration
FTIP	Federal Transportation Improvement Program
ft	foot/feet
HDR	HDR Engineering, Inc.
HOT	high-occupancy toll
HOV	high-occupancy vehicle
Hz	Hertz
I-710	Interstate 710
kHz	kilohertz
LA River	Los Angeles River
LACFCD	Los Angeles County Flood Control District
LARIO	Los Angeles River and Rio Hondo
L_{dn}	day-night level
L_{eq}	equivalent continuous sound level
$L_{eq}(h)$	equivalent continuous sound level over a specified period of time
L_{max}	maximum sound level
LOS	level of service

LT	long-term measurement
L_{xx}	percentile-exceeded sound level
MHWL	mean high water level
NAC	Noise Abatement Criteria
NB	northbound
NEPA	National Environmental Policy Act
No.	Number
NSA	noise study area
NSR	noise study report
Project	Shoemaker Bridge Replacement Project
Protocol	Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
ROW	right-of-way
RTP	Regional Transportation Plan
RV	recreational vehicle
SB	southbound
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SCS	Sustainable Communities Strategy
SPL	sound pressure level
SR-710	State Route 710
SSP	Standard Special Provisions
ST	short-term measurement
TCE	temporary construction easement
TeNS	Technical Noise Supplement
TNM	Traffic Noise Model
USC	United States Code
WB	westbound

Chapter 1. Introduction

The City of Long Beach (City) is the lead agency under the California Environmental Quality Act (CEQA), and the California Department of Transportation (Caltrans) is the lead agency under the National Environmental Policy Act (NEPA), as assigned by the Federal Highway Administration (FHWA), in accordance with NEPA (42 United States Code [USC] 4321 et seq.) and the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500–1508).

The City, in cooperation with Caltrans, is proposing to replace the Shoemaker Bridge (West Shoreline Drive) in the City of Long Beach, California. A regional location map is included on Figure 1-1. The Shoemaker Bridge Replacement Project (Project) is an Early Action Project (EAP) of the Interstate 710 (I-710) Corridor Project and is located at the southern end of State Route 710 (SR-710) in the City of Long Beach, bisected by the Los Angeles River (LA River).

Three alternatives, one no build alternative (Alternative 1) and two build alternatives (Alternatives 2 and 3), are being evaluated as part of the proposed Project. Alternatives 2 and 3 would replace the existing Shoemaker Bridge over the LA River, with a new bridge constructed just south of the existing bridge. In Alternatives 2 and 3, the Shoemaker Bridge would accommodate bicycle and pedestrian use and include the evaluation of design options for a roundabout (Design Option A) or a "Y" intersection (Design Option B) at the easterly end of the new bridge. The primary difference between Alternatives 2 and 3 is Alternative 2 includes repurposing a portion of the existing Shoemaker Bridge for nonmotorized transportation and recreational use, and Alternative 3 includes the removal of the existing Shoemaker Bridge in its entirety.

Alternatives 2 and 3 (Design Options A and B) would also provide improvements to associated roadway connectors to downtown Long Beach and along West Shoreline Drive from SR-710, as well as improvements along portions of 3rd, 6th, and 7th Streets, and West Broadway from Cesar E. Chavez Park to Magnolia Avenue. The proposed improvements may include additional street lighting; restriping; turn lanes; and bicycle, pedestrian, and streetscape improvements. The Project also includes the removal of the Golden Shore grade separation over West Shoreline Drive and modifications along Golden Shore to create a new controlled intersection at Golden Shore and West Shoreline Drive. Additionally, the Project would evaluate street improvements on 6th and 7th Streets from Magnolia Avenue to Atlantic Avenue and Anaheim Street between 9th and Atlantic Avenue. As an EAP of the I-710 Corridor Project, Alternatives 2 and 3 (Design Options A and B) would evaluate the impacts from the closure of the 9th and 10th Street ramp connections into downtown Long Beach. The Project limits are shown on Figure 1-2.

Although most of the modifications and construction would occur within the existing Caltrans or City right-of-way (ROW), a partial property acquisition, aerial easement, and temporary construction easements (TCE) from the Los Angeles County Flood Control District (LACFCD) would be required as part of the proposed Project. In addition, a small partial acquisition and a TCE may be required from an existing parking lot to complete the downtown street modifications along West Broadway. To accommodate the removal of the grade separation at Golden Shore and West Shoreline Drive, TCEs may be required along the west and east side of Golden Shore north of West Shoreline Drive and along the south side of West Shoreline Drive east of Golden Shore.

TCEs would be required along multiple portions of the LA River and Rio Hondo (LARIO) Trail to accommodate for trail connections associated with the proposed Project and along portions of 6th Street, 7th Street, Golden Avenue, and San Francisco Avenue. The TCEs required along 6th Street and 7th Street (between Golden Avenue and Daisy Avenue) would accommodate restriping, as well as curb and sidewalk improvements.

The proposed Project is included in the *Final 2017 Adopted Federal Transportation Improvement Program* (FTIP) (Southern California Association of Governments [SCAG] 2016a) and the *Final 2016-2040 Regional Transportation Plan* (RTP)/*Sustainable Communities Strategy* (SCS) (SCAG 2016b) for Los Angeles County as Project ID: LA0G830.

1.1. Purpose of the Noise Study Report

The purpose of this NSR is to evaluate noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) "Procedures for Abatement of Highway Traffic Noise." 23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and Federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with Federal Highway Administration (FHWA) noise standards. Compliance with 23 CFR 772 provides compliance with the noise impact assessment requirements of the National Environmental Policy Act (NEPA).

The Caltrans *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* (Protocol) (Caltrans 2011) provides Caltrans policy for implementing 23 CFR 772 in California. The Protocol outlines the requirements for preparing noise study reports (NSR). Noise impacts associated with this project under the California Environmental Quality Act (CEQA) are evaluated separately in the Project's Environmental Impact Report/Environmental Assessment, Chapter 3 – CEQA Evaluation, Section 3.2.13 Noise.

1.2. Purpose and Need

1.2.1. Purpose of the Project

The purpose of the proposed Project is to:

- Provide a structure and highway facility that meets current structural and geometric design standards
- Provide a facility that is compatible with planned freeway improvements and downtown development projects
- Improve connectivity from the downtown area to surrounding communities and adjacent recreational use areas
- Improve safety and operations for all modes of transportation

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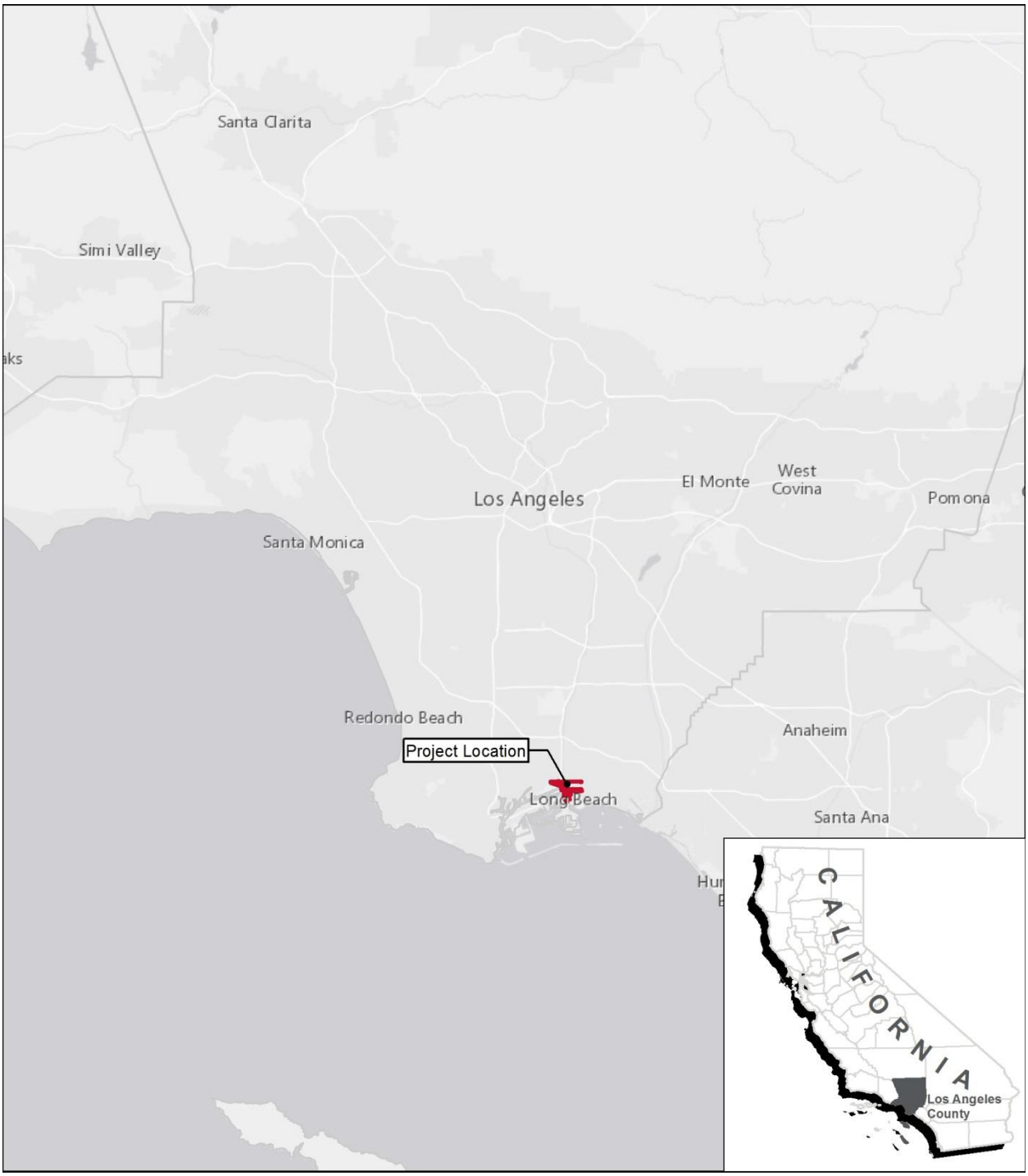

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Shoemaker Bridge Replacement Project

Figure 1-1. Regional Location

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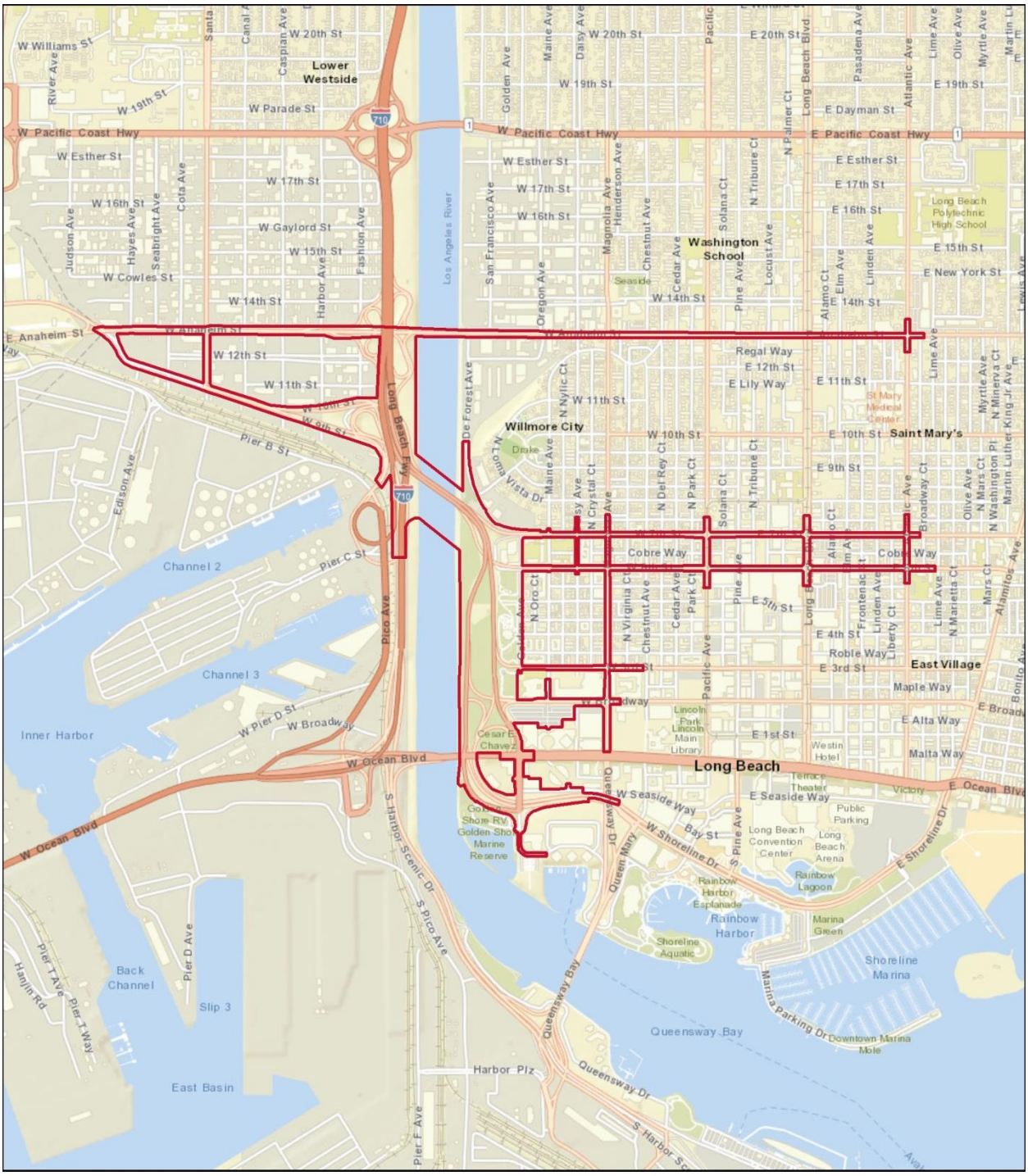

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Shoemaker Bridge Replacement Project

Figure 1-2. Project Location

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The Project limits are generally bounded by 9th and 10th Street ramp connections and West Shoreline Drive to the west, Magnolia Avenue to the east, Ocean Boulevard and West Shoreline Drive to the south, and Anaheim Street to the north. The Project limits on the east side extend beyond Magnolia Avenue along Anaheim, 6th Street, and 7th Street to Atlantic Boulevard. These limits provide the logical termini to facilitate the replacement of the existing bridge and accommodate planned City improvements, as well as the proposed improvements in the I-710 Corridor Project. The proposed Project is consistent with the preliminary conceptual designs, as identified in Alternatives 5C and 7 of the I-710 Corridor Project.

1.2.2. Need for the Project

The existing Shoemaker Bridge has structural deficiencies and a high accident rate due to nonstandard geometric features that cannot be upgraded to current state highway standards. The Project is needed to improve safety, operations, and connectivity between downtown Long Beach and regional transportation facilities. It is also needed to accommodate planned improvements in the area, such as the City's planned expansion of Cesar E. Chavez and Drake Parks.

If the existing Shoemaker Bridge were to continue to be used for vehicular traffic, the nonstandard features would remain, and the existing bridge alignment would preclude planned improvements by other locally and regionally significant projects, specifically the I-710 Corridor Project. Implementation of the proposed Project would provide consistency with the improvements proposed as part of the I-710 Corridor Project and the Mobility Element of the *City of Long Beach General Plan* (City of Long Beach 2013), in addition to meeting the needs for traffic safety and accommodating the projected increase in demand for the City's nonmotorized transportation facilities.

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Chapter 2. Project Description

2.1. Project Alternatives

This section describes the proposed design alternatives developed by a multi-disciplinary team to achieve the proposed Project's purpose while avoiding or minimizing environmental impacts. The alternatives, as described in this section, consist of Alternative 1 (No Build), Alternative 2 (Design Options A and B), and Alternative 3 (Design Options A and B).

2.1.1. Alternative 1 (No Build)

Under Alternative 1 (No Build), the proposed Project improvements would not be implemented; therefore, no construction activities would occur. The existing structure and highway facility would not meet current structural and geometric design standards and, thus, safety and connectivity would not be improved within the Project limits.

2.1.2. Alternative 2 (Design Options A and B)

Build Alternative 2 includes the replacement of the ramp structures that connect to the downtown Long Beach roadway system. This alternative would evaluate the roundabout design option (Design Option A) and the "Y" interchange design option (Design Option B) at the east end of the proposed bridge. The new bridge would consist of multiple structures, with numerous spans that cross the LA River, the northbound (NB) lanes of SR-710, and the LARIO Trail. The new ramps would be located approximately 500 feet (ft) (measured from centerline) south of the existing Shoemaker Bridge. A portion of the existing bridge would be repurposed into a nonmotorized recreational public space maintained by the City. The bottom of the new river-spanning structures would exceed the existing 43-ft mean high water level (MHWL).

The deck of the new bridge would accommodate two through ramp lanes in each direction, shoulders, barriers, and a bicycle and pedestrian path on the south side of the bridge. Under Alternative 2 (Design Option B), the bridge would also include two turn lanes in the southbound (SB) direction. On the west side of the river, the ramps would connect on the left side of the freeway, at approximately the same merge and diverge existing ramp locations. On the east side of the river, a roundabout or controlled intersection would be provided at the ramp termini. The ramp termini would be located at or near the eastern abutment of the river-spanning section of the new Shoemaker Bridge.

2.1.2.1. Local Streets

Alternatives 2 and 3 (Design Options A and B) include modifications to nine local streets, including West Shoreline Drive, Ocean Boulevard, Golden Shore/Golden Avenue, West Broadway, 3rd Street, 6th Street, 7th Street, 9th Street, 10th Street, and Anaheim Street.

West Shoreline Drive

At the eastern end of the new bridge, a new roundabout or controlled intersection would be constructed to allow West Shoreline Drive and 7th Street ingress and egress. The existing NB and SB West Shoreline Drive is currently separated by Cesar E. Chavez Park and the Southern California Edison (SCE) Seabright Substation. The NB roadbed would be removed and integrated into Cesar E. Chavez Park. The existing SB roadbed, located adjacent to the LA River, would be reconfigured and widened to allow two-way traffic and access from the newly configured West Shoreline Drive to the substation. A new controlled intersection would be introduced at West Shoreline Drive and the termini of West Broadway. The loop ramp connector between NB West Shoreline Drive and Ocean Boulevard would be removed and converted into park space. The existing Golden Shore Bridge that crosses over West Shoreline Drive would be removed, and a new controlled intersection would be created at West Shoreline Drive and Golden Shore.

3rd Street

The existing 3rd Street alignment curves to the north through Cesar E. Chavez Park and merges onto NB West Shoreline Drive. The proposed realignment of 3rd Street would be revised to end at Golden Avenue, and the 3rd Street section that curves into the park would be removed and converted into park space. The street, which currently carries one-way traffic in the westbound (WB) direction, would be reconfigured to allow for two-way traffic between Golden and Magnolia Avenues.

Ocean Boulevard

The loop ramp connecting NB West Shoreline Drive and Ocean Boulevard would be removed and converted into park space. The Ocean Boulevard and Golden Shore intersection would be modified to accommodate two-way traffic on Golden Shore between Ocean Boulevard and West Broadway.

Golden Shore/Golden Avenue

Golden Shore is currently a two-way street from Queensway Drive to Ocean Boulevard. North of Ocean Boulevard, Golden Shore becomes Golden Avenue and the roadway splits, providing connections to and from NB West Shoreline Drive and West Broadway. The proposed Project would eliminate the existing Golden Shore Bridge over West Shoreline Drive and reconstruct the street at a lower elevation to create a new controlled intersection at West Shoreline Drive. The connector ramps from SB West Shoreline Drive to Golden Shore and from NB Golden Shore to

eastbound (EB) West Shoreline Drive would be removed. The intersection of Golden Shore and West Seaside Way would be eliminated. The proposed Project would also eliminate the ramp connection from NB West Shoreline Drive and realign Golden Avenue to provide connections to and from West Broadway. Access from West Broadway to Golden Avenue would be limited to right-in and right-out only.

West Seaside Way

West Seaside Way between Golden Shore and Queens Way would be reconfigured, and the controlled intersection at Golden Shore would be eliminated. The street would continue to provide access to parking structures and local office buildings. A new intersection allowing access between West Shoreline Drive and West Seaside Way would be constructed approximately 675 ft east of Golden Shore.

West Broadway

The existing terminus of West Broadway is uncontrolled and diverges from the left side of SB West Shoreline Drive. The portion of West Broadway from West Shoreline Drive to Maine Avenue, including its grade separation structure, would be removed. The connection would be replaced by a controlled intersection at West Shoreline Drive and West Broadway. West Broadway would be configured for two-way traffic from West Shoreline Drive to Magnolia Avenue. Traveling EB, a right-turn pocket would be provided on West Broadway at the approach to Magnolia Avenue.

6th Street

The existing terminus of 6th Street is uncontrolled and diverges from the right side of SB West Shoreline Drive, on the Shoemaker Bridge. The existing grade separated structure would be removed. The portion of 6th Street from SB West Shoreline Drive to Golden Avenue would be reconfigured to provide access to the warehouse properties located at Topaz Court and Golden Avenue and would not provide connectivity to West Shoreline Drive. 6th Street would be converted from one-way WB to two-way traffic flow between Golden Avenue and Atlantic Avenue. Additionally, a new bicycle path would extend from the new 6th Street terminus, providing connections to the LARIO Trail and the proposed Shoemaker Bridge. A new roadway would also extend from the existing 6th Street terminus to provide access to Drake Park.

7th Street

The existing terminus of 7th Street is uncontrolled and merges on the right side of NB West Shoreline Drive, on the Shoemaker Bridge. The portion of 7th Street from Golden Avenue to West Shoreline Drive, including its grade separation structure, would be removed and reconstructed. The connection would be replaced by a roundabout or Y intersection at West Shoreline Drive.

Seventh Street would be reconfigured from one-way EB to two-way traffic between West Shoreline Drive and Atlantic Avenue and would feature two lanes in each direction.

9th Street

The existing terminus of 9th Street is uncontrolled and merges on the right side of SB West Shoreline Drive, on the Shoemaker Bridge. The portion of 9th Street from Fashion Avenue to West Shoreline Drive, including its grade separation structure, would be removed. The connection would not be replaced. The Project would also evaluate traffic calming and signal improvements on 9th Street between Caspian Avenue and Anaheim Street.

10th Street

The existing terminus of 10th Street is uncontrolled and diverges from the right side of NB West Shoreline Drive, on the Shoemaker Bridge. The portion of 10th Street from West Shoreline Drive to Fashion Avenue, including its grade separation structure, would be removed. The connection would not be replaced.

Anaheim Street

The Project would evaluate traffic calming and signal improvements on Anaheim Street between West 9th Street and Atlantic Avenue.

Ramps/Connectors

The new ramps would be operated and maintained by Caltrans. The area owned and maintained by Caltrans after completion of the proposed Project would include the new Shoemaker Bridge terminus on the east of the LA River, the main span over the LA River to SR-710, the structure spanning the NB lanes of SR-710, and the roadbed connecting to SR-710.

2.1.3. Alternative 3 (Design Options A and B)

Similar to Alternative 2, Alternative 3 includes the replacement of the ramp structures that connect to the downtown Long Beach roadway system. It would also evaluate Design Options A and B at the east end of the proposed bridge. In addition, similar to Alternative 2, the bridge under Alternative 3 with Design Option B would include two turn lanes in the SB direction. On the west side of the river, the ramps would connect on the left side of the freeway, at the same merge and diverge locations of the existing ramps. On the east side of the river, a roundabout (Design Option A) or a controlled intersection (Design Option B) would be provided at the ramp termini. The ramp termini are located at or near the eastern abutment of the river-spanning section of the new Shoemaker Bridge. Local street improvements described under Alternative 2 would also apply under Alternative 3. The difference between Alternatives 2 and 3 is the removal of the existing Shoemaker Bridge. The same ramp/connectors proposed under Alternative 2 would apply under Alternative 3.

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Chapter 3. Fundamentals of Traffic Noise

The following is a brief discussion of fundamental traffic noise concepts. For a detailed discussion, refer to the Caltrans' Technical Noise Supplement (TeNS) (Caltrans 2013), a technical supplement to the Protocol that is available on the Caltrans website at 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 determines 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 and Hertz

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 micro-Pascals (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 approximately 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 sounds 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, a difference of 3 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 dBA. Table 3-1 shows typical A-weighted noise levels.

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 ft		
	— 100 —	
Gas lawn mower at 3 ft		
	— 90 —	
Diesel truck at 50 ft at 50 mph		Food blender at 3 ft
	— 80 —	Garbage disposal at 3 ft

Table 3-1. Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Noisy urban area, daytime		
Gas lawn mower, 100 ft	— 70 —	Vacuum cleaner at 10 ft
Commercial area		Normal speech at 3 ft
Heavy traffic at 300 ft	— 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
Notes:
dBA=A-weighted decibels; ft=feet; mph=miles per hour

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 than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1 dB changes in sound levels when exposed to steady, single-frequency ("pure-tone") signals in the midfrequency range (1,000–8,000 Hz). In typical noisy environments, 1–2 dB changes in noise 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 the 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. 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 1-hour period and is the basis for Noise Abatement Criteria (NAC) used by Caltrans and the Federal Highway Administration (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 percent of the time, and L_{90} is the sound level exceeded 90 percent 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 the nighttime hours between 10:00 p.m. and 7:00 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 10:00 p.m. and 7:00 a.m., and a 5 dB penalty applied to the A-weighted sound levels occurring during the evening hours between 7:00 p.m. and 10:00 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 following factors.

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 dB 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 dB 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 ft. 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 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall dropoff rate of 4.5 dB 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 ft) 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 Humanmade 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.

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Chapter 4. Federal, State, and Local Policies and Procedures

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, the physical alternation of an existing highway where there is either substantial horizontal or substantial vertical alteration, or other activities discussed below. 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.

Type I projects also include the addition of through-traffic lanes, which function as high-occupancy vehicle (HOV) lanes, high-occupancy toll (HOT) lanes, bus lanes, or truck climbing lanes. Other Type I projects include the addition of an auxiliary lane (except when an auxiliary lane is a turn lane); 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 auxiliary lane; and the addition of a new or substantial alternation 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. Projects unrelated to increased noise levels, such as striping, lighting, signing, and landscaping projects, are not considered Type I projects.

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 2035 approaches or exceeds the NAC specified in 23 CFR 772, or a predicted noise level

substantially exceeds the existing noise level (i.e., a "substantial" noise increase). Even though 23 CFR 772 does not specifically define the terms "substantial increase" or "approach," these criteria are defined in the Traffic Noise Analysis Protocol, as described below.

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

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

Activity Category	NAC, Hourly A-Weighted Noise Level, $L_{eq}(h)$ [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 through D or F.
F	No NAC – Reporting Only	—	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	No NAC – Reporting Only	—	Undeveloped lands that are not permitted.

Notes:
[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.
dBA=A-weighted decibels; FHWA=Federal Highway Administration; $L_{eq}(h)$=equivalent continuous sound level over a specified period of time; NAC=Noise Abatement Criteria

In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. In situations where there are no exterior activities, or where the exterior activities are far from the roadway or physically shielded in a manner that prevents an impact on exterior activities, the interior criterion (Activity Category D) is used as the basis for determining a noise impact.

4.2. State Regulations and Policies

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

The Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Traffic Noise Analysis Protocol; Caltrans 2011) specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. The NAC specified in the Traffic Noise Analysis Protocol are the same as those specified in 23 CFR 772. The Traffic Noise Analysis Protocol defines a noise increase as "substantial" when the predicted noise levels with project implementation exceed existing noise levels by 12 dB. The Traffic Noise Analysis Protocol also states that a sound level is considered to approach an NAC level when the sound level is within 1 dB of the NAC identified in 23 CFR 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

The Caltrans Technical Noise Supplement (Caltrans 2013) and the Traffic Noise Analysis Protocol provide detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

4.2.2. 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.

4.2.3. 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 $L_{eq}(h)$ (hourly equivalent continuous sound level in A-weighted decibels) in the interior of public or private elementary or secondary classrooms, libraries, multi-purpose rooms, or spaces. This

requirement does not replace the "approach or exceed" NAC criterion for FHWA Activity Category D 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 nonfreeway sources exceed 52 dBA $L_{eq}(h)$ prior to the construction of the proposed freeway project, then noise abatement must be provided to reduce noise to the level that existed prior to construction of the project.

Chapter 5. Study Methods and Procedures

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

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the Project. Land uses in the noise study area (NSA) were categorized in terms of FHWA activity categories (as shown in Table 4-1) and the extent of frequent human use. As stated in the Traffic Noise Analysis Protocol (Caltrans 2011), noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with outdoor activity areas of frequent human use corresponding to Activity Categories B or C, such as residential backyards, common use areas at multi-family residences, playground areas associated with schools, and sitting areas associated with a park. This NSR also evaluates interior noise levels for land uses associated with Activity Category D. The pool area associated with the hotel was evaluated under Activity Category E. In addition, office, industrial, and commercial uses without outdoor frequent human use areas in the NSA were classified as Activity Category F for documentation purposes only.

Twenty-five short-term measurement (ST) locations were selected to represent outdoor frequent human use areas within the NSA. Two long-term measurement (LT) locations were selected to capture the traffic noise level patterns for each acoustically equivalent zone within the NSA. Exterior to interior noise level reduction measurements were performed (LSA Associates, Inc. [LSA] 2013) in representative classrooms at Cesar Chavez and Edison Elementary Schools.[1] Short-term measurement locations were selected to serve as representative modeling locations. Also, other non-measurement locations were selected as modeling locations. A total of 189 receptor locations were modeled to represent land uses associated with Activity Categories B through F uses in the NSA. The two outdoor frequent human use areas are located on the west side of the Cesar Chavez Elementary School representing the basketball court and sitting area were not modeled in Traffic Noise Model (TNM) 2.5 because the future roadway alignment would require demolition of these two uses. The monitoring and modeled receptor locations are shown on Figure 5-1.

[1] The interior/exterior measurements at Cesar Chavez Elementary School (Kimberly Weber, Principal) and Edison Elementary School (Richard Littlejohn, Principal) were authorized by the schools' principals on January 20, 2011.

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EA No. 27300

Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 1 of 10

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EA No. 27300

Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 2 of 10

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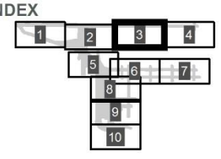
LEGEND

- Project Limits
- Modeled Noise Receptor Location
- Short-Term Monitoring Location
- Long-Term Monitoring Location
- Roadway Improvements
- Existing Right-of-Way

0 Feet 200

MAP INDEX



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EA No. 27300

Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 3 of 10

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EA No. 27300

Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 4 of 10

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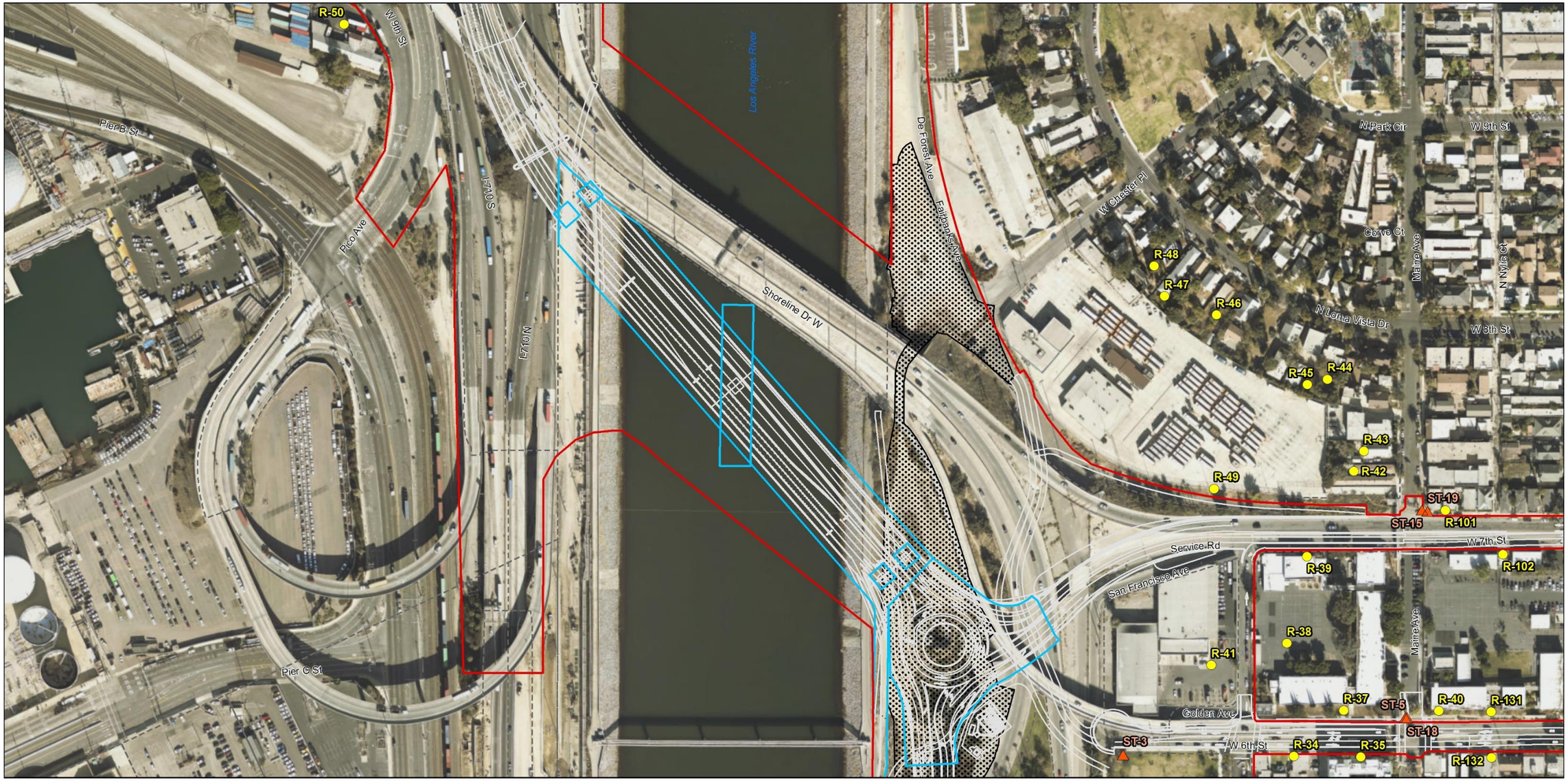

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Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 5A of 10

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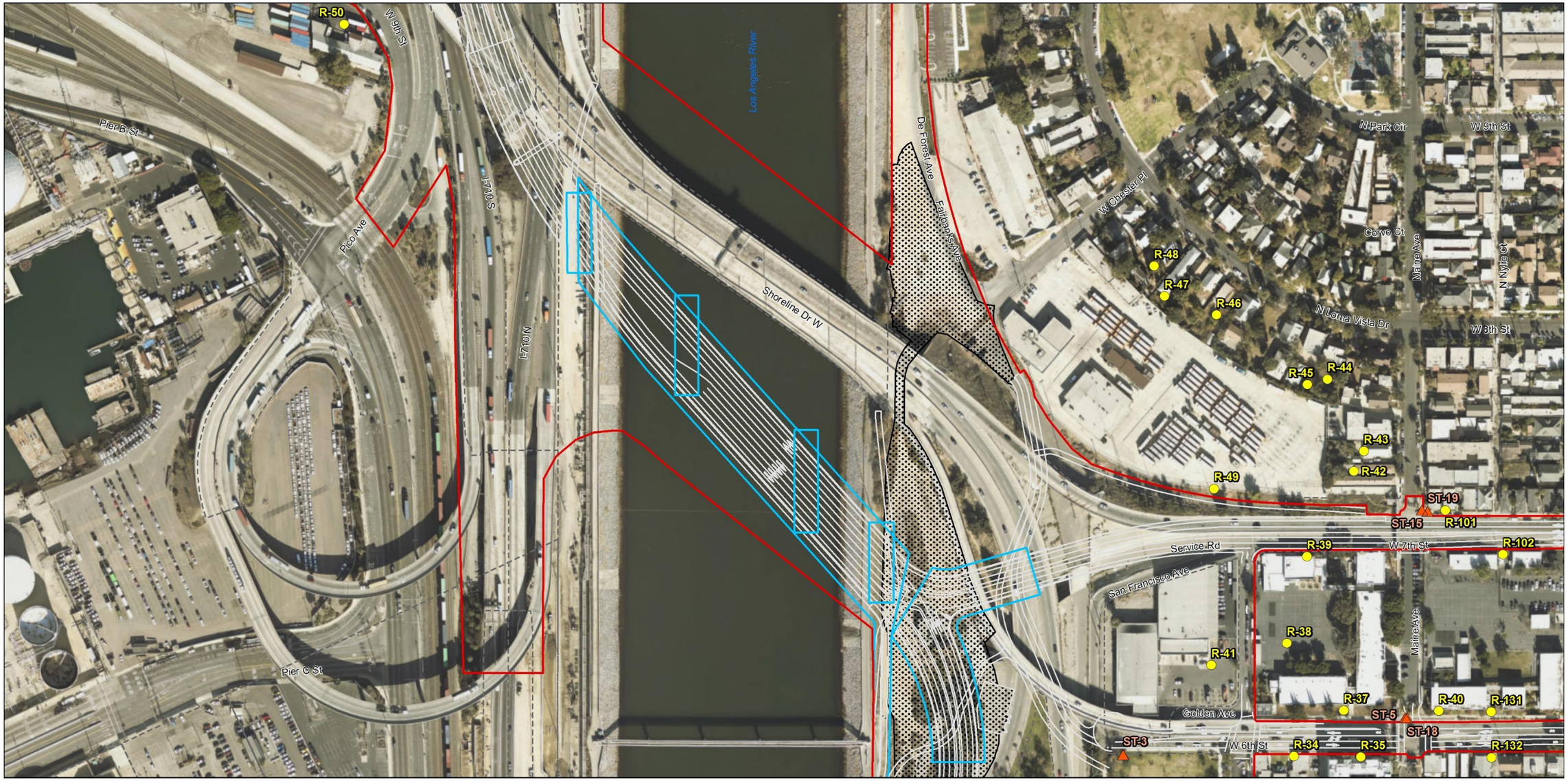

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EA No. 27300

Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 5B of 10

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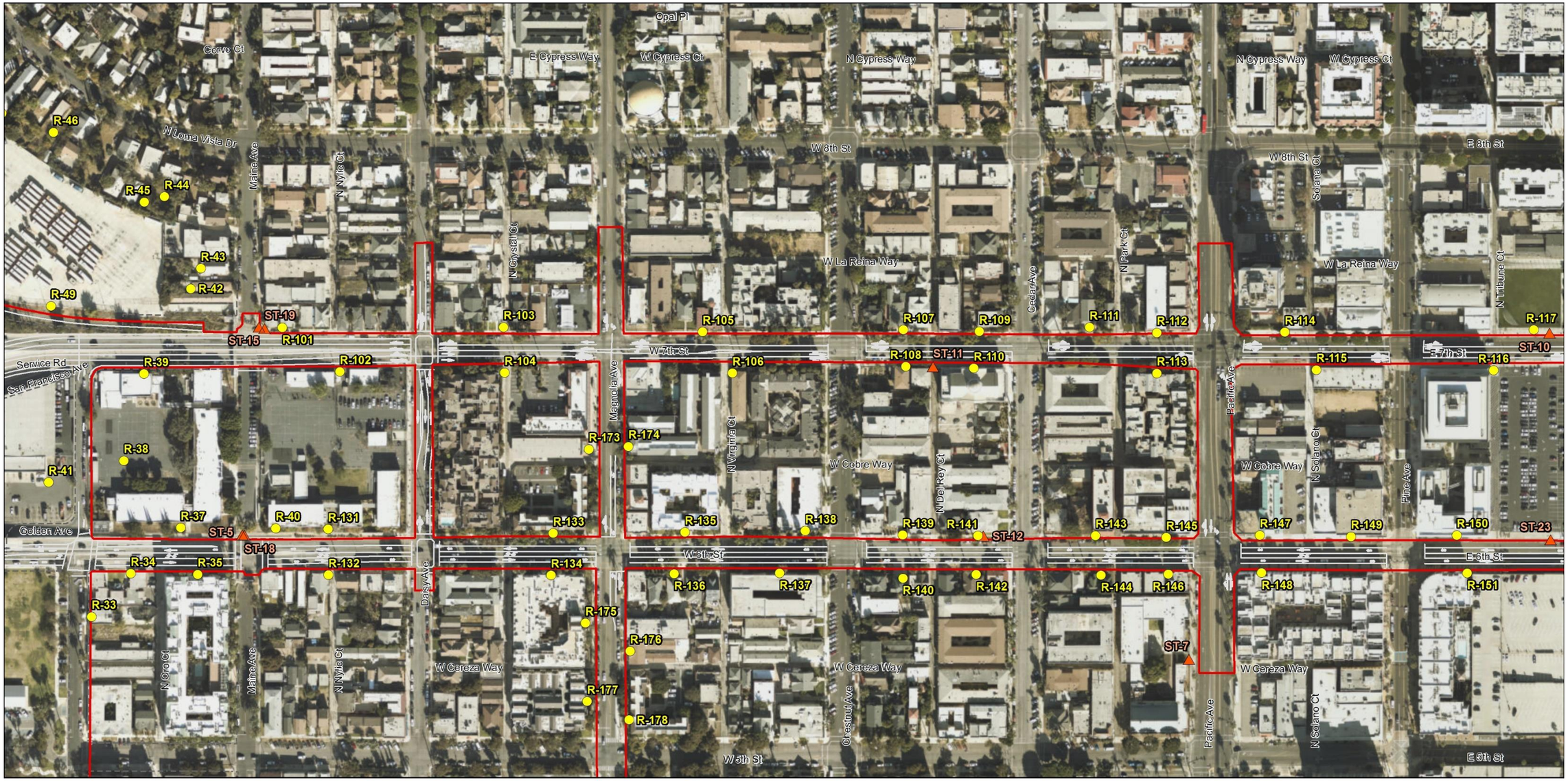
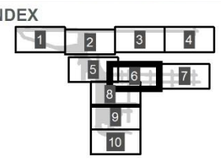


LEGEND

- Project Limits
- Modeled Noise Receptor Location
- Short-Term Monitoring Location
- Long-Term Monitoring Location
- Roadway Improvements
- Existing Right-of-Way

0 Feet 200

MAP INDEX



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EA No. 27300

Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 6 of 10

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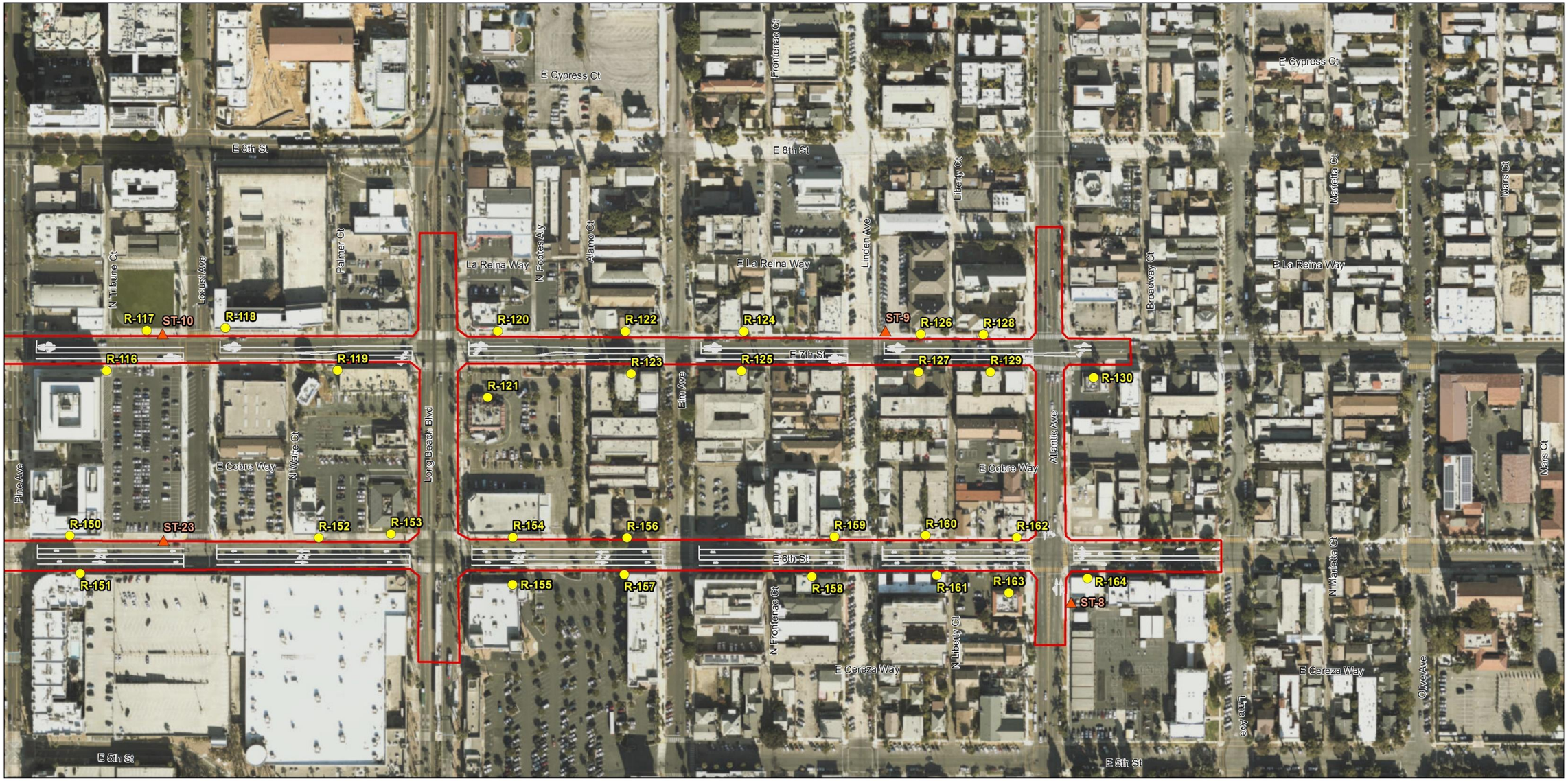

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Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 7 of 10

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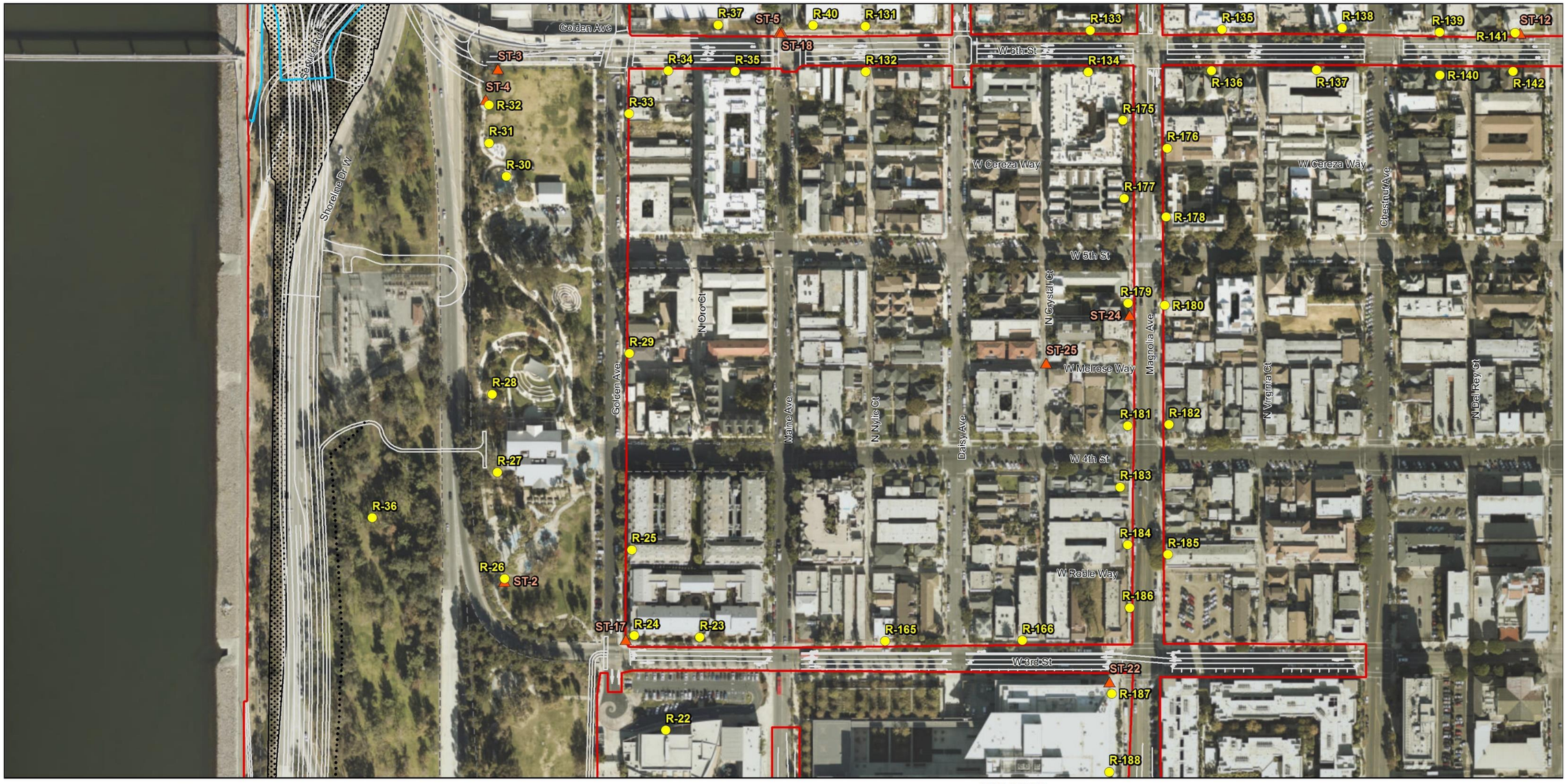
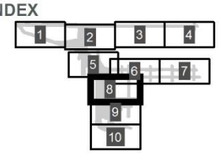


LEGEND

- Project Limits
- Modeled Noise Receptor Location
- Short-Term Monitoring Location
- Long-Term Monitoring Location
- Roadway Improvements
- Existing Right-of-Way
- Proposed Right-Of-Way
- Long Beach MUST Project
- Permanent Slope Easement

0 Feet 200

MAP INDEX



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EA No. 27300

Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 8 of 11

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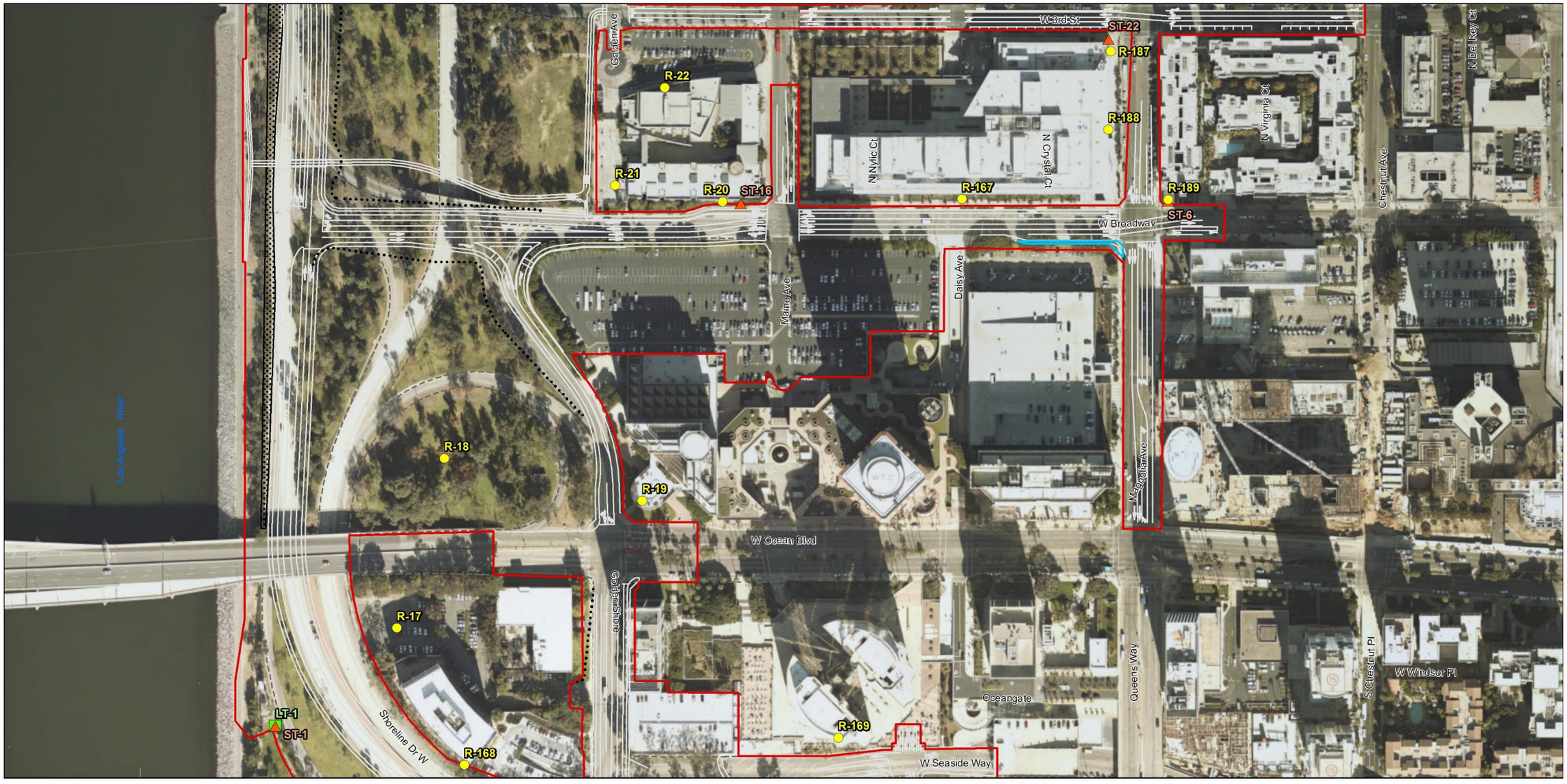

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Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 9 of 10

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Shoemaker Bridge Replacement Project

Figure 5-1. Project Design Features of Alternatives 2 and 3
Sheet 10 of 10

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5.2. Field Measurement Procedures

Short-term noise measurements were taken at outdoor frequent human use areas classified as Activity Categories B, C, and D within the NSA during off-peak traffic hours when traffic was flowing freely. Field measurements were taken at these locations to document ambient noise levels to calibrate the noise prediction model and determine the building exterior-to-interior noise level reductions. Measurements were taken in accordance with the procedures cited in the TeNS (Caltrans 2013).

All measurements were made using a Larson Davis Model 820 Type 1 sound level meter (Serial Number (No.) 1332. The following short-term measurement procedures were utilized:

- Calibrate the sound level meter
- Set up the sound level meter at a height of 5 ft
- Commence noise monitoring
- Collect site-specific data, such as date, time, direction of traffic, vehicle speed, and the location of the sound level meter relative to any existing feature
- Count passing vehicles for a period of 10 to 15 minutes during noise level measurement; vehicles were split into three categories: automobiles, medium-duty trucks, and heavy-duty trucks
- Stop measurement after 10 to 15 minutes
- Calibrate the sound level meter
- Proceed to next monitoring site and repeat

The traffic counts were expanded to hourly volumes (to normalize the results to hourly values) and entered into TNM 2.5 for each monitoring site. The monitoring results were used to calibrate the model outputs.

5.2.1. Short-Term Measurements

Short-term noise level measurements were conducted using a Larson Davis Model 820 Type 1 sound level meter. Measurements were taken over a 10- to 15-minute period at each site; longer measurement periods were used for streets that had lower traffic volumes. Short-term monitoring was conducted at Activity Categories B, C, and D land uses.

Traffic on 3rd Street, 6th Street, 7th Street, 9th Street, Magnolia Avenue, Anaheim Street, Broadway Avenue, and adjacent roadways were counted during short-term noise measurements. Vehicles were classified as automobiles, medium-duty trucks, or heavy-duty trucks. Automobiles are vehicles with two axles and four tires that are designed primarily to carry passengers; small

vans and light trucks are included in this category. Medium-duty trucks include all cargo vehicles with two axles and six tires. Heavy-duty trucks include all vehicles with three or more axles. This traffic condition was modeled in TNM 2.5..

5.2.2. Long-Term Measurement

Two long-term 24-hour noise level measurements were conducted within the NSA using a Larson Davis Model 820 Type 1 sound level meter. Long-term sound level data were collected over a 24-hour period at various locations. LT-1 was conducted between April 17, 2017, and April 18, 2017; LT-2 was conducted between April 19, 2017, and April 20, 2017. The purpose of these measurements was to describe variations in sound levels throughout the day. Figure 5-1 shows the long-term 24-hour noise level measurement locations.

5.2.3. Exterior to Interior Noise Measurements

Simultaneous exterior and interior noise measurements were conducted by LSA on January 20, 2011, using Larson Davis Models 824 and 831 Type 1 sound level meters. The purpose of these measurements was to determine the exterior-to-interior noise level reduction provided by the building. These exterior and interior noise level measurements were conducted in buildings with classrooms. The measured building attenuation was applied to the predicted future exterior noise level to obtain the predicted future interior noise level.

For each measurement, a microphone was set up outside, approximately the same distance from the highway as the center of each room under investigation. The second microphone was placed in the center of the room. The microphones were set up far enough away from each of the buildings to avoid shielding by the corners of the buildings. This was accomplished by maintaining at least a 70-degree angle between a perpendicular line to the highway and a line to the corner of the building.

5.3. Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using FHWA TNM 2.5. TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010. Key inputs to the TNM were the locations of roadways, shielding features (e.g., topography and buildings), noise barriers, ground type, and receptors. Three-dimensional representations of these inputs were developed using topographic maps provided by the Project engineer in May 2017.

The ambient short-term noise monitoring and concurrent traffic counts were used to calibrate the TNM 2.5 model. The TNM 2.5 program is the TNM used to evaluate traffic noise impacts against the NAC. The existing and future traffic noise levels at all 189 receptor locations were modeled using either the peak-hour traffic volumes or the worst-case traffic volumes, whichever is lower.

The worst-case operation (prior to speed degradation) is assumed to be level of service (LOS) D/E. The existing and future peak-hour traffic volumes obtained from the Draft *Traffic Operational Analysis Report* (HDR Engineering, Inc. [HDR] 2018) and the LOS D/E volumes for each roadway within the area of the Project limits were determined by the Project engineer in June 2017 and are provided in Appendix A of this NSR. The modeled future noise levels were compared with the modeled existing peak noise (for substantial increases in noise levels) and the NAC to determine the potential noise impacts. Feasible noise abatement measures were considered to reduce the projected noise impacts.

The TNM 2.5 model is sensitive to the volume of trucks on the roadway because trucks contribute disproportionally to the traffic noise. Truck percentages on all roadways within the NSA for existing conditions were collected from traffic counts taken during ambient noise measurements. The future vehicle distributions for all roadways within the NSA were provided by the Project engineer in June 2017. Vehicle distribution and speed on all roadways used for existing and future traffic noise modeling are shown in Appendix A.

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

Traffic noise impacts are considered to occur at receptor locations where predicted future worst-case noise levels are at least 12 dB greater than their corresponding modeled existing peak traffic noise level or where predicted 2035 noise levels approach or exceed the NAC for the applicable activity category. Where traffic noise impacts are identified, noise abatement must be considered for reasonableness and feasibility, as required by 23 CFR 772 and the Traffic Noise Analysis Protocol.

According to the Traffic Noise Analysis Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dB at affected receptor locations is predicted with implementation of the abatement measures. In addition, barriers should be designed to intercept the line of sight from the exhaust stack of a truck to the first tier of receptors, as required by the *Highway Design Manual*, Chapter 1100 (Caltrans 2018). Other factors that affect feasibility include topography, access requirements for driveways and ramps, presence of local cross streets, utility conflicts, other noise sources in the area, and safety considerations. The overall reasonableness of noise abatement for each noise barrier is determined by considering a minimum noise reduction of 7 dB for at least one of the benefited receptor locations based on the Traffic Noise Analysis Protocol (Caltrans 2011). Additional factors to consider include the cost of noise abatement and viewpoints of benefited receptors.

The Traffic Noise Analysis Protocol (Caltrans 2011) defines the cost consideration in the reasonableness determination of noise abatement based on an allowance per benefited unit/receptor (i.e., residences that receive at least 5 dB of noise reduction from a noise barrier). In 2019, Caltrans updated the allowance to $107,000 per benefited unit/receptor (Caltrans n.d.). Total allowances are calculated by multiplying the cost per residence by the number of benefited residences.

Chapter 6. Existing Noise Environment

6.1. Existing Land Uses

Developed and undeveloped land uses in the Project vicinity were identified through land use maps, aerial photography, and site inspection. Within each land use category, outdoor frequent human use areas associated with single-family and multi-family residences, a recreational vehicle (RV) park, two schools, public parks, and hotels; other uses that include office, commercial, and industrial uses were identified as receptors within the NSA. Existing land uses in the NSA are described below in further detail.

- **Shoreline Drive South of Ocean Boulevard:** Land uses in this area include Golden Shore RV Park, which is located south of Shoreline Drive and is approximately 7 ft lower in elevation, and office uses are located north of Shoreline Drive with a similar elevation to Shoreline Drive. The SB off-ramp from Golden Shore Street is higher in elevation than Shoreline Drive, which provides topographical shielding for the RV Park. The RV Park was evaluated under Activity Category B, which has an exterior NAC of 67 A-weighted decibel (dBA) L_{eq}. The office has no outdoor frequent human use areas and was classified under Activity Category E for documentation purposes.
- **Shoreline Drive between Ocean Boulevard and Broadway:** Land uses in this area include a hotel, a park, and commercial uses. The hotel is located east of Shoreline Drive and is approximately 9 ft higher in elevation. The NB on-ramp from Golden Shore Street is higher in elevation than Shoreline Drive, which provides topographical shielding for the hotel. Cesar E. Chavez Park is located east of Shoreline Drive and is similar in elevation to the road and to the west of the NB on-ramp from Golden Shore Street. The park is located between the NB and SB lanes of Shoreline Drive. An outdoor swimming pool area associated with the hotel was evaluated under Activity Category E, which has an exterior NAC of 72 dBA L_{eq}. The park has no outdoor frequent human use areas and was classified under Activity Category F for documentation purposes.
- **Shoreline Drive between Broadway and 3rd Street:** Land uses in this area include Cesar Chavez Elementary School, which is located east of Shoreline Drive and is approximately 10 ft higher in elevation, where there is topographical shielding provided by the elevation difference. The school's playground was evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. The school's classrooms were evaluated under Activity Category D, which has an interior NAC of 52 dBA L_{eq}. Third Street passes along the north side of the school and transitions into an on-ramp to Shoreline Drive. The Broadway off-ramp coming from Shoreline Drive passes along the southern side of the school. There is no shielding along the northern or southern sides of the school.

- **Shoreline Drive between 3rd Street and 6th Street:** Land uses in this area include Cesar E. Chavez Park, located east of Shoreline Drive, and multi-family residences located east of Golden Avenue. The southern half of the park is approximately 10 ft higher in elevation, which provides topographical shielding for the park. The northern half of the park is similar in elevation to Shoreline Drive, and an existing 9 ft high wall (Existing Wall [EW] No. 1) runs along the western edge of the park. Cesar E. Chavez Park provides topographical shielding, and the EW partially shields for these multi-family residences. The multi-family residences are located approximately 360 ft from Shoreline Drive. Third Street transitions into an on-ramp to Shoreline Drive. Sixth Street is an off-ramp overpass coming from Shoreline Drive. The outdoor active use areas within Cesar E. Chavez Park were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. The park located on the west side of NB Shoreline Drive has no outdoor frequent human use areas based on the field land use survey and were classified under Activity Category F for documentation purposes. The multi-family residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}.
- **Shoreline Drive between 6th Street and 7th Street:** Land uses in this area include Edison Elementary School and bus yard (i.e., commercial/industrial) uses. Edison Elementary School is located east of Shoreline Drive and is approximately 12 ft lower in elevation. The school's outdoor active use areas were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq}. The school's classrooms were evaluated under Activity Category D, which has an interior NAC of 52 dBA L_{eq}. The bus yard is located between the school and Shoreline Drive, which provides shielding for the school. The bus yard was classified under Activity Category F for documentation purposes. The 6th Street off-ramp overpass coming from Shoreline Drive passes along the southern side of the school. Seventh Street passes along the northern side of the school and transitions into an on-ramp to Shoreline Drive. There is no shielding for the northern or southern sides of the school.
- **Shoreline Drive north of 7th Street:** Land uses in this area include single-family residences, a bus mechanical facility, and commercial/industrial uses that are located approximately 20 to 30 ft lower in elevation than Shoreline Drive/Shoemaker Bridge. There is an existing 7 ft high property wall (EW No. 2) that runs along the rear property line of all the single-family residences in this area, where the backyards of these residences face toward Shoreline Drive/Shoemaker Bridge. The single-family residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The bus mechanical facility and commercial/industrial uses were classified under Activity Category F for documentation purposes.
- **West of SR-710 between 9th Street and Pier B Street:** Land uses in this area include commercial uses that are located approximately 25 ft lower in elevation than SR-710. The commercial uses were classified under Activity Category F for documentation purposes.

- **Anaheim Street between I-710 and Atlantic Avenue:** Land uses in this area include multi-family residences and commercial uses that are located at grade with Anaheim Street. The residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The commercial uses were classified under Activity Category F for documentation purposes.
- **7th Street between Shoreline Drive and Atlantic Avenue:** Land uses in this area include single-family and multi-family residences, churches, and commercial uses that are located at grade with 7th Street. The residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The churches were evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq} and Activity Category D, which has an interior NAC of 52 dBA L_{eq}. The commercial uses were classified under Activity Category F for documentation purposes.
- **6th Street between Shoreline Drive and Atlantic Avenue:** Land uses in this area include single-family and multi-family residences, a church, and commercial uses that are located at grade with 6th Street. The residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The church was evaluated under Activity Category C, which has an exterior NAC of 67 dBA L_{eq} and Activity Category D, which has an interior NAC of 52 dBA L_{eq}. The commercial uses were classified under Activity Category F for documentation purposes.
- **3rd Street between Shoreline and Magnolia Avenue:** Land uses in this area include single-family and multi-family residences and commercial uses that are located at grade with 3rd Street. The residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The commercial uses were classified under Activity Category F for documentation purposes.
- **Magnolia Avenue between 7th Street and Ocean Boulevard:** Land uses in this area include single-family and multi-family residences and commercial uses that are located at grade with Magnolia Avenue. The residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The commercial uses were classified under Activity Category F for documentation purposes.
- **Pacific Avenue between 7th Street and 6th Street:** Land uses in this area include multi-family residences and commercial uses that are located at grade with Pacific Avenue. The residences were evaluated under Activity Category B, which has an exterior NAC of 67 dBA L_{eq}. The commercial uses were classified under Activity Category F for documentation purposes.
- **Atlantic Avenue between 7th Street and 6th Street:** Land uses in this area include multi-family residences and commercial uses that are located at grade with Atlantic Avenue. The residences were evaluated under Activity Category B, which has an exterior

NAC of 67 dBA L_{eq}. The commercial uses were classified under Activity Category F for documentation purposes.

6.2. Noise Measurement Results

The existing noise environment in the NSA is determined based on short-term and long-term 24-hour noise level measurements. Also, exterior-to-interior noise level reduction measurements were conducted at classrooms associated with Cesar Chavez and Edison Elementary Schools to evaluate potential interior noise impacts. The field data sheets that include the noise monitoring results (provided by Ambient), concurrent traffic counts, and measured vehicle speeds for each monitoring site are included in Appendix B.

6.2.1. Short-Term Monitoring

The primary source of noise in the NSA is traffic on Shoreline Drive, as well as the Golden Shore on- and off-ramps, Broadway off-ramp, 3rd Street on-ramp, 6th Street off-ramp, and 7th Street on-ramp. Secondary noise also emanates from the local street traffic on the surface streets in downtown Long Beach. Table 6-1 shows the results of the short-term noise level measurements. These short-term noise measurements were used to calibrate the noise model and predict the noise levels at all 189 modeled receptors in the NSA. The short-term monitoring locations are shown on Figure 5-1. Table 6-2 shows the meteorological conditions during the short-term and long-term noise monitoring.

Table 6-1. Short-Term Noise Measurement Results

Position	Address	Land Use	Start Time	Date	Duration (minutes)	Measured dBA L_{eq}
ST-1	Golden Shores RV Park	Recreational	19:25	4/17/2017	10	66.5
ST-2	Cesar E. Chaves Park	Recreational	6:15	4/19/2017	15	65.5
ST-3	Cesar E. Chaves Park	Recreational	6:40	4/19/2017	10	67.8
ST-4	Cesar E. Chaves Park	Recreational	7:05	4/19/2017	10	68.5
ST-5	W. 6th Street at Edison E.S.	School	7:20	4/19/2017	10	72.8
ST-6	421 W. Broadway	Restaurant	8:00	4/19/2017	10	65.3
ST-7	507 Pacific Street	Place of Worship	8:25	4/19/2017	10	64.5
ST-8	Atlantic Avenue, South of E 6t Street at Stevenson Robert Luis E.S.	School	8:50	4/19/2017	10	62.8
ST-9	525 E. 7th Street	Place of Worship	9:07	4/19/2017	10	66.7
ST-10	E. 7th Street, west of Locust Avenue	School	9:35	4/19/2017	10	66.1
ST-11	324 W. 7th Street	Multi-family Residential	10:14	4/19/2017	10	69.3
ST-12	W 6th Street, west of Cedar Avenue	Multi-family Residential	10:33	4/19/2017	11	61.9
ST-13	200 E Anaheim Street	Multi-family Residential	11:01	4/19/2017	12	68.6

Table 6-1. Short-Term Noise Measurement Results

Position	Address	Land Use	Start Time	Date	Duration (minutes)	Measured dBA L_{eq}
ST-14	Drake/Chavez Greenbelt Entrance. W. Anaheim Street/Daisy Avenue	Recreational	11:25	4/19/2017	10	71.6
			13:10	4/19/2017	10	71.5
			13:22	4/19/2017	10	72.4
ST-15	W. 7th Street at Maine Avenue	Single-family Residential	12:25	4/19/2017	10	69.9
ST-16	W. Broadway at Cesar Chaves E.S.	School	16:00	4/21/2017	10	66.8
ST-17	745 W. 3rd Street	Multi-family Residential	16:25	4/21/2017	10	65.2
ST-18	W. 6th Street at Edison E.S.	School	16:55	4/21/2017	10	73.3
ST-19	W. 7th Street at Maine Avenue	Single-family Residential	17:18	4/21/2017	10	68.5
ST-20	W. 9th Street at Canal	Industrial	17:45	4/21/2017	10	70.4
ST-21	1475 W. Anaheim Street	Industrial	18:05	4/21/2017	10	73.4
ST-22	W. 3rd Street, west of Broadway	Restaurant	6:38	4/21/2017	10	65.3
ST-23	E. 6th Street, west of Locust Avenue	Commercial	7:47	4/21/2017	10	65.5
ST-24	429 Magnolia Avenue	Multi-family Residential	6:55	4/21/2017	10	59.7
ST-25	W. Melrose Way at N. Crystal Court	Multi-family Residential	7:10	4/21/2017	10	48.7

Notes:
dBA=A-weighted decibels; L_{eq}=equivalent sound level; RV=recreational vehicle

Table 6-2. Meteorological Conditions During Noise Monitoring

Date	Temperature (˚F)	Relative Humidity (%)	Average Wind Speed (mph)
1/20/2011	49-69	29-64	0.0-2.0
4/19/2017	61-69	58-84	2.0-6.0
4/21/2017	58-69	66-81	2.0-5.0
4/17/2017 – 4/18/2017	60-68	70-86	2.0-8.0
4/19/2017 – 4/20/2017	61-70	60-87	1.0-5.0

Source: LSA 2013
Notes:
˚F = degrees Fahrenheit; mph = miles per hour

6.2.2. Long-Term Monitoring

Long-term monitoring was conducted at two locations using a Larson Davis 820 Type 1 SLM. The purpose of these measurements was to describe variations in sound levels throughout the day. The long-term monitoring locations are shown on Figure 5-1.

Long-term monitoring location LT-1 was conducted between Monday, April 17, 2017, and Tuesday, April 18, 2017, at Golden Shore RV Park, 101 Golden Shore Street, Long Beach, in the northern most corner of the pool area. The worst-hour noise level was 71 dBA L_{eq}(h) during the 7 a.m. hour.

Long-term monitoring location LT-2 was conducted between Wednesday, April 19, 2017, and Thursday, April 20, 2017, at the park in the southwest corner of Anaheim Street and Daisy Avenue. The worst-hour noise level was 75 dBA L_{eq}(h) during the 8 a.m. hour.

Table 6-3 and Table 6-4 summarize the results of the long-term monitoring.

6.2.3. Exterior to Interior Noise Level Measurements

Exterior-to-interior noise level measurements were conducted at Cesar Chavez Elementary School and Edison Elementary School to determine the existing exterior-to-interior noise level reduction at the representative classrooms. These representative classrooms were used to evaluate two classrooms represented by Receptors R-21 and R-23 at Cesar Chavez Elementary School and three classrooms represented by Receptors R-38, R-39, R-40, R-41, R-102, and R-131 at Edison Elementary School. Measurements were conducted at these locations to ensure that the interior noise levels would not approach or exceed the 52 dBA L_{eq} NAC under future conditions with the proposed Project. Table 6-5 shows the results of the exterior-to-interior noise level reduction measurements at the representative classrooms.

Table 6-3. Summary of Long-Term Monitoring at Location LT-1

Hour	Start Time	Date	Noise Level (dBA L_{eq})
1	8 p.m.	4/17/2017	66
2	9 p.m.	4/17/2017	65
3	10 p.m.	4/17/2017	63
4	11 p.m.	4/17/2017	59
5	12 a.m.	4/18/2017	60
6	1 a.m.	4/18/2017	57
7	2 a.m.	4/18/2017	57
8	3 a.m.	4/18/2017	59
9	4 a.m.	4/18/2017	65
10	5 a.m.	4/18/2017	70
11	6 a.m.	4/18/2017	70
12	7 a.m.	4/18/2017	**71**[1]
13	8 a.m.	4/18/2017	70
14	9 a.m.	4/18/2017	66
15	10 a.m.	4/18/2017	64
16	11 a.m.	4/18/2017	65
17	12 p.m.	4/18/2017	66
18	1 p.m.	4/18/2017	65
19	2 p.m.	4/18/2017	64
20	3 p.m.	4/18/2017	64
21	4 p.m.	4/18/2017	66
22	5 p.m.	4/18/2017	67
23	6 p.m.	4/18/2017	66
24	7 p.m.	4/18/2017	66

Notes:
[1] **Bold** number represents peak ambient noise hour.
dBA=A-weighted decibels; L_{eq}=equivalent sound level

Table 6-4. Summary of Long-Term Monitoring at Location LT-2

Hour	Start Time	Date	Noise Level (dBA L_{eq})
1	4 p.m.	4/19/2017	72
2	5 p.m.	4/19/2017	72
3	6 p.m.	4/19/2017	72
4	7 p.m.	4/19/2017	73
5	8 p.m.	4/19/2017	73
6	9 p.m.	4/19/2017	74
7	10 p.m.	4/19/2017	72
8	11 p.m.	4/19/2017	71
9	12 a.m.	4/20/2017	72
10	1 a.m.	4/20/2017	68
11	2 a.m.	4/20/2017	68
12	3 a.m.	4/20/2017	67
13	4 a.m.	4/20/2017	66
14	5 a.m.	4/20/2017	68
15	6 a.m.	4/20/2017	71
16	7 a.m.	4/20/2017	74
17	8 a.m.	4/20/2017	**75**[1]
18	9 a.m.	4/20/2017	74
19	10 a.m.	4/20/2017	73
20	11 a.m.	4/20/2017	73
21	12 p.m.	4/20/2017	70
22	1 p.m.	4/20/2017	71
23	2 p.m.	4/20/2017	72
24	3:00 p.m.	4/20/2017	73

Notes:
[1] **Bold** number represents peak ambient noise hour.
dBA=A-weighted decibels; L_{eq}=equivalent sound level

Table 6-5. Exterior to Interior Noise Monitoring Results

Receptor	Exterior (dBA L_{eq})	Interior (dBA L_{eq})	Exterior to Interior Noise Level Reduction	Land Use Description
EI-1	70.1	33.9	36.2	Cesar Chavez Elementary School
EI-2	71.0	40.5	30.5	Edison Elementary School

Source: LSA 2013
Notes:
dBA=A-weighted decibels; L_{eq}=equivalent sound level

6.3. Noise Model Calibration

Ten separate model runs were conducted using the traffic counts and measured vehicle speeds collected during the ambient noise monitoring. The results of these model runs were compared with the measured ambient noise levels to calibrate the accuracy of TNM 2.5. Calibration factors, known as K-factors, were applied to each of the modeled receptor locations so that the monitored and modeled noise levels were the same. Based on the TeNS, no correction factors were applied to the short-term measurements because the modeled noise level was within 1 dB of the measured noise level. Table 6-6 shows the measured ambient noise level, the modeled noise levels, the

change between the two levels, and the K-factor at each of the 10 locations. The concurrent traffic counts for each of the calibration runs (monitoring locations) are provided in Appendix B. All calibration model runs are included on the attached CD-ROM.

Table 6-6. Model Calibration

Monitor No.	Measured Noise Level (dBA L_{eq})	Modeled Noise Level (dBA L_{eq})	Measured Minus Modeled (dBA)	K-Factor (dBA)
Cal-1	70	69	-1	0
Cal-2	73	73	0	0
Cal-3	72	71	-1	0
Cal-4	73	73	0	0
Cal-5	65	65	0	0
Cal-6	69	68	-1	0
Cal-7	67	67	0	0
Cal-8	65	65	0	0
Cal-9	60	61	1	0
Cal-10	66	65	-1	0

Notes:
dBA=A-weighted decibels; L_{eq}=equivalent sound level

6.4. Existing Noise Levels

The existing noise levels were evaluated using either the existing worst-case traffic conditions or the existing peak-hour traffic volumes obtained from the Project engineer in May 2017 for the proposed Project, whichever is lower. The traffic volumes were entered into TNM 2.5 with existing roadway conditions. The traffic volumes for TNM 2.5 are provided in Appendix A. The results of the existing traffic noise modeling are shown in Table C-1 in Appendix C. Of the 189 modeled receptor locations, 66 receptors currently approach or exceed the 67 dBA L_{eq} NAC under Activity Categories B or C. Figure 5-1 shows the locations of the modeled receptors.

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

7.1. Future Noise Environment and Impacts

Potential long-term noise impacts associated with Project operations are solely from traffic noise. Using coordinates obtained from topographic maps, a total of 189 receptors were modeled and evaluated for potential noise impacts resulting from vehicular traffic. These receptor locations were representative of outdoor frequent human use areas associated with existing single-family and multi-family residences, an RV park, two schools, one public park, and a hotel. Other uses include office, commercial, and industrial uses were identified as receptors within the NSA.

Future traffic noise levels for all 189 receptor locations were determined with EWs using either the peak-hour traffic volumes or future worst-case traffic, whichever is lower, as described in Section 5.3. Tables C-1 and C-2 in Appendix C summarize the traffic noise modeling results for existing conditions without the Project and 2035 conditions with and without the Project. Predicted 2035 traffic noise levels with the Project (Alternatives 2 and 3 [Design Options A and B]) were compared with existing conditions and 2035 no Project conditions. The comparison with existing conditions is included in the analysis to identify traffic noise impacts under 23 CFR 772. The comparison with no Project conditions indicates the direct effect of the Project.

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

Of the 189 modeled receptor locations, 67, 45, and 45 receptors for Alternative 1 (No Build), Alternative 2 (Design Option A and B), and Alternative 3 (Design Option A and B), respectively, would "approach or exceed" the NAC under Activity Categories B or C. Alternatives 2 and 3 (Design Options A and B) have the same number of impacted receptors because the proposed alignments are the same, except that Alternative 3 (Design Options A and B) proposes to reuse the existing Shoemaker Bridge for nontransportation uses. Alternatives 2 and 3 (Design Options A and B) would result in fewer traffic noise impacts at receptor locations within the area of the proposed Project because the existing NB Shoreline Drive would be realigned farther away from the receptors. Also, of the 189 modeled receptor locations, no receptors under either Alternative 2 or 3 (Design Options A and B) would experience a "substantial increase" in noise of 12 dB or more over their corresponding modeled existing noise level.

The following receptor locations would be or would continue to be exposed to noise levels that approach or exceed the 67 dBA L_{eq} NAC for Alternatives 2 and 3 (Design Options A and B).[1]

- **Receptor R-20:** This receptor location represents the Cesar Chavez Elementary School. Currently, there are no EWs that shield this school. The sidewalk along the ROW has a width of approximately 6 ft and contains existing utilities. Therefore, it is not feasible to abate traffic noise with noise barriers. The interior noise levels within the school buildings are discussed in Section 7.1.1.
- **Receptor R-39 and R-102:** These receptor locations represent the Edison Elementary School. Currently, there are no EWs that shield this school. The sidewalk along the ROW has a width of approximately 4 ft. A potential noise wall at this receptor would potentially impede Americans with Disability Act (ADA) access. Therefore, it is not feasible to abate traffic noise with noise barriers. The interior noise levels within the school buildings are discussed in Section 7.1.1.
- **Receptor R-75:** This receptor location represents an existing residential park. Currently, there are no EWs that shield this park. This park/trail is surrounded by residential, commercial use, and City ROW. A noise wall would impede access to this trail, which terminates at this street corner. In addition, utility poles/wires are located in the ROW immediately east of this receptor. Therefore, it is not feasible to abate traffic noise with noise barriers.
- **Receptors R-76 and R-77:** These receptor locations represent existing multi-family residences. Currently, there are no EWs that shield these residences. Utility poles are located at this receptor along the ROW (parkway). Therefore, it is not feasible to abate traffic noise with noise barriers.
- **Receptor R-84:** This receptor location represents an existing restaurant. This indoor restaurant does not include outdoor seating areas and does not have outdoor areas of frequent human use. Therefore, no abatement measures are required.
- **Receptor R-87:** This receptor location represents existing multi-family residences. Currently, there are no EWs that shield these residences. The ROW along Anaheim Street include an approximately 8-ft-wide sidewalk from property line to roadway ROW, with no parkway. A noise wall would interfere with pedestrian access along Anaheim Street,

[1] An NSR prepared for the Shoemaker Bridge Replacement Project in August 2013 identified several locations within the Golden Shore RV Park, currently identified as Receptors R-1 through R-12 in this 2018 NSR. It was originally concluded in the 2013 NSR that these receptor locations would be exposed to noise levels approaching or exceeding the NAC. However, since the Project evaluated different design elements, such as the removal of the Golden Shore grade separation over West Shoreline Drive, the design now provides additional shielding from noise impacts at the Golden Shore RV Park. This shielding reduces the noise levels from 67-68 dBA L_{eq}, as reported in the 2013 NSR, to 64 dBA or less in the 2018 NSR. Thus, no noise barriers were evaluated at this location as part of the Project.

which is predominately comprised of commercial uses in the vicinity of Anaheim Street/Pine Avenue. Therefore, it is not feasible to abate traffic noise with noise barriers.

- **Receptor R-89:** This receptor location represents the rear of a multi-family residential building. This receptor is not located within an outdoor common use area within this multi-family residential property, as the building rear includes storage facilities/units used by residents. Therefore, noise abatement is not required.
- **Receptor R-90**: This receptor location represents an existing restaurant. Currently, there are no outdoor active use areas associated with this development. Therefore, no abatement measures are required.
- **Receptor R-91:** This receptor location represents existing multi-family residences. Currently, there are no EWs that shield these residences. A pedestrian crossing intersects this residential use and includes an ADA-compliant pedestrian walkway. Therefore, it is not feasible to abate traffic noise with noise barriers.
- **Receptor R-93:** This receptor location represents an existing restaurant. Currently, there are no outdoor active use areas associated with this development. Therefore, no abatement measures are required.
- **Receptor R-99**: This receptor location represents an existing restaurant. Currently, there are no outdoor active use areas associated with this development. Therefore, no abatement measures are required.
- **Receptors R-101 and R-103 through R-109:** These receptor locations represent existing multi-family residences. Currently, there are no EWs that shield these residences. Utility poles/wires are located along the ROW, thus prohibiting the placement of noise walls at this receptor. Therefore, it is not feasible to abate traffic noise with noise barriers.
- **Receptors R-110 and R-126:** These receptor locations represent existing churches. Currently, there are no outdoor active use areas associated with these churches. Therefore, no abatement measures are required. The interior noise levels within the church buildings are discussed in Section 7.1.1.
- **Receptors R-111 through R-113 and R-115:** These receptor locations represent existing multi-family residences. Currently, there are no EWs that shield these residences. A barrier at this location would impede ADA access to the property. Therefore, it is not feasible to abate traffic noise with noise barriers.
- **Receptor R-114**: This receptor location represents an existing health clinic. Currently, there are no outdoor active use areas associated with this development. Therefore, no abatement measures are required.

- **Receptor R-116**: This receptor location represents an existing office. Currently, there are no outdoor active use areas associated with this development. Therefore, no abatement measures are required.
- **Receptors R-117 and R-118:** These receptor locations represent the International Elementary School and playground. Currently, there are no EWs that shield these uses. As there is existing pedestrian access to the street and utilities that must be maintained, it is not feasible to abate traffic noise with noise barriers. The interior noise levels within the school buildings are discussed in Section 7.1.1.
- **Receptor R-119:** This receptor location represents an existing restaurant. Currently, there are no outdoor active use areas associated with this development. Therefore, no abatement measures are required.
- **Receptors R-122 through R-125, R-127, and R-129:** These receptor locations represent existing multi-family residences. Currently, there are no EWs that shield these residences. A barrier at this location would impede ADA access to the property. Therefore, it is not feasible to abate traffic noise with noise barriers.
- **Receptor R-130**: This receptor location represents an existing restaurant. Currently, there are no outdoor active use areas associated with this development. Therefore, no abatement measures are required.
- **Receptor R-157:** This receptor location represents existing multi-family residences. Existing improvements in the ROW include street trees, dual-parking meters, and sewer/storm drain infrastructure. Therefore, it is not feasible to abate traffic noise with noise barriers.
- **Receptors R-173, R-174, and R-177 through R-186:** These receptor locations represent existing multi-family residences with adjacent narrow sidewalks and landscaped parkways. A potential noise wall at these receptors would potentially impede ADA access. Currently, there are no EWs that shield these residences. As there is existing pedestrian access to the street that must be maintained, it is not feasible to abate traffic noise with noise barriers.
- **Receptor R-188**: This receptor location represents an existing office. Currently, there are no outdoor active use areas associated with this development. Therefore, no abatement measures are required.

7.1.1. Interior Noise Impacts

Two classrooms represented by Receptors R-20 through R-22 for Cesar Chavez Elementary School; three classrooms represented by Receptors R-37, R-39, R-40, R-102, and R131 for Edison Elementary School; one classroom represented by Receptor R-188 for the International Elementary School; and four churches represented by Receptors R-110, R-126, R-128, and

R-147 were evaluated under Activity Category D, which has an interior NAC of 52 dBA L_{eq}. Figure 5-1 shows the locations of the interior noise evaluation. Table 7-1 shows the existing exterior-to-interior noise level reduction, the predicted future worst-case traffic noise level, and the calculated future interior noise level for each location. As shown in Table 7-1, noise levels in the classrooms at Cesar Chavez Elementary School, Edison Elementary School, and the International Elementary School; or within the four churches; would not approach or exceed the 52 dBA L_{eq} NAC under either Alternative 2 or 3 (Design Options A and B).

Table 7-1. Predicted Future Interior Noise Levels

Receptor No.	Land Use Description	Exterior to Interior Reduction (dB)[1]	Alternatives 2 and 3	
			Exterior (dBA L_{eq})	Interior (dBA L_{eq})
R-20	Cesar Chavez Elementary School	36	66[2]	30
R-21	Cesar Chavez Elementary School	36	63	27
R-22	Cesar Chavez Elementary School	36	54	18
R-37	Edison Elementary School	30	56	26
R-38	Edison Elementary School	30	58	28
R-39	Edison Elementary School	30	75	45
R-40	Edison Elementary School	30	55	25
R-102	Edison Elementary School	30	76	46
R-110	Church	24	71	47
R-118	International Elementary School	24	71	47
R-131	Edison Elementary School	30	56	26
R-126	Church	24	68	44
R-128	Church	24	68	44
R-147	Church	24	62	38

Source: LSA 2013
Notes:
[1] The exterior-to-interior noise level reduction was calculated based on noise level measurements shown in Table 6-5.
[2] No outdoor activity areas and no consideration/evaluation of abatement
dBA=A-weighted decibels; L_{eq}=equivalent sound level

7.2. Preliminary Noise Abatement Analysis

In accordance with 23 CFR 772, noise abatement is considered where noise impacts are predicted in areas of frequent human use that would benefit from a lowered noise level. Potential noise abatement measures identified in the Traffic Noise Analysis Protocol include the following:

- Avoiding the impact by using design alternatives, such as altering the horizontal and vertical alignment of the project
- Constructing noise barriers
- Acquiring property to serve as a buffer zone
- Using traffic management measures to regulate types of vehicles and speeds
- Acoustically insulating public use or nonprofit institutional structures

All the above abatement options have been considered; however, because of the Project configuration and location, abatement in any form is not considered to be feasible.

Chapter 8. Construction Noise

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 and 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, 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 related to construction of the proposed Project passing at 50 ft would exist. However, the projected construction traffic would be minimal when compared with existing traffic volumes on Shoreline Drive, Ocean Boulevard, Broadway Avenue, 3rd Street, 6th Street, 7th Street, and other affected streets, and its associated long-term noise level change would not be perceptible. Therefore, short-term construction-related worker commutes and equipment transport noise impacts would not be substantial.

The second type of short-term noise impact is related to noise generated during roadway construction. Construction is performed in discrete 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 ft between the equipment and a noise receptor.

Typical noise levels at 50 ft from an active construction area range up to 90 dBA L_{eq} 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 earth-moving equipment. Earth-moving equipment includes excavating machinery, such as excavators, backfillers, bulldozers, and front loaders. Earth-moving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve 1 or 2 minutes of full-power operation followed by 3 or 4 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 ft)	Suggested Maximum Sound Levels for Analysis (dBA L_{max} at 50 ft)
Pile drivers	81–96	93
Rock drills	83–99	96
Jackhammers	75–85	82
Pneumatic tools	78–88	85
Pumps	74–84	80
Scrapers	83–91	87
Haul trucks	83–94	88
Cranes	79–86	82
Portable generators	71–87	80
Rollers	75–82	80
Dozers	77–90	85
Tractors	77–82	80
Front-end loaders	77–90	86
Hydraulic backhoe	81–90	86
Hydraulic excavators	81–90	86
Graders	79–89	86
Air compressors	76–89	86
Trucks	81–87	86

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

Construction of the proposed Project is expected to require the use of earthmovers, bulldozers, water trucks, and pickup trucks. Noise associated with the use of construction equipment is estimated between 79 and 89 dBA L_{max} at a distance of 50 ft from the active construction area for the grading phase. As shown in Table 8-1, the maximum noise level generated by each scraper is assumed to be approximately 87 dBA L_{max} at 50 ft from the scraper in operation. Each bulldozer would generate approximately 85 dBA L_{max} at 50 ft. The maximum noise level generated by water trucks and pickup trucks is approximately 86 dBA L_{max} at 50 ft from these vehicles. Each doubling of the sound source would increase the noise level by 3 dB. 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_{eq} (at a distance of 50 ft from an active construction area).

The closest sensitive receptors (residences and schools) are located within 50 ft of the Project construction area. Therefore, these receptor locations may be subject to short-term noise higher than 91 dBA L_{eq} generated by construction activities along the Project alignment. Compliance with the construction hours specified in the City of Long Beach Municipal Code would be required. To minimize construction noise impacts on sensitive land uses adjacent to the Project limits, construction noise is regulated by Caltrans Standard Specifications in Section 14-8.02, "Noise Control," and also by Standard Special Provisions (SSP) S5-310. The noise level from the contractor's operations, between the hours of 9 p.m. and 6 a.m., would not exceed 86 dBA L_{max} at a distance of 50 ft.

8.1. Minimization Measures

The following Project features will reduce potential construction noise impacts to the extent feasible:

- During construction, the City's Resident Engineer will ensure that the contractor will use an alternative warning method instead of a sound signal unless required by safety laws.
- During construction, the City's Residential Engineer will ensure that the contractor will equip all internal combustion engines with the manufacturer-recommended muffler and will not operate any internal combustion engine on the job site without the appropriate muffler.
- During construction, the City's Resident Engineer or designated contractor will ensure that all construction equipment, fixed or mobile, will be equipped with properly operating and maintained mufflers consistent with manufacturers' standards during all Project site excavation and grading on site.
- During construction, the City's Resident Engineer or designated contractor will ensure that all stationary construction equipment will be placed so that emitted noise is directed away from noise-sensitive locations nearest the Project site.
- During construction, the City's Resident Engineer or designated contractor will ensure that construction vehicle staging areas and equipment maintenance areas will be located as far as possible from sensitive receptor locations.

In addition, the following minimization measure will reduce potential construction noise impacts to the extent feasible:

N-1 During construction, the City of Long Beach's (City) Resident Engineer or designated contractor will ensure that all heavy construction activities that would potentially exceed 86 A-weighted decibels (dBA) equivalent maximum sound level (L_{max}) at 50 feet (ft) will be conducted between 6 a.m. and 9 p.m.

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Chapter 9. References

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Appendix A. Traffic Data

This appendix contains tables presenting the traffic data for existing conditions, 2035 conditions without the Project, and 2035 conditions with the Project for Alternatives 2 and 3 (Design Options A and B).

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ROADWAY SEGMENT PK-HR VOLUMES

6/29/2017

EXISTING CONDITIONS

ROADWAY SEGMENTS	VEHICLE FLEET MIX (%)						PEAK-HOUR TRAFFIC VOLUMES BY VEHICLE CLASS											
							EASTBOUND						WESTBOUND					
	TOTAL	LDA	MDV	HDV	BUS	MC	TOTAL	LDA	MDV	HDV	BUS	MC	TOTAL	LDA	MDV	HDV	BUS	MC
W ANAHEIM ST, WEST OF SANTA FE ST	100.0%	78.2%	1.8%	18.1%	1.2%	0.6%	517	405	9	94	6	3	965	755	17	175	12	6
W ANAHEIM ST, SANTA FE ST TO HARBOR ST	100.0%	78.2%	1.8%	18.1%	1.2%	0.6%	679	531	12	123	8	4	1148	898	21	208	14	7
W ANAHEIM ST, HARBOR ST TO OREGON	100.0%	78.2%	1.8%	18.1%	1.2%	0.6%	802	628	15	145	10	5	1326	1038	24	240	16	8
W ANAHEIM ST, OREGON AVE TO MAGNOLIA AVE	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	758	719	18	5	13	3	1256	1191	30	9	22	4
W ANAHEIM ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	762	723	18	5	13	3	1079	1023	26	7	19	4
E ANAHEIM ST, PACIFIC AVE TO ATLANTIC	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	872	827	21	6	15	3	1192	1131	29	8	20	4
E ANAHEIM ST, EAST OF ATLANTIC	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	820	778	20	6	14	3	1310	1242	32	9	23	5
7TH ST, WEST OF MAGNOLIA AVE	100.0%	95.7%	0.9%	0.0%	1.7%	1.7%	0	0	0	0	0	0	1408	1347	12	0	24	24
7TH ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	95.7%	0.9%	0.0%	1.7%	1.7%	0	0	0	0	0	0	1543	1476	13	0	27	27
7TH ST, PACIFIC AVE TO ATLANTIC AVE	100.0%	95.7%	0.9%	0.0%	1.7%	1.7%	0	0	0	0	0	0	1438	1376	12	0	25	25
7TH ST, EAST OF ATLANTIC AVE	100.0%	95.7%	0.9%	0.0%	1.7%	1.7%	206	197	2	0	4	4	1278	1223	11	0	22	22
6TH ST, WEST OF MAGNOLIA AVE	100.0%	96.3%	2.8%	0.0%	0.9%	0.0%	812	782	23	0	8	0	0	0	0	0	0	0
6TH ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	96.3%	2.8%	0.0%	0.9%	0.0%	779	750	22	0	7	0	0	0	0	0	0	0
6TH ST, PACIFIC AVE TO ATLANTIC AVE	100.0%	96.3%	2.8%	0.0%	0.9%	0.0%	932	897	26	0	9	0	0	0	0	0	0	0
6TH ST, EAST OF ATLANTIC AVE	100.0%	96.3%	2.8%	0.0%	0.9%	0.0%	482	464	14	0	5	0	51	49	1	0	0	0
3RD ST, WEST OF GOLDEN AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	0	0	0	0	0	0	878	843	7	7	7	14
3RD ST, GOLDEN AVE TO MAINE AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	0	0	0	0	0	0	878	843	7	7	7	14
3RD ST, MAINE AVE TO MAGNOLIA AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	0	0	0	0	0	0	895	860	7	7	7	14
3RD ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	0	0	0	0	0	0	979	940	8	8	8	15
BROADWAY, WEST OF MAINE AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	1146	1119	9	0	9	9	0	0	0	0	0	0
BROADWAY, MAINE AVE TO MAGNOLIA AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	1146	1119	9	0	9	9	0	0	0	0	0	0
BROADWAY, EAST OF MAGNOLIA AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	899	878	7	0	7	7	0	0	0	0	0	0
OCEAN BLVD WEST OF GOLDEN SHORE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	967	929	8	8	8	15	1191	1144	9	9	9	19
OCEAN BLVD GOLDEN SHORE TO MAGNOLIA AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	869	835	7	7	7	14	1647	1582	13	13	13	26
OCEAN BLVD MAGNOLIA AVE TO PACIFIC AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	786	755	6	6	6	12	1793	1722	14	14	14	28
9TH ST, WEST OF SANTA FE	100.0%	94.3%	1.9%	3.8%	0.0%	0.0%	153	144	3	6	0	0	255	241	5	10	0	0
9th ST, EAST OF SANTA FE	100.0%	94.3%	1.9%	3.8%	0.0%	0.0%	284	268	5	11	0	0	506	477	10	19	0	0

EXISTING CONDITIONS (CONT.)

MAGNOLIA AVE, ANAHEIM ST TO 10TH ST	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	342	322	6	0	11	3	379	357	6	0	13	3
MAGNOLIA AVE, 10TH ST TO 7TH ST	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	378	356	6	0	13	3	264	249	4	0	9	2
MAGNOLIA AVE, 7TH ST TO 6TH ST	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	492	463	8	0	16	4	222	209	4	0	7	2
MAGNOLIA AVE, 6TH ST TO 3RD ST	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	493	464	8	0	16	4	183	172	3	0	6	2
MAGNOLIA AVE, 3RD ST TO BROADWAY	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	612	576	10	0	20	5	209	197	3	0	7	2
MAGNOLIA AVE, BROADWAY TO OCEAN BLVD	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	694	654	12	0	23	6	229	216	4	0	8	2
MAGNOLIA AVE, S OF OCEAN BLVD	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	373	351	6	0	12	3	80	75	1	0	3	1

Traffic volumes and vehicle fleet mix based on data derived from the traffic analysis prepared for this project. Traffic volumes for Shoreline Dr. and Golden Shore derived from the traffic noise study report previously prepared for this project.
Vehicle fleet mix data based on site surveys and data derived from the traffic noise study report previously prepared for this project

4/4/2018

ROADWAY SEGMENT PK-HR VOLUMES

6/29/2017

2035 NO-BUILD CONDITIONS

ROADWAY SEGMENTS	VEHICLE FLEET MIX (%)						PEAK-HOUR TRAFFIC VOLUMES BY VEHICLE CLASS											
							EASTBOUND						WESTBOUND					
	TOTAL	LDA	MDV	HDV	BUS	MC	TOTAL	LDA	MDV	HDV	BUS	MC	TOTAL	LDA	MDV	HDV	BUS	MC
W ANAHEIM ST, WEST OF SANTA FE ST	100.0%	78.2%	1.8%	18.1%	1.2%	0.6%	692	541	13	125	8	4	1080	845	20	196	13	7
W ANAHEIM ST, SANTA FE ST TO HARBOR ST	100.0%	78.2%	1.8%	18.1%	1.2%	0.6%	1010	790	18	183	12	6	1249	977	23	226	15	8
W ANAHEIM ST, HARBOR ST TO OREGON	100.0%	78.2%	1.8%	18.1%	1.2%	0.6%	1190	931	22	216	14	7	1441	1128	26	261	17	9
W ANAHEIM ST, OREGON AVE TO MAGNOLIA AVE	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	860	816	21	6	15	3	1331	1262	32	9	23	5
W ANAHEIM ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	807	765	19	6	14	3	1172	1112	28	8	20	4
E ANAHEIM ST, PACIFIC AVE TO ATLANTIC	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	904	857	22	6	16	3	1259	1194	30	9	22	4
E ANAHEIM ST, EAST OF ATLANTIC	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	900	854	22	6	15	3	1414	1341	34	10	24	5
7TH ST, WEST OF MAGNOLIA AVE	100.0%	95.7%	0.9%	0.0%	1.7%	1.7%	0	0	0	0	0	0	1475	1411	13	0	25	25
7TH ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	95.7%	0.9%	0.0%	1.7%	1.7%	0	0	0	0	0	0	1639	1568	14	0	28	28
7TH ST, PACIFIC AVE TO ATLANTIC AVE	100.0%	95.7%	0.9%	0.0%	1.7%	1.7%	0	0	0	0	0	0	1490	1426	13	0	26	26
7TH ST, EAST OF ATLANTIC AVE	100.0%	95.7%	0.9%	0.0%	1.7%	1.7%	220	211	2	0	4	4	1361	1302	12	0	23	23
6TH ST, WEST OF MAGNOLIA AVE	100.0%	96.3%	2.8%	0.0%	0.9%	0.0%	843	811	24	0	8	0	0	0	0	0	0	0
6TH ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	96.3%	2.8%	0.0%	0.9%	0.0%	810	780	23	0	8	0	0	0	0	0	0	0
6TH ST, PACIFIC AVE TO ATLANTIC AVE	100.0%	96.3%	2.8%	0.0%	0.9%	0.0%	976	940	27	0	9	0	0	0	0	0	0	0
6TH ST, EAST OF ATLANTIC AVE	100.0%	96.3%	2.8%	0.0%	0.9%	0.0%	514	495	14	0	5	0	52	50	1	0	0	0
3RD ST, GOLDEN AVE TO MAINE AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	0	0	0	0	0	0	927	891	7	7	7	15
3RD ST, MAINE AVE TO MAGNOLIA AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	0	0	0	0	0	0	956	918	8	8	8	15
3RD ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	0	0	0	0	0	0	1037	996	8	8	8	16
BROADWAY, WEST OF MAINE AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	1278	1248	10	0	10	10	0	0	0	0	0	0
BROADWAY, MAINE AVE TO MAGNOLIA AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	1203	1175	9	0	9	9	0	0	0	0	0	0
BROADWAY, MAGNOLIA AVE TO PACIFIC AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	977	954	8	0	8	8	0	0	0	0	0	0
BROADWAY, EAST OF PACIFIC AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	600	586	5	0	5	5	0	0	0	0	0	0
OCEAN BLVD WEST OF GOLDEN SHORE	101.6%	97.7%	0.8%	0.8%	0.8%	1.6%	1011	987	8	8	8	16	1311	1281	10	10	10	21
OCEAN BLVD GOLDEN SHORE TO MAGNOLIA AVE	101.6%	97.7%	0.8%	0.8%	0.8%	1.6%	901	880	7	7	7	14	1781	1740	14	14	14	28
OCEAN BLVD MAGNOLIA AVE TO PACIFIC AVE	101.6%	97.7%	0.8%	0.8%	0.8%	1.6%	836	817	7	7	7	13	1939	1894	15	15	15	31
9TH ST, WEST OF SANTA FE	100.0%	94.3%	1.9%	3.8%	0.0%	0.0%	252	238	5	10	0	0	345	325	7	13	0	0
9th ST, EAST OF SANTA FE	100.0%	94.3%	1.9%	3.8%	0.0%	0.0%	420	396	8	16	0	0	630	594	12	24	0	0

2035 NO-BUILD CONDITIONS (CONT.)																		
MAGNOLIA AVE, ANAHEIM ST TO 10TH ST	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	367	346	6	0	12	3	440	414	7	0	15	4
MAGNOLIA AVE, 10TH ST TO 7TH ST	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	401	378	7	0	13	3	276	260	5	0	9	2
MAGNOLIA AVE, 7TH ST TO 6TH ST	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	560	527	9	0	19	5	233	219	4	0	8	2
MAGNOLIA AVE, 6TH ST TO 3RD ST	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	528	497	9	0	18	4	250	235	4	0	8	2
MAGNOLIA AVE, 3RD ST TO BROADWAY	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	640	603	11	0	21	5	285	268	5	0	10	2
MAGNOLIA AVE, BROADWAY TO OCEAN BLVD	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	690	650	12	0	23	6	260	245	4	0	9	2
MAGNOLIA AVE, S OF OCEAN BLVD	100.0%	94.2%	1.7%	0.0%	3.3%	0.8%	399	376	7	0	13	3	83	78	1	0	3	1

Traffic volumes and vehicle fleet mix based on data derived from the traffic analysis prepared for this project. Traffic volumes for Shoreline Dr. and Golden Shore derived from the traffic noise study report previously prepared for this project. Vehicle fleet mix data based on site surveys and data derived from the traffic noise study report previously prepared for this project

4/4/2018

ROADWAY SEGMENT PK-HR VOLUMES

6/29/2017

2035 BUILD CONDITIONS

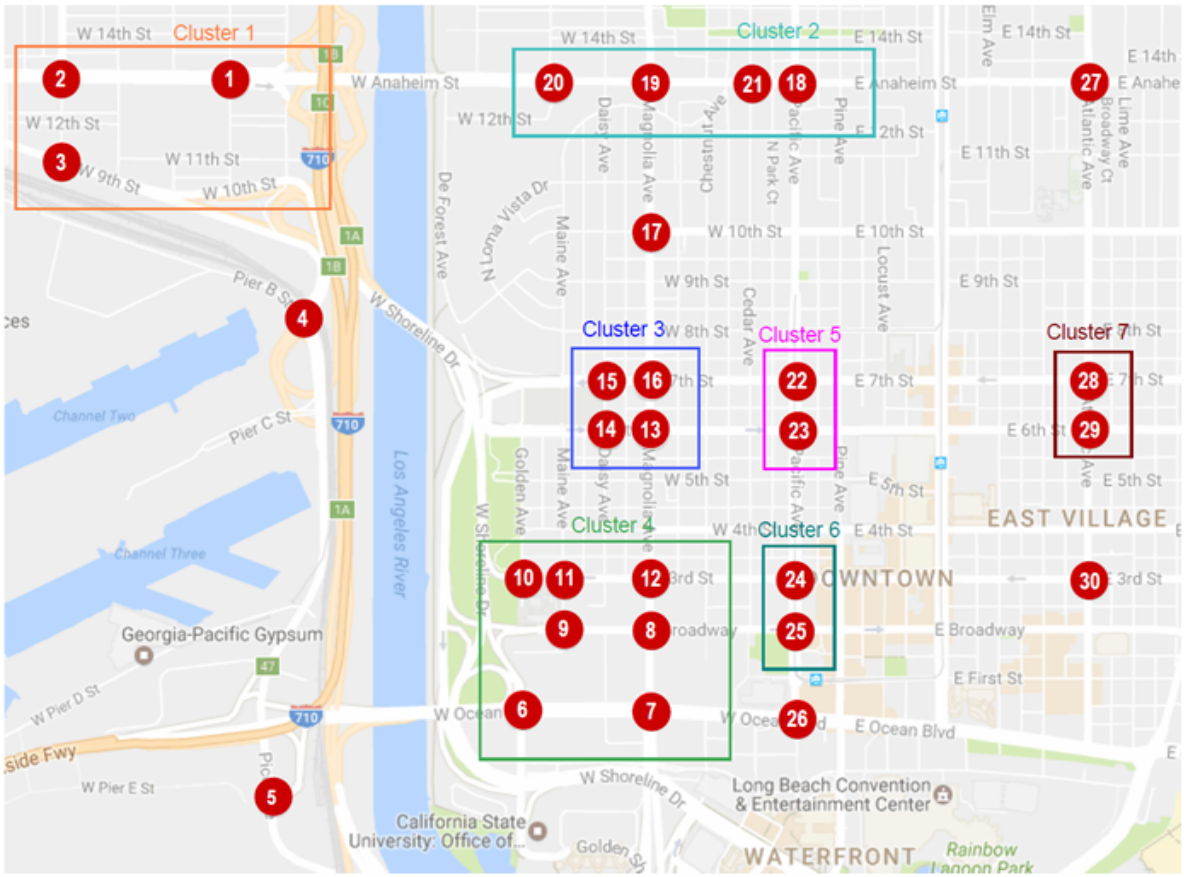
ROADWAY SEGMENTS	VEHICLE FLEET MIX (%)						PEAK-HOUR TRAFFIC VOLUMES BY VEHICLE CLASS											
							EASTBOUND						WESTBOUND					
	TOTAL	LDA	MDV	HDV	BUS	MC	TOTAL	LDA	MDV	HDV	BUS	MC	TOTAL	LDA	MDV	HDV	BUS	MC
W ANAHEIM ST, WEST OF SANTA FE ST	100.0%	78.2%	1.8%	18.1%	1.2%	0.6%	692	541	13	125	8	4	1517	1187	27	275	18	9
W ANAHEIM ST, SANTA FE ST TO HARBOR ST	100.0%	78.2%	1.8%	18.1%	1.2%	0.6%	1129	883	20	205	14	7	1702	1332	31	309	21	10
W ANAHEIM ST, HARBOR ST TO OREGON	100.0%	78.2%	1.8%	18.1%	1.2%	0.6%	1309	1024	24	237	16	8	1894	1482	34	343	23	11
W ANAHEIM ST, OREGON AVE TO MAGNOLIA AVE	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	979	929	24	7	17	3	1784	1692	43	12	31	6
W ANAHEIM ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	887	841	21	6	15	3	1427	1353	34	10	25	5
E ANAHEIM ST, PACIFIC AVE TO ATLANTIC	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	944	895	23	6	16	3	1354	1284	33	9	23	5
E ANAHEIM ST, EAST OF ATLANTIC	100.0%	94.8%	2.4%	0.7%	1.7%	0.3%	900	854	22	6	15	3	1414	1341	34	10	24	5
7TH ST, WEST OF MAGNOLIA AVE	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	783	754	15	0	15	0	1698	1635	31	0	31	0
7TH ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	692	666	13	0	13	0	1555	1497	29	0	29	0
7TH ST, PACIFIC AVE TO ATLANTIC AVE	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	738	711	14	0	14	0	1364	1313	25	0	25	0
7TH ST, EAST OF ATLANTIC AVE	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	549	529	10	0	10	0	1254	1208	23	0	23	0
6TH ST, WEST OF DAISY	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	25	24	0	0	0	0	15	14	0	0	0	0
6TH ST, WEST OF MAGNOLIA AVE	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	51	49	1	0	1	0	37	36	1	0	1	0
6TH ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	108	104	2	0	2	0	101	97	2	0	2	0
6TH ST, PACIFIC AVE TO ATLANTIC AVE	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	238	229	4	0	4	0	139	134	3	0	3	0
6TH ST, EAST OF ATLANTIC AVE	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	209	201	4	0	4	0	196	189	4	0	4	0
3RD ST, WEST OF GOLDEN AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	0	0	0	0	0	0	0	0	0	0	0	0
3RD ST, GOLDEN AVE TO MAINE AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	37	36	0	0	0	1	68	65	1	1	1	1
3RD ST, MAINE AVE TO MAGNOLIA AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	46	44	0	0	0	1	397	381	3	3	3	6
3RD ST, MAGNOLIA AVE TO PACIFIC AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	0	0	0	0	0	0	1037	996	8	8	8	16
BROADWAY, WEST OF MAINE AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	1228	1199	10	0	10	10	1145	1118	9	0	9	9
BROADWAY, MAINE AVE TO MAGNOLIA AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	1153	1126	9	0	9	9	780	762	6	0	6	6
BROADWAY, MAGNOLIA AVE TO PACIFIC AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	977	954	8	0	8	8	0	0	0	0	0	0
BROADWAY, EAST OF PACIFIC AVE	100.0%	97.7%	0.8%	0.0%	0.8%	0.8%	600	586	5	0	5	5	0	0	0	0	0	0
OCEAN BLVD WEST OF GOLDEN SHORE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	1043	1002	8	8	8	16	1435	1379	11	11	11	23
OCEAN BLVD GOLDEN SHORE TO MAGNOLIA AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	1027	987	8	8	8	16	1471	1413	12	12	12	23
OCEAN BLVD MAGNOLIA AVE TO PACIFIC AVE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	868	834	7	7	7	14	2466	2369	19	19	19	39
SHORELINE, WEST OF GOLDEN SHORE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	1200	1153	9	9	9	19	793	762	6	6	6	12
SHORELINE, EAST OF GOLDEN SHORE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	520	500	4	4	4	8	842	809	7	7	7	13
9TH ST, WEST OF SANTA FE	100.0%	94.3%	1.9%	3.8%	0.0%	0.0%	252	238	5	10	0	0	100	94	2	4	0	0
9th ST, EAST OF SANTA FE	100.0%	94.3%	1.9%	3.8%	0.0%	0.0%	301	284	6	11	0	0	177	167	3	7	0	0

2035 BUILD CONDITIONS (CONT.)

ROADWAY SEGMENTS	VEHICLE FLEET MIX (%)						PEAK-HOUR TRAFFIC VOLUMES BY VEHICLE CLASS											
							SOUTHBOUND						NORTHBOUND					
	TOTAL	LDA	MDV	HDV	BUS	MC	TOTAL	LDA	MDV	HDV	BUS	MC	TOTAL	LDA	MDV	HDV	BUS	MC
MAGNOLIA AVE, ANAHEIM ST TO 10TH ST	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	407	392	8	0	8	0	639	615	12	0	12	0
MAGNOLIA AVE, 10TH ST TO 7TH ST	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	441	425	8	0	8	0	475	457	9	0	9	0
MAGNOLIA AVE, 7TH ST TO 6TH ST	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	631	608	12	0	12	0	633	610	12	0	12	0
MAGNOLIA AVE, 6TH ST TO 3RD ST	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	567	546	11	0	11	0	708	682	13	0	13	0
MAGNOLIA AVE, 3RD ST TO BROADWAY	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	947	912	18	0	18	0	415	400	8	0	8	0
MAGNOLIA AVE, BROADWAY TO OCEAN BLVD	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	680	655	13	0	13	0	1006	969	19	0	19	0
MAGNOLIA AVE, S OF OCEAN BLVD	100.0%	96.3%	1.9%	0.0%	1.9%	0.0%	418	403	8	0	8	0	282	272	5	0	5	0
GOLDEN SHORE, NORTH OF SHORELINE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	194	186	2	2	2	3	416	400	3	3	3	7
GOLDEN SHORE, SOUTH OF SHORELINE	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	497	477	4	4	4	8	131	126	1	1	1	2
SHORELINE, NORTH OF 7TH	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	3026	2907	24	24	24	48	1817	1745	14	14	14	29
SHORELINE, SOUTH OF 7TH	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	2400	2306	19	19	19	38	835	802	7	7	7	13
SHORELINE, NORTH OF BROADWAY	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	2400	2306	19	19	19	38	835	802	7	7	7	13
SHORELINE, SOUTH OF BROADWAY	100.0%	96.1%	0.8%	0.8%	0.8%	1.6%	1257	1208	10	10	10	20	793	762	6	6	6	12

Traffic volumes and vehicle fleet mix based on data derived from the traffic analysis prepared for this project. Vehicle fleet mix data based on site surveys and data derived from the traffic noise study report previously prepared for this project
LDA - Light Duty Autos; MDV - Medium Duty Vehicles; HDV - Heavy Duty Vehicles; MC - Motorcycles

Figure 3.1: Study Area Intersection Clusters for Conservation of Flow



Appendix B. Traffic Counts, Measured Vehicle Speeds, and Noise Monitoring Results

This appendix contains tables presenting the traffic data for existing conditions, 2035 conditions without the Project, and 2035 conditions with the Project for Alternatives 2 and 3 (Design Options A and B).

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SHORT-TERM NOISE MEASUREMENT SUMMARY

	LOCATION	LAND USE	DATE	START TIME	DURATION (MINUTES)	MEASURED NOISE LEVEL (dBA Leq)	NOTES
ST-1	GOLDEN SHORES RV PARK	RECREATIONAL	4/17/2017	19:25	10	66.5	NORTHERN SITE BOUNDARY
ST-2	CESAR E. CHAVEZ PARK	RECREATIONAL	4/19/2017	6:15	15	65.5	SOUTHERN PARK AREA NEAR W 3RD ST/SHORELINE DRIVE
ST-3	CESAR E. CHAVEZ PARK	RECREATIONAL	4/19/2017	6:40	10	67.8	NORTHERN PARK AREA NEAR W 6TH ST
ST-4	CESAR E. CHAVEZ PARK	RECREATIONAL	4/19/2017	7:05	10	68.5	NORTHERN PARK AREA SOUTH OF W 6TH ST NEAR PARK BENCH
ST-5	W. 6TH ST AT EDISON ELEMENTARY SCHOOL	SCHOOL	4/19/2017	7:20	10	72.8	SOUTHERN PROPERTY LINE OF SCHOOL
ST-6	421 W. BROADWAY, OUTDOOR EATING AREA	RESTAURANT	4/19/2017	8:00	10	65.3	SOUTHWESTERN CORNER OF RESTAURANT OUTDOOR EATING AREA
ST-7	507 PACIFIC STREET	PLACE OF WORSHIP	4/19/2017	8:25	10	64.5	FIRST METHODIST CHURCH, 15 FEET FROM ROAD EDGE
ST-8	ATLANTIC AVENUE, SOUTH OF E 6TH STREET, AT STEVENSON ROBERT LOUIS ELEMENTARY SCHOOL	SCHOOL	4/19/2017	8:50	10	62.8	WESTERN PROPERTY LINE OF STEVENSON ROBERT LOUIS ELEMENTARY SCHOOL, APPROXMATELY 46 FEET FROM ATLANTIC AVENUE CENTERLINE
ST-9	525 E 7TH STREET, NE CORNER OF E 7TH STREET & LINDEN AVENUE	PLACE OF WORSHIP	4/19/2017	9:07	10	66.7	ST. LUKE'S EPISCOPAL CHURCH, APPROXMATELY 45 FEET FROM E 7TH ST CENTERLINE
ST-10	E 7TH STREET, WEST OF LOCUST AVENUE. OUTDOOR ACTIVITY AREA OF INTERNATIONAL ELEMENTARY SCHOOL	SCHOOL	4/19/2017	9:35	10	66.1	OUTDOOR ACTIVITY AREA OF INTERNATIONAL ELEMENTARY SCHOOL, APPROXIMATELY 38 FEET FROM E 7TH ST CENTERLINE
ST-11	324 W. 7TH STREET	MFR	4/19/2017	10:14	10	69.3	WEST OF SECOND SAMOAN CHURCH (655 CEDAR AVENUE), APPROXIMATELY 30 FEET FROM E 7TH ST. CENTERLINE.
ST-12	W 6TH STREET, WEST OF CEDAR AVENUE	MFR	4/19/2017	10:33	11	61.9	AT MFR (605 W. CEDAR AVE.) APPROXIMATELY 75 FEET WEST OF CEDAR AVE., APPROXIMATELY 37 FEET FROM W 6TH ST CENTERLINE
ST-13	200 E ANAHEIM STREET	MFR	4/19/2017	11:01	12	68.6	LONG BEACH SENIOR ARTS COLONY APARTMENTS. APPROXIMATELY 44 FEET FROM E ANAHEIM STREET CENTERLINE
ST-14	DRAKE/CHAVEZ GREENBELT ENTRANCE AT W. ANAHEIM STREET/DAISY AVENUE	RECREATIONAL	4/19/2017	11:25	10	71.6	DRAKE/CHAVEZ GREENBELT ENTRANCE (CURRENTLY UNDER CONSTRUCTION), SOUTH OF W. ANAHEIM STREET, WEST OF N DAISY AVENUE, APPROXIMATELY 42 FEET FROM W. ANAHEIM ST. CENTERLINE
				13:10	10	71.5	
				13:22	10	72.4	
ST-15	W 7TH STREET AT MAINE AVE.	SFR	4/19/2017	12:25	10	69.9	APPROXIMATELY 31 FEET FROM W 7TH STREET CENTERLINE/SETBACK OF NEARBY SFR OUTDOOR ACTIVY AREA
ST-16	W. BROADWAY AT CESAR CHAVEZ ELEMENTARY SCHOOL	SCHOOL	4/21/2017	16:00	10	66.8	W. BROADWAY AT CESAR CHAVEZ ELEMENTARY SCHOOL WEST OF MAINE AVENUE, APPROXIMATELY 40 FEET FROM W. BROADWAY CENTERLINE
ST-17	745 W 3RD STREET	MFR	4/21/2017	16:25	10	65.2	PUERO DEL SOL APARTMENTS AT NORTHEAST CORNER OF W 3RD STREET/GOLDEN AVENUE
ST-18	W 6TH STREET AT EDISON ELEMENTARY SCHOOL	SCHOOL	4/21/2017	16:55	10	73.3	W 6TH STREET AT EDISON ELEMENTARY SCHOOL (625 MAINE AVE) APPROXIMATELY 25 FEET FROM W 6TH ST CENTERLINE
ST-19	W 7TH STREET AT MAINE AVE.	SFR	4/21/2017	17:18	10	68.5	APPROXIMATELY 31 FEET FROM W 7TH STREET CENTERLINE/SETBACK OF NEARBY SFR OUTDOOR ACTIVY AREA
ST-20	W 9TH STREET AT CANAL	INDUSTRIAL	4/20/2017	17:45	10	70.4	APPROXIMATELY 40 FEET FROM W 9TH STREET CENTERLINE
ST-21	1475 W ANAHEIM STREET	INDUSTRIAL	4/20/2017	18:05	10	73.4	APPROXIMATELY 80 FEET FROM W ANAHEIM STREET CENTERLINE
ST-22	W 3RD STREET, WEST OF MAGNOLIA	RESTAURANT	4/21/2017	6:38	10	65.3	NEAR OUTDOOR EATING AREA OF RESTAURANT (275 MAGNOLIA AVE), APPROXIMATELY 49 FEET FROM W 3RD ST CENTERLINE, 82 FEET FROM MAGNOLIA AVE CENTERLINE 275 MAGNOLIA AVENUE
ST-23	E 6TH STREET, WEST OF LOCUST AVENUE	COMMERCIAL	4/21/2017	7:47	10	65.5	APPROXIMATELY 38 FEET FROM E 6TH STREET CENTERLINE
ST-24	429 MAGNOLIA AVENUE	MFR	4/21/2017	6:55	10	59.7	APPROXIMATELY 38 FEET FROM MAGNOLIA AVE CENTERLINE
ST-25	W MELROSE WAY AT N CRYSTAL COURT	MFR	4/21/2017	7:10	10	48.7	BACKGROUND NOISE MEASUREMENT

LONG-TERM NOISE MEASUREMENT SUMMARY

	LOCATION	LAND USE	START DATE	START TIME	DURATION (HOURS)	PEAK NOISE HOUR	MEASURED PKHR NOISE LEVEL (dBA Leq)	NOTES
LT-1	GOLDEN SHORES RV PARK	RECREATIONAL	4/17/2017	20:00	24	7:00 AM	71	NORTHERN SITE BOUNDARY, APPROXIMATELY 16 FEET FROM EXIT RAMP CENTERLINE.
LT-2	DRAKE/CHAVEZ GREENBELT ENTRANCE AT W. ANAHEIM STREET/DAISY AVENUE	RECREATIONAL	4/19/2017	14:00	24	6:00 AM	75	DRAKE/CHAVEZ GREENBELT ENTRANCE (CURRENTLY UNDER CONSTRUCTION), SOUTH OF W. ANAHEIM STREET, WEST OF N DAISY AVENUE, APPROXIMATELY 42 FEET FROM W. ANAHEIM ST. CENTERLINE.

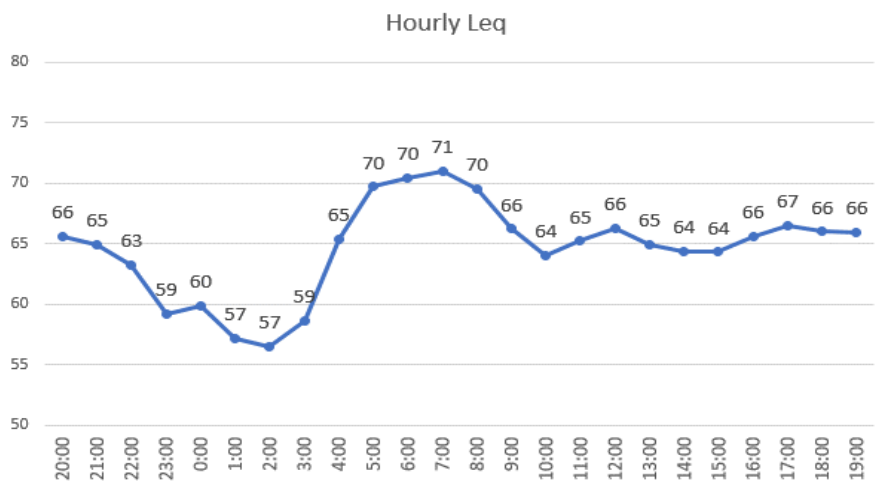
SUMMARY OF METEOROLOGICAL CONDITIONS

SURVEYS	DATE	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	AVERAGE WIND SPEEDS (MPH)
SHORT-TERM	4/19/2017	61-69	58-84	2-6
SHORT-TERM	4/21/2017	58-69	66-81	2-5
LONG-TERM	4/17/2017-4/18/2017	60-68	70-86	2-8
LONG-TERM	4/19/2017-4/20/2017	61-70	60-87	1-5

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	APRIL 17TH - 18TH, 2017
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W SHORELINE DR EXIT TO GOLDEN SHORE. NORTHERN BOUNDARY OF GOLDEN SHORE RV RESORT



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 60-68F. HUMIDITY: 70-86% WIND SPEED: 2-8MPH SKY: OVERCAST/PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

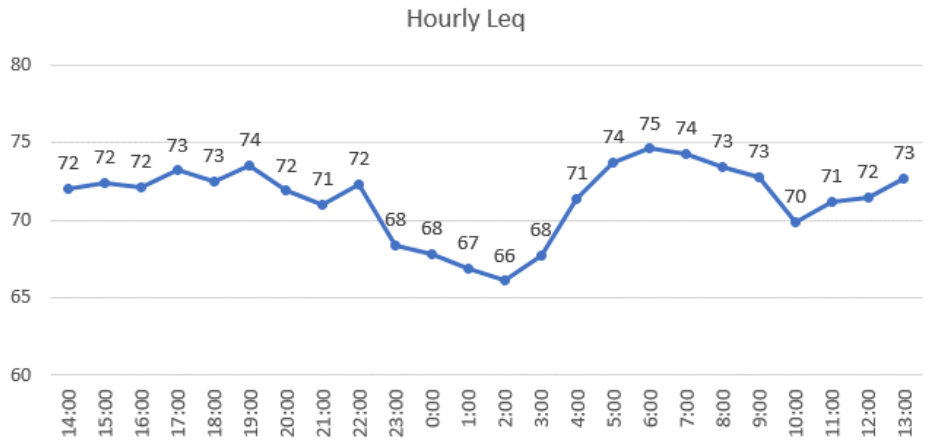
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			PKHR LEQ	PKHR	LDN/CNEL			
ST1	START: 20:00 24 HRS	VEHICLE TRAFFIC ON W SHORELINE DR	71	7:00 AM	71			

ALSO SITE OF ST-1. ~16 feet from exit ramp centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	April 19-20, 2017
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W ANAHEIM ST, WEST OF DAISY AVE (OUTDOOR PARK)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 61-70F. HUMIDITY: 60-87 % WIND SPEED: 1-5 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			PKHR LEQ	PKHR	LDN/CNEL			
LT2	START: 14:00 24 HRS	VEHICLE TRAFFIC ON W ANAHEIM ST	75	6:00 AM	75			

ALSO SITE OF ST-14. 42 feet from road centerline

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	17-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W SHORELINE DR EXIT TO GOLDEN SHORE. NORTHERN BOUNDARY OF GOLDEN SHORE RV RESORT

Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 67 F. HUMIDITY: 73 % WIND SPEED: 4 MPH SKY: OVERCAST/PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

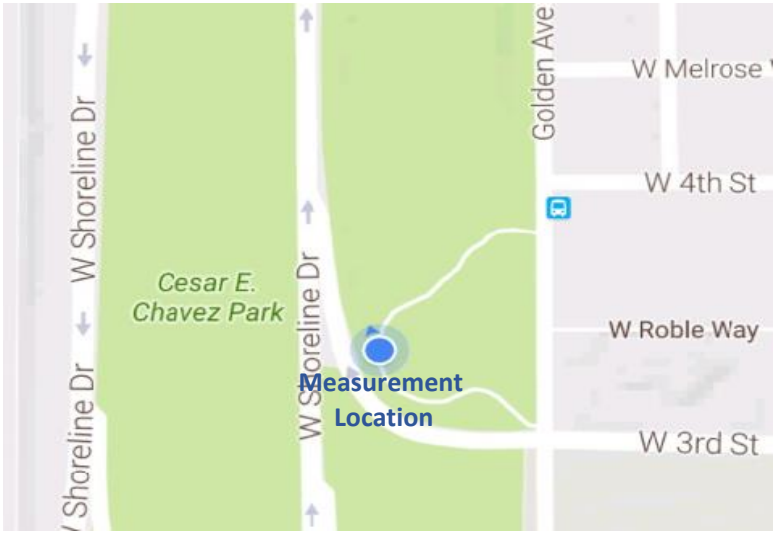
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST1	1925-1935	VEHICLE TRAFFIC ON W SHORELINE DR	66.5	88.3	44			

SITE OF ST-1 AND LT-1. 16 feet from exit ramp centerline

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	CESAR CHAVEZ PARK, SOUTHWESTERN BOUNDARY.



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 61F. HUMIDITY: 83% WIND SPEED: 4 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

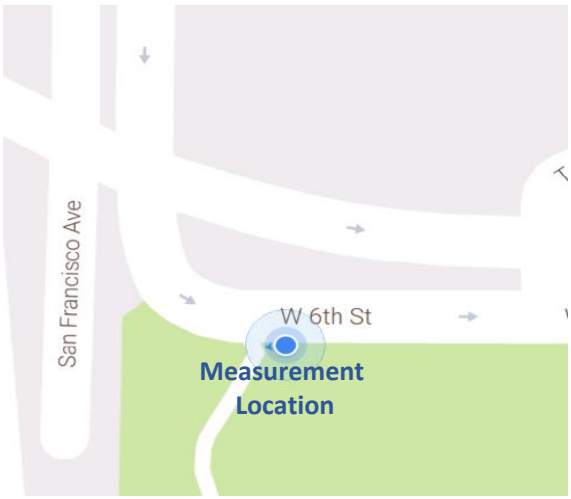
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST2	0615-0630	VEHICLE TRAFFIC ON W SHORELINE DR	65.5	73.7	55.3			

Noise measurement is consistent (within 1 dB) with measurements previously conduted by LSA for this same hour/location.~59 feet to onramp centerline, ~115 feet to NB W Shoreline Dr centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	CESAR CHAVEZ PARK, NORTHERN BOUNDARY AT W 6TH ST.



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 61F. HUMIDITY: 83% WIND SPEED: 3 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

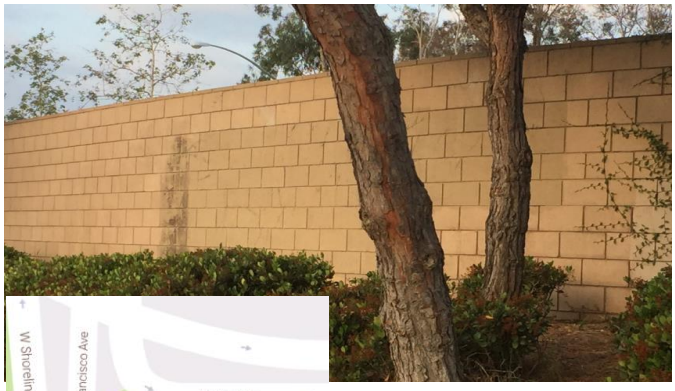
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST3	0640-0650	VEHICLE TRAFFIC ON W SHORELINE DR	67.8	73.3	60.9			

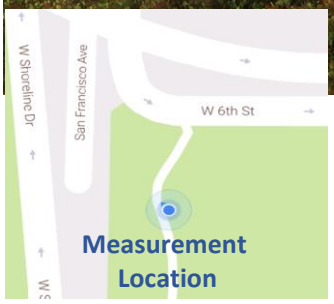
~134 feet to NB W Shoreline Dr centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	CESAR CHAVEZ PARK, NORTHWESTERN AREA NEAR PARK BENCH.





Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 62F. HUMIDITY: 82% WIND SPEED: 3 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

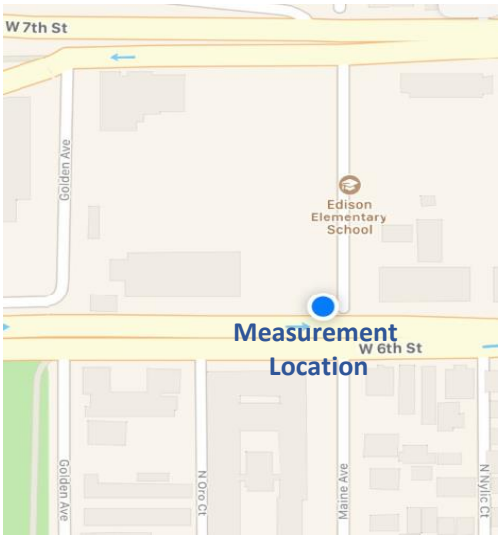
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST4	0705-0715	VEHICLE TRAFFIC ON W SHORELINE DR	68.5	69.8	56.9			

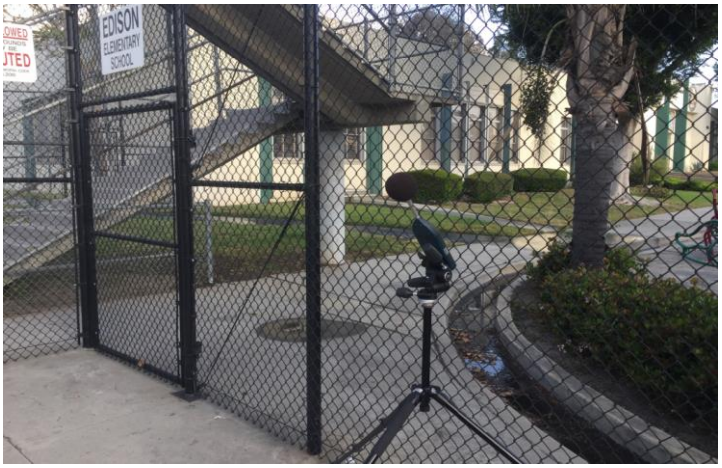
Noise measurement is consistent (within 2 dB) of measurements previously conduted by LSA for this same hour/location.~99 feet to NB W Shoreline Dr centerline. Approximate 6.5 ft barrier on berm (~9-10 ft total height).

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W 6TH ST, WEST OF MAINE AVE (EDISON ELEMENTARY SCHOOL, 625 MAINE AVE.)





Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 62F. HUMIDITY: 82% WIND SPEED: 4 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

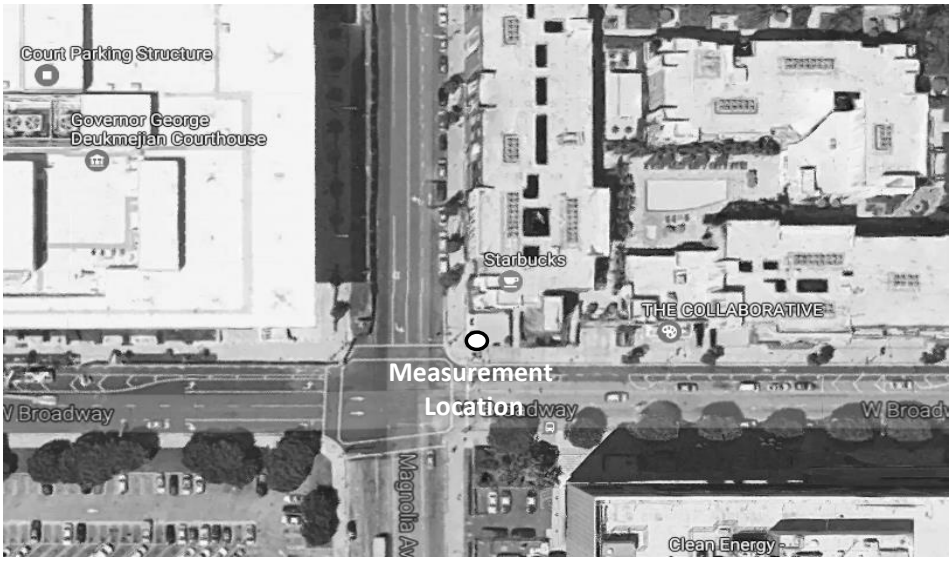
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST5	0720-0730	VEHICLE TRAFFIC ON W 6TH ST	72.8	82.2	52.2			

25 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	CORNER OF W BROADWAY AND MAGNOLIA AVE. OUTDOOR EATING AREA.
(421 W. BROADWAY)	



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 61 F. HUMIDITY: 84% WIND SPEED: 3MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

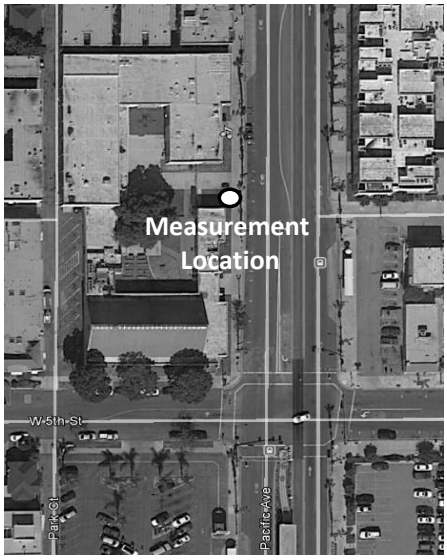
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST6	0800-0810	VEHICLE TRAFFIC ON W BROADWAY & MAGNOLIA AVE	65.3	74.1	56.9			

Measurement location at outdoor eating area.~55 feet to Magnolia Ave centerline, ~49 feet to W. Broadway centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	507 Pacific Street, south of W 6th St. (First Methodist Church)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 61 F. HUMIDITY: 82% WIND SPEED: 2MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

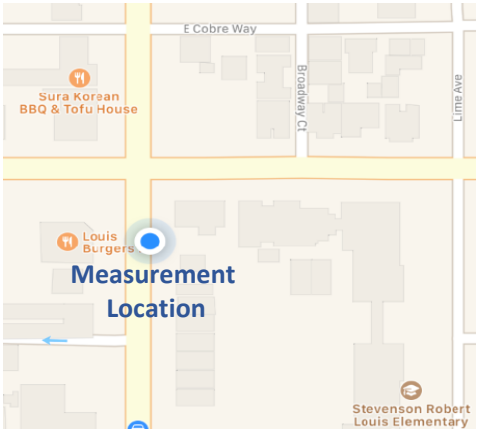
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST7	0825-0835	VEHICLE TRAFFIC ON PACIFIC ST	64.5	72.1	51.9			

15 feet from road edge.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	ATLANTIC AVE, SOUTH OF E 6TH ST. (STEVENSON ELEMENTARY SCHOOL)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 64 F. HUMIDITY: 78% WIND SPEED: 3 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

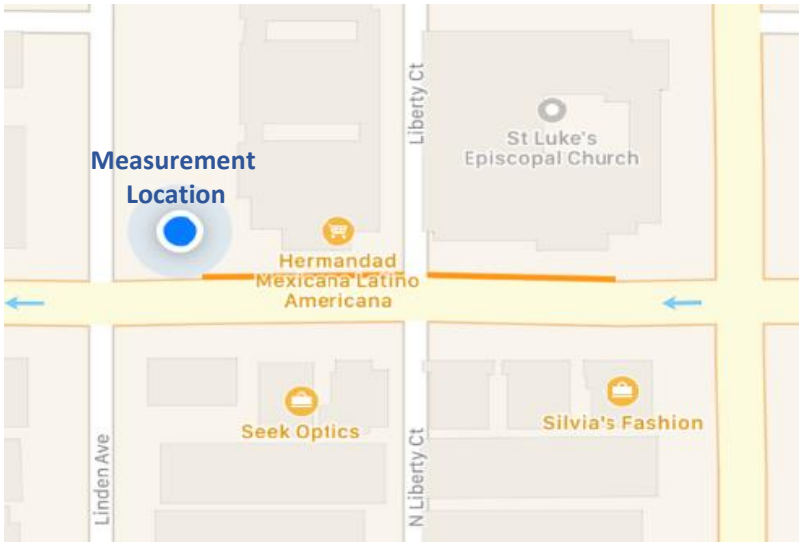
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST8	0850-0900	VEHICLE TRAFFIC ON ATLANTIC & 6TH ST	62.8	71.3	55.5			

46 feet to Atlantic Ave centerline

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	NE CORNER OF E 7TH ST & LINDEN AVE. (ST LUKE'S EPISCOPAL CHURCH, 525 E 7TH ST)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 65 F. HUMIDITY: 75% WIND SPEED: 4 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM

CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES

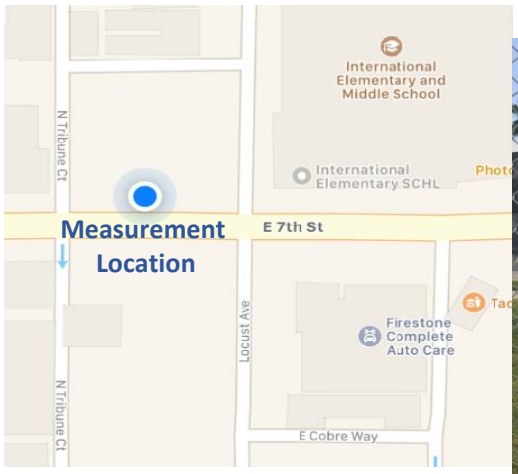
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST9	0907-0917	VEHICLE TRAFFIC ON E 7TH ST	66.7	82.4	48.1			

45 feet to road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	E 7TH ST, WEST OF LOCUST AVE. OUTDOOR REC AREA OF INTERNATIONAL ELEMENTARY SCHOOL
(700 LOCUST AVE.)	



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 66 F. HUMIDITY: 70% WIND SPEED: 4 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

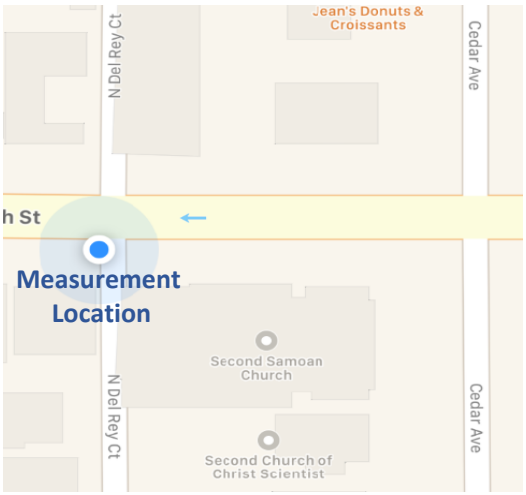
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST10	0935-0945	VEHICLE TRAFFIC ON E 7TH ST	66.1	79.4	52.3			

38 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	324 W 7TH ST (AT DEL REY CT.), MF RESIDENTIAL. NEAR OF SECOND SAMOAN CHURCH



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 67 F. HUMIDITY: 66% WIND SPEED: 6 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

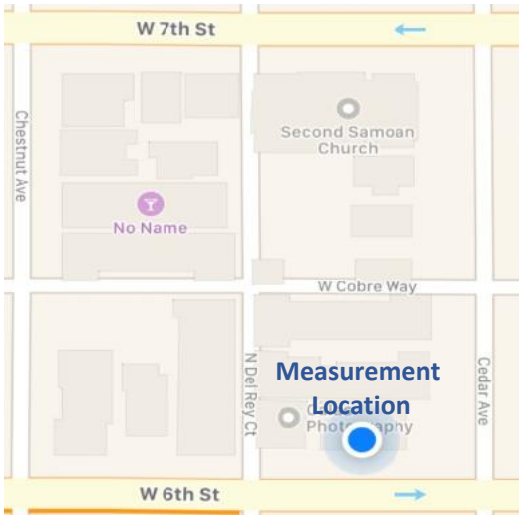
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST11	1014-1024	VEHICLE TRAFFIC ON W 7TH	69.3	82.5	46.7			

~30 feet from road centerline

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W 6TH ST, WEST OF CEDAR AVE. (605 W. CEDAR AVE.)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 69 F. HUMIDITY: 62% WIND SPEED: 4 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

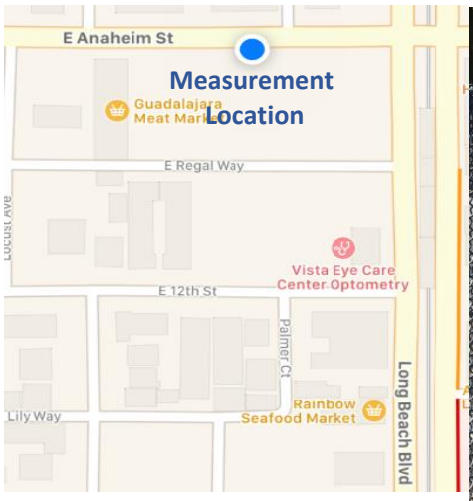
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST12	1033-1044	VEHICLE TRAFFIC ON W 6TH ST	61.9	73.2	48.9			

37 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	200 E ANAHEIM ST, WEST OF LONG BEACH BLVD. (LONG BEACH SENIOR ARTS COLONY APARTMENTS)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 69 F. HUMIDITY: 61% WIND SPEED: 4 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST13	1101-1113	VEHICLE TRAFFIC ON E ANAHEIM ST	68.6	78.4	57.4			

~44 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W ANAHEIM ST, WEST OF DAISY AVE (DRAKE/CHAVEZ GREENBELT ENTRANCE UNDER CONSTRUCTION)

Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 69-70 F. HUMIDITY: 58-61% WIND SPEED: 3-5 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

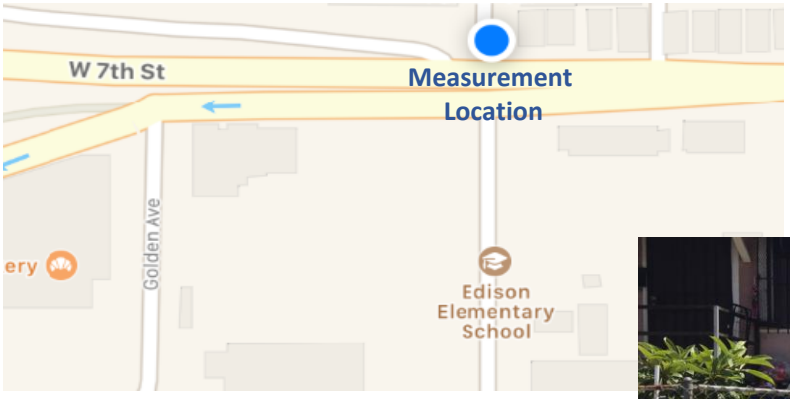
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST14	1125-1135	VEHICLE TRAFFIC ON W ANAHEIM ST	71.6	82.1	57.4			
ST14	1310-1320	VEHICLE TRAFFIC ON W ANAHEIM ST	71.5	81	58.2			
ST14	1322-1332	VEHICLE TRAFFIC ON W ANAHEIM ST	72.4	87.7	56.1			

ALSO SITE OF LT-2. Traffic counts conducted for 1320-1332. 42 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	19-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W 7TH ST AT MAINE AVE



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 69 F. HUMIDITY: 59% WIND SPEED: 3 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM

CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES

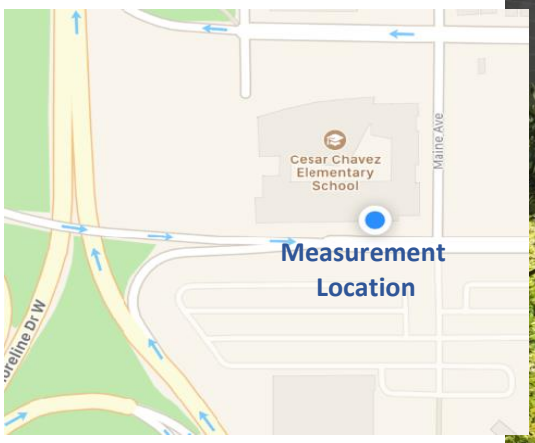
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST15	1225-1235	VEHICLE TRAFFIC ON W 7TH ST	69.9	82.8	51.6			

Noise measurement is consistent (within 0 dB) with measurements previously conduted by LSA for this same hour/location.31 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	21-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W BROADWAY, WEST OF MAINE AVE AT CESAR CHAVEZ ELEMENTARY SCHOOL(730 W 3RD ST)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 69 F. HUMIDITY: 66% WIND SPEED: 4MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM

CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES

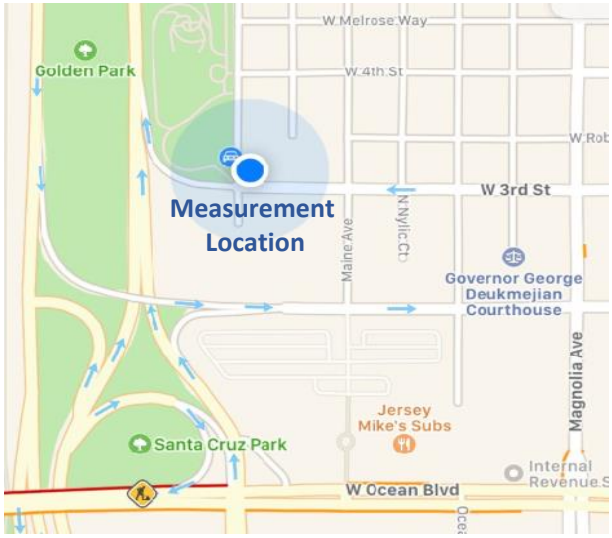
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST16	1600-1610	VEHICLE TRAFFIC ON W BROADWAY	66.8	79.2	54.7			

Noise measurement is consistent with measurements previously conduted by LSA for this same hour/location.40 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	21-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	745 W 3RD ST AT GOLDEN AVE (PUERO DEL SOL APARTMENTS)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 69 F. HUMIDITY: 66% WIND SPEED: 4MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

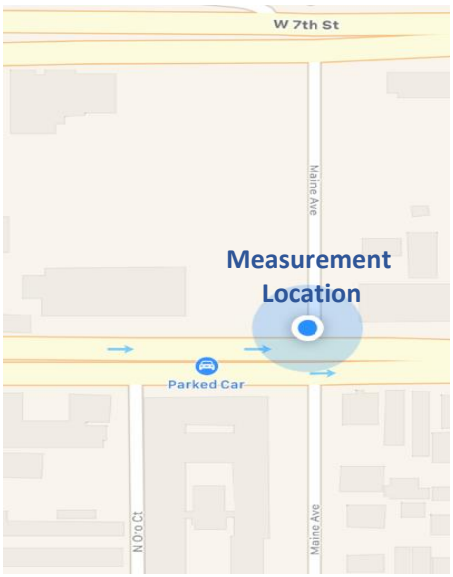
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST17	1625-1635	VEHICLE TRAFFIC ON W 3RD ST	65.2	82.2	53.5			

Noise measurement is consistent with measurements previously conduted by LSA for this same hour/location.26 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	21-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W 6TH ST AT MAINE AVE AT EDISON ELEMENTARY SCHOOL (625 MAINE AVE)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 68 F. HUMIDITY: 67% WIND SPEED: 3MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST18	1655-1705	VEHICLE TRAFFIC ON W 6TH ST	73.3	79.7	57.5			

25 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	21-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W 7TH ST AT MAINE (SFR)

Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 68 F. HUMIDITY: 67% WIND SPEED: 3MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

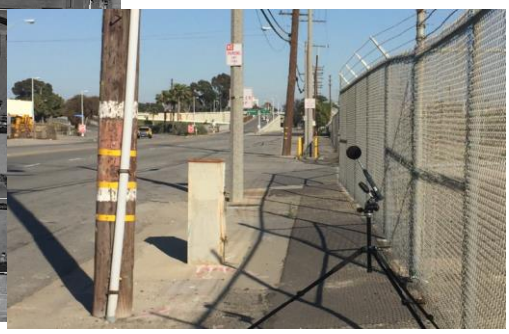
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST19	1718-1728	VEHICLE TRAFFIC ON W 7TH ST	68.5	76.9	51.8			

Noise measurement is consistent (within 2 dB) with measurements previously conduted by LSA for this same hour/location.31 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	20-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W 9TH ST AT CANAL (INDUSTRIAL)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 67 F. HUMIDITY: 70% WIND SPEED: 5MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

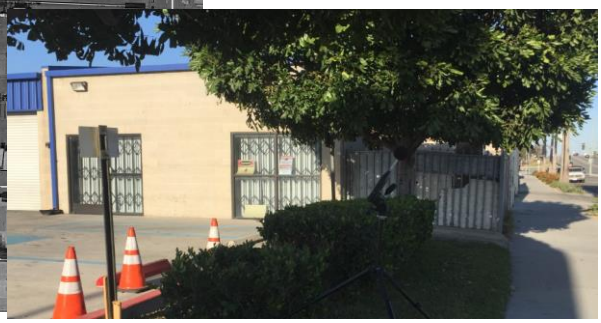
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST20	1725-1735	VEHICLE TRAFFIC ON W 9TH ST	70.4	86.5	56.3			

40 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	20-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	1475 W ANAHEIM ST, EAST OF CASPIAN AVE (INDUSTRIAL)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 67 F. HUMIDITY: 70% WIND SPEED: 5MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

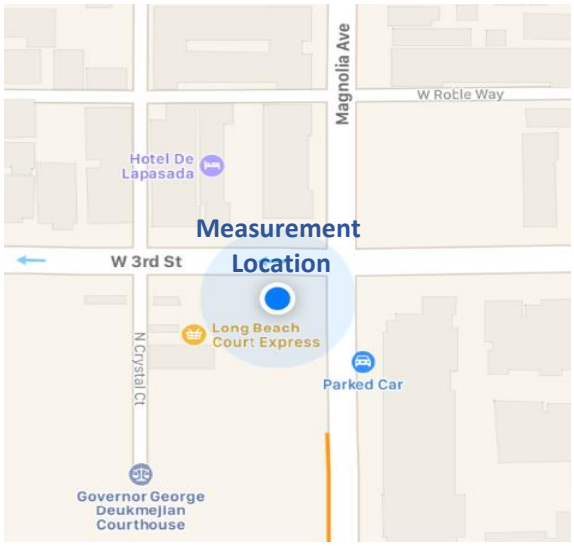
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST21	1748-1758	VEHICLE TRAFFIC ON W ANAHEIM ST	73.4	93.7	57.8			

80 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	21-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W 3RD ST, WEST OF MAGNOLIA, NEAR RESTAURANT OUTDOOR EATING AREA
(SUBWAY RESTAURANT, 275 MAGNOLIA AVE)	



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 58F. HUMIDITY: 81% WIND SPEED: 2 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

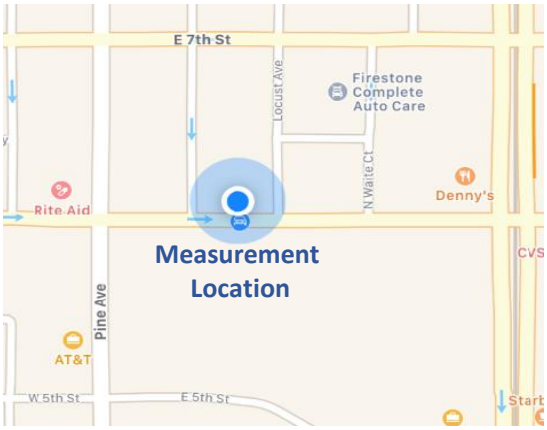
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST22	0638-0648	VEHICLE TRAFFIC ON W 3RD ST	65.3	80.8	50.7			

Traffic counts conducted.49 feet from W 3rd centerline and 82 feet from Magnolia Ave centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	21-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	E 6TH ST , WEST OF LOCUST AVE



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 60F. HUMIDITY: 78% WIND SPEED: 2 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

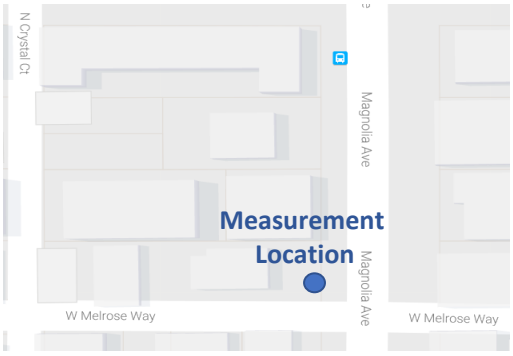
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST23	0747-0757	VEHICLE TRAFFIC ON E 6TH ST	65.5	82.5	53.8			

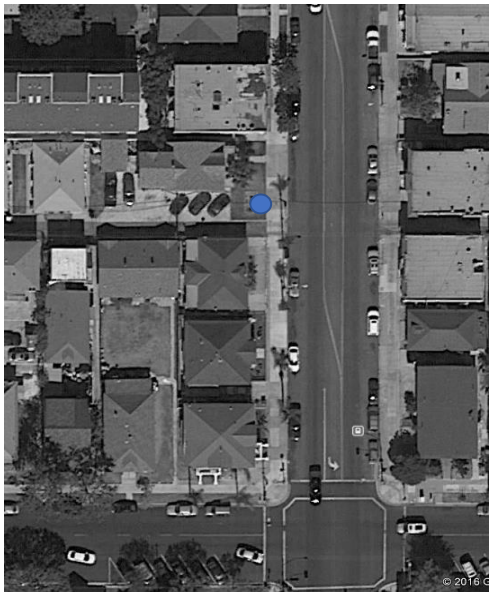
Traffic counts conducted. 38 feet to road centerline.Bibleway Baptist Church located ~600 feet to the west at roughly equivalent setback distance. Unable to conduct measurements at POW due to vehicle stereo noise at location.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	21-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	429 MAGNOLIA AVE NORTH OF W MELROSE WAY (MFR)





Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 58F. HUMIDITY: 81% WIND SPEED: 4 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

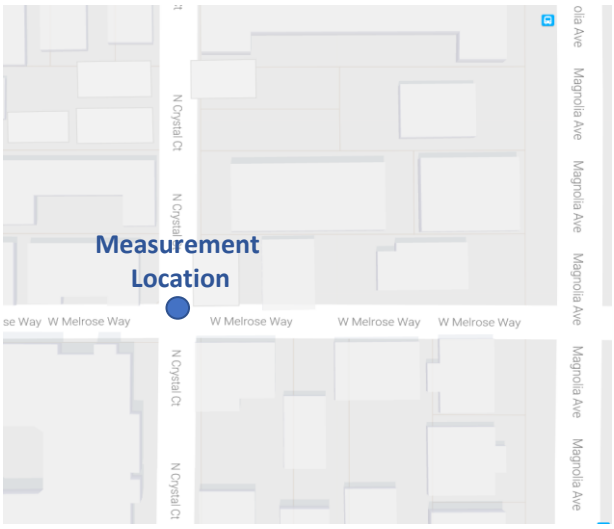
LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST24	0655-0705	VEHICLE TRAFFIC ON MAGNOLIA	59.7	70.4	43.7			

Traffic counts conducted. 38 feet from road centerline.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

NOISE MEASUREMENT SURVEY

DATE:	21-Apr-17
PROJECT:	SHOEMAKER BRIDGE REPLACEMENT PROJECT, LONG BEACH, CA
NOISE MONITORING LOCATION:	W MELROSE WAY AT N CRYSTAL CT (BACKGROUND NOISE MEASUREMENT)



Measurement locations are approximate. Not to scale.

MET CONDITIONS:	TEMP: 59F. HUMIDITY: 80% WIND SPEED: 2 MPH SKY: PARTLY CLOUDY GROUND: DRY
NOISE MONITORING EQUIPMENT:	2-LARSON DAVIS MODEL 820, TYPE I SLM; 1-TYPE II SLM
CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS: YES	

LOCATION	MONITORING PERIOD	PRIMARY NOISE SOURCES	NOISE LEVEL					
			LEQ	LMAX	LMIN			
ST25	0710-0720	BIRDS, OCCASSIONAL VOICES, DISTANT TRAFFIC	48.7	58.3	43.5			

Background noise measurement.

Meteorological conditions measured using a Kestrel Weather Meter, Model 5500.

AMBIENT
AIR QUALITY & NOISE CONSULTING

TRAFFIC SURVEY DATA

SIGNALIZED INTERSECTION RED TIME

SIGNALIZED INTERSECTION	ROADWAY	DATE	START TIME	TOTAL TIME (SEC)	RED TIME (SEC)	% RED TIME
E 7TH & LONG BEACH	W 7TH	20-Apr-17	18:34	390	247	63%
	LONG BEACH				143	37%
E 7TH & LOCUST	W 7TH	20-Apr-17	18:44	300	135	45%
	LOCUST				165	55%
E/W 7TH & PINE	W 7TH	20-Apr-17	18:51	360	138	38%
	PINE				222	62%
W 7TH & PACIFIC	W 7TH	20-Apr-17	19:00	234	136	58%
	PACIFIC				98	42%
W 7TH & CEDAR	W 7TH	20-Apr-17	1908	180	61	34%
	CEDAR				119	66%
W 7TH & CHESTNUT	W 7TH	20-Apr-17	1915	195	54	28%
	CHESTNUT				141	72%
W 7TH & MAGNOLIA	W 7TH	20-Apr-17	1922	180	89	49%
	MAGNOLIA				91	51%
W 7TH & DAISY	W 7TH	20-Apr-17	1930	255	88	35%
	DAISY				167	65%
MAGNOLIA & W 4TH	MAGNOLIA	20-Apr-17	1938	240	128	53%
	W 4TH				112	47%
E 6TH & ELM	W 6TH	21-Apr-17	805	360	120	33%
	ELM				240	67%
E 6TH & LINDEN	W 6TH	21-Apr-17	814	270	61	23%
	LINDEN				209	77%
E 6TH & ATLANTIC	W 6TH	21-Apr-17	822	240	111	46%
	ATLANTIC				129	54%
W ANAHEIM & OREGON	ANAHEIM	24-Apr-17	1412	480	53	11%
	OREGON				427	89%
W ANAHEIM & DAISY	ANAHEIM	24-Apr-17	1425	540	132	24%
	DAISY				408	76%
W ANAHEIM & MAGNOLIA	ANAHEIM	24-Apr-17	1440	538	195	36%
	MAGNOLIA				343	64%
W ANAHEIM & CHESTNUT	ANAHEIM	24-Apr-17	1453	420	107	25%
	CHESTNUT				313	75%
W ANAHEIM & CEDAR	ANAHEIM	24-Apr-17	1504	660	173	26%
	CEDAR				487	74%
W ANAHEIM & PACIFIC	ANAHEIM	24-Apr-17	1518	415	105	25%
	PACIFIC				310	75%
W/E ANAHEIM & PINE	ANAHEIM	24-Apr-17	1528	343	53	15%
	PINE				290	85%
E ANAHEIM & LOCUST	ANAHEIM	24-Apr-17	1538	463	66	14%
	LOCUST				397	86%
E ANAHEIM & LONG BEACH	ANAHEIM	24-Apr-17	1550	410	110	27%
	LONG BEACH				300	73%
E ANAHEIM & LONG BEACH	ANAHEIM	24-Apr-17	1600	420	112	27%
	LONG BEACH				308	73%
E ANAHEIM & ATLANTIC	ANAHEIM	24-Apr-17	1618	355	112	32%
	ATLANTIC				243	68%
W ANAHEIM & HARBOR	ANAHEIM	24-Apr-17	1636	418	108	26%
	HARBOR				310	74%
W ANAHEIM & SANTA FE	ANAHEIM	24-Apr-17	1647	287	57	20%
	SANTA FE				230	80%
W 9TH & SANTA FE	ANAHEIM	24-Apr-17	1700	302	144	48%
	SANTA FE				158	52%
W ANAHEIM & W 9TH	ANAHEIM	24-Apr-17	1709	360	73	20%
	W 9TH				287	80%

TRAFFIC SURVEY DATA & TNM CALIBRATION

FLEET MIX/SPEEDS & MEASURED LEQ

DATE	TIME	MONITORING LOCATION	ROADWAY SEGMENT	10-MINUTE COUNT LDV	MDV	HDV	BUS	MC	TOTAL	VEH SPEED (MPH) L/MD	HD	MEASURED LEQ	DISTANCE FROM ROAD CL (FT)
4/20/2017	1725-1735	ST20. W 9TH AT CANAL AVE	W 9TH	100	2	4	0	0	106	45	40	70	40
4/20/2017	1748-1758	ST21. 1475 W ANAHEIM	ANAHEIM	259	6	60	4	2	331	45	45	73	80
4/19/2017	1322-1332	ST14. W ANAHEIM, WEST OF DAISY	ANAHEIM	276	7	2	5	1	291	40	35	72	42
4/21/2017	1655-1705	ST18. W 6TH ST, W OF MAIN AVE	W 6TH ST	248	0	0	0	2	250	48	NM	73	25
4/21/2017	1625-1635	ST17. W 3RD ST AT GOLDEN AVE	W 3RD	82	0	1	1	0	84	35	NM	65	26
4/21/2017	1718-1728	ST19. 7TH AT MAINE	W 7TH ST	111	0	0	0	0	111	45	NM	69	31
4/21/2017	1600-1610	ST16. BROADWAY WEST OF MAINE	BROADWAY	126	1	0	1	1	129	43	NM	67	40
4/21/2017	0638-0648	ST22. W 3RD ST, WEST OF MAGNOLIA	W 3RD	122	1	1	1	2	127	30	30	65	49
			MAGNOLIA	61	1	0	3	1	66	30	NM		82
4/21/2017	0655-0705	ST24. MAGNOLIA AT MELROSE	MAGNOLIA	52	1	0	1	0	54	30	NM	60	38
4/21/2017	0747-0757	ST23. E 6TH ST , WEST OF LOCUST AVE	E 6TH ST	103	3	0	1	0	107	35	35	66	38

**Vehicle speeds measured traveling in-flow with traffic and using a Bushnell Radar Gun, Model 101911.*

TNM CALIBRATION

	MONITORING LOCATION	ROADWAY SEGMENT	1-HOUR CALC LDV	MDV	HDV	BUS	MC	TOTAL	MEASURED LEQ	MODELED LEQ	DIFFERENCE
CAL 1	W 9TH AT CANAL AVE	W 9TH	600	12	24	0	0	636	70	69	-1
CAL 2	1475 ANAHEIM	ANAHEIM	1554	36	360	24	12	1986	73	73	0
CAL 3	ANAHEIM, WEST OF DAISY	ANAHEIM	1656	42	12	30	6	1746	72	71	-1
CAL 4	W 6TH ST, W OF MAIN AVE	W 6TH ST	1488	0	0	0	12	1500	73	73	0
CAL 5	W 3RD ST, EAST OF GOLDEN AVE	W 3RD	492	0	6	6	0	504	65	65	0
CAL 6	7TH AT MAINE	W 7TH ST	666	0	0	0	0	666	69	68	-1
CAL 7	BROADWAY WEST OF MAINE	BROADWAY	756	6	0	6	6	774	67	67	0
CAL 8	W 3RD ST, WEST OF MAGNOLIA	W 3RD	732	6	6	6	12	762	65	65	0
		MAGNOLIA	366	6	0	18	6	396			
CAL 9	MAGNOLIA AT MELROSE	MAGNOLIA	312	6	0	6	0	324	60	61	1
CAL 10	E 6TH ST , WEST OF LOCUST AVE	E 6TH ST	618	18	0	6	0	642	66	65	-1

Appendix C. Predicted Future Noise Levels

This appendix contains tables that summarize the traffic noise modeling results for existing conditions without the project and 2035 conditions with and without the project.

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Table C-1. Predicted Future Noise and Barrier Analysis (Wye Alt.)

Receptor I.D.	Land Use	Existing Noise Level L_{eq}(h), dBA	Future Worst Hour Noise Levels - L_{eq}(h), dBA																								
			Design Year Noise Level without Project Leq(h), dBA	Design Year Noise Level with Project Leq(h), dBA	Design Year Noise Level without Project minus Existing Conditions Leq(h), dBA	Design Year Noise Level with Project Minus No Project Conditions Leq(h), dBA	Noise Abatement Criteria (NAC) Activity Category	NAC Leq(h), dBA	Impact Type	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receptors (NBR)																	
										6 feet			8 feet			10 feet			12 feet			14 feet			16 feet		
										L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR
1	RV Park	60	61	64	1	4	B	67	None																		
2	RV Park	59	60	64	1	5	B	67	None																		
3	RV Park	59	60	63	1	4	B	67	None																		
4	RV Park	59	60	63	1	4	B	67	None																		
5	RV Park	63	64	63	1	0	B	67	None																		
6	RV Park	64	65	62	1	-2	B	67	None																		
7	RV Park	65	65	62	0	-3	B	67	None																		
8	RV Park	64	64	62	0	-2	B	67	None																		
9	RV Park/Recreational	64	64	62	0	-2	C	67	None																		
10	RV Park	59	60	61	1	2	B	67	None																		
11	RV Park	58	59	61	1	3	B	67	None																		
12	RV Park	59	60	60	1	1	B	67	None																		
13	RV Park	59	60	60	1	1	B	67	None																		
14	RV Park	60	61	60	1	0	B	67	None																		
15	RV Park	60	61	60	1	0	B	67	None																		
16	RV Park	59	60	59	1	0	B	67	None																		
17	Office	64	63	65	-1	1	E	72	None																		
18	Park/Trail	62	62	62	0	0	C	67	None																		
19	Hotel	66	67	66	1	0	E	72	None																		
20	School	69	69	66	0	-3	C	67	A/E																		
21	School	66	66	63	0	-3	C	67	None																		
22	School	59	60	54	1	-5	C	67	None																		
23	Residential	67	68	59	1	-8	B	67	None																		
24	Residential	70	70	63	0	-7	B	67	None																		
25	Residential	61	61	61	0	0	B	67	None																		
26	Park	68	68	58	0	-10	C	67	None																		
27	Park	67	68	58	1	-9	C	67	None																		
28	Park	67	68	59	1	-8	C	67	None																		
29	Residential	61	61	61	0	0	B	67	None																		
30	Park	58	59	55	1	-3	C	67	None																		
31	Park	59	60	55	1	-4	C	67	None																		
32	Park	63	64	57	1	-6	C	67	None																		
33	Residential	63	64	63	1	0	B	67	None																		
34	Residential	66	66	55	0	-11	B	67	None																		
35	Residential	66	67	57	1	-9	B	67	None																		
36	Park	66	67	63	1	-3	C	67	None																		
37	School	67	68	56	1	-11	C	67	None																		
38	School	56	56	58	0	2	C	67	None																		
39	School	68	69	75	1	7	C	67	A/E																		

40	School	67	68	55	1	-12	C	67	None																	
41	Industrial/Bus Yard	58	58	54	0	-4	F	None	None																	
42	Residential	58	59	62	1	4	B	67	None																	
43	Residential	58	58	61	0	3	B	67	None																	
44	Residential	56	57	57	1	1	B	67	None																	
45	Residential	55	56	55	1	0	B	67	None																	
46	Residential	57	57	54	0	-3	B	67	None																	
47	Residential	55	55	53	0	-2	B	67	None																	
48	Residential	58	59	55	1	-3	B	67	None																	
49	Commercial/Retail	64	65	67	1	3	F	None	None																	
50	Industrial/Bus Mechanical Facility	62	63	63	1	1	F	None	None																	
51	Industrial	73	73	74	0	1	F	None	None																	
52	Industrial	76	77	78	1	2	F	None	None																	
53	Industrial	75	75	77	0	2	F	None	None																	
54	Industrial	75	76	76	1	1	F	None	None																	
55	Industrial	74	75	76	1	2	F	None	None																	
56	Industrial	74	74	75	0	1	F	None	None																	
57	Industrial	76	77	78	1	2	F	None	None																	
58	Industrial	73	74	75	1	2	F	None	None																	
59	Industrial	72	73	74	1	2	F	None	None																	
60	Industrial	73	74	75	1	2	F	None	None																	
61	Industrial	73	74	75	1	2	F	None	None																	
62	Industrial	66	67	68	1	2	F	None	None																	
63	Industrial	67	68	69	1	2	F	None	None																	
64	Industrial	62	62	60	0	-2	F	None	None																	
65	Industrial	66	66	65	0	-1	F	None	None																	
66	Industrial	65	65	61	0	-4	F	None	None																	
67	Industrial	60	61	59	1	-1	F	None	None																	
68	Industrial	61	62	59	1	-2	F	None	None																	
69	Industrial	64	64	65	0	1	F	None	None																	
70	Industrial	73	74	75	1	2	F	None	None																	
71	Industrial	72	73	74	1	2	F	None	None																	
72	Commercial/Retail	72	72	73	0	1	F	None	None																	
73	Commercial/Retail	70	71	72	1	2	F	None	None																	
74	Industrial	71	71	72	0	1	F	None	None																	
75	Park/Trail	71	71	72	0	1	C	67	A/E																	
76	Residential	67	67	68	0	1	B	67	A/E																	
77	Residential	64	65	66	1	2	B	67	A/E																	
78	Commercial/Retail	72	73	74	1	2	F	None	None																	
79	Commercial/Retail	65	66	66	1	1	F	None	None																	
80	Commercial/Indoor Restaurant	69	70	70	1	1	E	72	None																	
81	Commercial/Retail	73	73	74	0	1	F	None	None																	
82	Residential	60	61	61	1	1	B	67	None																	
83	Commercial/Indoor Restaurant	67	67	68	0	1	E	72	None																	
84	Commercial/Indoor Restaurant	73	73	74	0	1	E	72	A/E																	
85	Residential	64	64	64	0	0	B	67	None																	
86	Commercial/Retail	74	74	74	0	0	F	None	None																	
87	Residential	72	72	72	0	0	B	67	A/E																	
88	Commercial/Retail	72	72	72	0	0	F	None	None																	
89	Residential	65	65	66	0	1	B	67	A/E																	
90	Commercial/Indoor Restaurant	73	73	73	0	0	E	72	A/E																	
91	Residential	72	72	72	0	0	B	67	A/E																	
92	Residential	55	55	55	0	0	B	67	None																	
93	Commercial/Indoor Restaurant	72	72	72	0	0	E	72	A/E																	

94	Residential	58	58	59	0	1	B	67	None																	
95	Residential	59	59	59	0	0	B	67	None																	
96	Industrial	73	73	74	0	1	F	None	None																	
97	Industrial	70	71	71	1	1	F	None	None																	
98	Industrial	73	73	73	0	0	F	None	None																	
99	Commercial/Indoor Restaurant	73	74	74	1	1	E	72	A/E																	
100	Residential	61	62	62	1	1	B	67	None																	
101	Residential	70	71	75	1	5	B	67	A/E																	
102	Elementary School	69	69	76	0	7	C	67	A/E																	
103	Residential	69	69	75	0	6	B	67	A/E																	
104	Residential	70	70	76	0	6	B	67	A/E																	
105	Residential	65	65	68	0	3	B	67	A/E																	
106	Residential	67	67	69	0	2	B	67	A/E																	
107	Residential	67	68	69	1	2	B	67	A/E																	
108	Residential/Community Garden	71	71	73	0	2	B	67	A/E																	
109	Residential	68	68	70	0	2	B	67	A/E																	
110	Place of Worship	71	71	73	0	2	C	67	A/E																	
111	Residential	68	68	70	0	2	B	67	A/E																	
112	Residential	69	69	70	0	1	B	67	A/E																	
113	Residential	71	72	73	1	2	B	67	A/E																	
114	Health Clinic	68	68	70	0	2	C	67	A/E																	
115	Residential	70	70	71	0	1	B	67	A/E																	
116	Office	69	69	71	0	2	E	72	A/E																	
117	Playground	67	67	69	0	2	C	67	A/E																	
118	Elementary School	69	69	71	0	2	C	67	A/E																	
119	Commercial/Indoor Restaurant	70	70	71	0	1	E	72	A/E																	
120	Commercial/Indoor Restaurant	68	68	70	0	2	E	72	None																	
121	Commercial/Indoor Restaurant	65	66	67	1	2	E	72	None																	
122	Residential	67	67	69	0	2	B	67	A/E																	
123	Residential	71	71	72	0	1	B	67	A/E																	
124	Residential	66	66	68	0	2	B	67	A/E																	
125	Residential	70	71	72	1	2	B	67	A/E																	
126	Place of Worship/Office	67	67	68	0	1	C	67	A/E																	
127	Residential	71	71	73	0	2	B	67	A/E																	
128	Office	67	67	68	0	1	E	72	None																	
129	Residential	71	71	73	0	2	B	67	A/E																	
130	Commercial/Indoor Restaurant	70	70	72	0	2	E	72	A/E																	
131	Elementary School	67	67	56	0	-11	C	67	None																	
132	Residential	67	68	58	1	-9	B	67	None																	
133	Residential	67	67	61	0	-6	B	67	None																	
134	Residential	70	70	62	0	-8	B	67	None																	
135	Residential	65	65	61	0	-4	B	67	None																	
136	Residential	68	68	63	0	-5	B	67	None																	
137	Residential	68	68	63	0	-5	B	67	None																	
138	Residential	65	65	60	0	-5	B	67	None																	
139	Residential	64	64	59	0	-5	B	67	None																	
140	Residential	68	68	62	0	-6	B	67	None																	
141	Residential	64	65	60	1	-4	B	67	None																	
142	Residential	67	67	62	0	-5	B	67	None																	
143	Residential	64	64	61	0	-3	B	67	None																	
144	Residential	67	68	64	1	-3	B	67	None																	
145	Residential	65	65	62	0	-3	B	67	None																	
146	Residential	68	68	65	0	-3	B	67	None																	
147	Place of Worship	66	66	62	0	-4	C	67	None																	

148	Residential	68	68	64	0	-4	B	67	None																	
149	Office	65	66	62	1	-3	E	72	None																	
150	Office	65	66	62	1	-3	E	72	None																	
151	Residential	67	68	64	1	-3	B	67	None																	
152	Commercial/Retail	66	66	62	0	-4	F	None	None																	
153	Commercial/Indoor Restaurant	67	67	63	0	-4	E	72	None																	
154	Commercial/Retail	67	67	63	0	-4	F	None	None																	
155	Commercial/Retail	67	67	63	0	-4	F	None	None																	
156	Residential	67	67	63	0	-4	B	67	None																	
157	Residential	70	70	66	0	-4	B	67	A/E																	
158	Residential	69	69	65	0	-4	B	67	None																	
159	Residential	66	66	62	0	-4	B	67	None																	
160	Residential	65	65	61	0	-4	B	67	None																	
161	Residential	69	70	65	1	-4	B	67	None																	
162	Commercial/Indoor Restaurant	65	66	61	1	-4	E	72	None																	
163	Commercial/Indoor Restaurant	64	65	61	1	-3	E	72	None																	
164	Elementary School	67	70	64	3	-3	C	67	None																	
165	Residential	64	65	61	1	-3	B	67	None																	
166	Residential	65	65	62	0	-3	B	67	None																	
167	Office	67	67	67	0	0	E	72	None																	
168	Office	66	68	69	2	3	E	72	None																	
169	Office	62	63	66	1	4	E	72	None																	
170	Office	57	58	57	1	0	E	72	None																	
171	Office	68	69	67	1	-1	E	72	None																	
172	Office	69	69	67	0	-2	E	72	None																	
173	Residential	64	64	67	0	3	B	67	A/E																	
174	Residential	65	65	68	0	3	B	67	A/E																	
175	Residential	65	66	66	1	1	B	67	A/E																	
176	Residential	62	63	65	1	3	B	67	None																	
177	Residential	65	65	66	0	1	B	67	A/E																	
178	Residential	64	65	67	1	3	B	67	A/E																	
179	Residential	67	67	68	0	1	B	67	A/E																	
180	Residential	66	66	68	0	2	B	67	A/E																	
181	Residential	67	68	69	1	2	B	67	A/E																	
182	Residential	66	66	69	0	3	B	67	A/E																	
183	Residential	66	66	68	0	2	B	67	A/E																	
184	Residential	67	68	69	1	2	B	67	A/E																	
185	Residential	65	66	69	1	4	B	67	A/E																	
186	Residential	69	69	70	0	1	B	67	A/E																	
187	Restaurant/Outdoor Eating Area	69	69	70	0	1	E	72	None																	
188	Office	70	70	71	0	1	E	72	A/E																	
189	Restaurant/Outdoor Eating Area	69	69	69	0	0	E	72	None																	

Table C-2. Predicted Future Noise and Barrier Analysis (RAB Alt.)

Receptor I.D.	Land Use	Existing Noise Level $L_{eq}(h)$, dBA	Future Worst Hour Noise Levels - $L_{eq}(h)$, dBA																								
			Design Year Noise Level without Project Leq(h), dBA	Design Year Noise Level with Project Leq(h), dBA	Design Year Noise Level without Project minus Existing Conditions Leq(h), dBA	Design Year Noise Level with Project Minus No Project Conditions Leq(h), dBA	Noise Abatement Criteria (NAC) Activity Category	NAC Leq(h), dBA	Impact Type	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receptors (NBR)																	
										6 feet			8 feet			10 feet			12 feet			14 feet			16 feet		
										$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR	$L_{eq}(h)$	I.L.	NBR
1	RV Park	60	61	64	1	4	B	67	None																		
2	RV Park	59	60	64	1	5	B	67	None																		
3	RV Park	59	60	63	1	4	B	67	None																		
4	RV Park	59	60	63	1	4	B	67	None																		
5	RV Park	63	64	63	1	0	B	67	None																		
6	RV Park	64	65	62	1	-2	B	67	None																		
7	RV Park	65	65	62	0	-3	B	67	None																		
8	RV Park	64	64	62	0	-2	B	67	None																		
9	RV Park/Recreational	64	64	62	0	-2	C	67	None																		
10	RV Park	59	60	61	1	2	B	67	None																		
11	RV Park	58	59	61	1	3	B	67	None																		
12	RV Park	59	60	60	1	1	B	67	None																		
13	RV Park	59	60	60	1	1	B	67	None																		
14	RV Park	60	61	60	1	0	B	67	None																		
15	RV Park	60	61	60	1	0	B	67	None																		
16	RV Park	59	60	59	1	0	B	67	None																		
17	Office	64	63	65	-1	1	E	72	None																		
18	Park/Trail	62	62	62	0	0	C	67	None																		
19	Hotel	66	67	66	1	0	E	72	None																		
20	School	69	69	66	0	-3	C	67	A/E																		
21	School	66	66	63	0	-3	C	67	None																		
22	School	59	60	54	1	-5	C	67	None																		
23	Residential	67	68	59	1	-8	B	67	None																		
24	Residential	70	70	63	0	-7	B	67	None																		
25	Residential	61	61	61	0	0	B	67	None																		
26	Park	68	68	58	0	-10	C	67	None																		
27	Park	67	68	58	1	-9	C	67	None																		
28	Park	67	68	59	1	-8	C	67	None																		
29	Residential	61	61	61	0	0	B	67	None																		
30	Park	58	59	55	1	-3	C	67	None																		
31	Park	59	60	55	1	-4	C	67	None																		
32	Park	63	64	58	1	-5	C	67	None																		
33	Residential	63	64	63	1	0	B	67	None																		
34	Residential	66	66	54	0	-12	B	67	None																		
35	Residential	66	67	56	1	-10	B	67	None																		
36	Park	66	67	63	1	-3	C	67	None																		
37	School	67	68	54	1	-13	C	67	None																		
38	School	56	56	58	0	2	C	67	None																		
39	School	68	69	75	1	7	C	67	A/E																		

40	School	67	68	54	1	-13	C	67	None																
41	Industrial/Bus Yard	58	58	55	0	-3	F	None	None																
42	Residential	58	59	63	1	5	B	67	None																
43	Residential	58	58	62	0	4	B	67	None																
44	Residential	56	57	58	1	2	B	67	None																
45	Residential	55	56	57	1	2	B	67	None																
46	Residential	57	57	56	0	-1	B	67	None																
47	Residential	55	55	54	0	-1	B	67	None																
48	Residential	58	59	56	1	-2	B	67	None																
49	Commercial/Retail	64	65	71	1	7	F	None	None																
50	Industrial/Bus Mechanical Facility	62	63	62	1	0	F	None	None																
51	Industrial	73	73	74	0	1	F	None	None																
52	Industrial	76	77	78	1	2	F	None	None																
53	Industrial	75	75	77	0	2	F	None	None																
54	Industrial	75	76	76	1	1	F	None	None																
55	Industrial	74	75	76	1	2	F	None	None																
56	Industrial	74	74	75	0	1	F	None	None																
57	Industrial	76	77	78	1	2	F	None	None																
58	Industrial	73	74	75	1	2	F	None	None																
59	Industrial	72	73	74	1	2	F	None	None																
60	Industrial	73	74	75	1	2	F	None	None																
61	Industrial	73	74	75	1	2	F	None	None																
62	Industrial	66	67	68	1	2	F	None	None																
63	Industrial	67	68	69	1	2	F	None	None																
64	Industrial	62	62	60	0	-2	F	None	None																
65	Industrial	66	66	65	0	-1	F	None	None																
66	Industrial	65	65	61	0	-4	F	None	None																
67	Industrial	60	61	58	1	-2	F	None	None																
68	Industrial	61	62	59	1	-2	F	None	None																
69	Industrial	64	64	65	0	1	F	None	None																
70	Industrial	73	74	75	1	2	F	None	None																
71	Industrial	72	73	74	1	2	F	None	None																
72	Commercial/Retail	72	72	73	0	1	F	None	None																
73	Commercial/Retail	70	71	72	1	2	F	None	None																
74	Industrial	71	71	72	0	1	F	None	None																
75	Park/Trail	71	71	72	0	1	C	67	A/E																
76	Residential	67	67	68	0	1	B	67	A/E																
77	Residential	64	65	66	1	2	B	67	A/E																
78	Commercial/Retail	72	73	74	1	2	F	None	None																
79	Commercial/Retail	65	66	66	1	1	F	None	None																
80	Commercial/Indoor Restaurant	69	70	70	1	1	E	72	None																
81	Commercial/Retail	73	73	74	0	1	F	None	None																
82	Residential	60	61	61	1	1	B	67	None																
83	Commercial/Indoor Restaurant	67	67	68	0	1	E	72	None																
84	Commercial/Indoor Restaurant	73	73	74	0	1	E	72	A/E																
85	Residential	64	64	64	0	0	B	67	None																
86	Commercial/Retail	74	74	74	0	0	F	None	None																
87	Residential	72	72	72	0	0	B	67	A/E																
88	Commercial/Retail	72	72	72	0	0	F	None	None																
89	Residential	65	65	66	0	1	B	67	A/E																
90	Commercial/Indoor Restaurant	73	73	73	0	0	E	72	A/E																
91	Residential	72	72	72	0	0	B	67	A/E																
92	Residential	55	55	55	0	0	B	67	None																
93	Commercial/Indoor Restaurant	72	72	72	0	0	E	72	A/E																
94	Residential	58	58	59	0	1	B	67	None																
95	Residential	59	59	59	0	0	B	67	None																

96	Industrial	73	73	74	0	1	F	None	None																	
97	Industrial	70	71	71	1	1	F	None	None																	
98	Industrial	73	73	73	0	0	F	None	None																	
99	Commercial/Indoor Restaurant	73	74	74	1	1	E	72	A/E																	
100	Residential	61	62	62	1	1	B	67	None																	
101	Residential	70	71	75	1	5	B	67	A/E																	
102	Elementary School	69	69	76	0	7	C	67	A/E																	
103	Residential	69	69	75	0	6	B	67	A/E																	
104	Residential	70	70	76	0	6	B	67	A/E																	
105	Residential	65	65	68	0	3	B	67	A/E																	
106	Residential	67	67	69	0	2	B	67	A/E																	
107	Residential	67	68	69	1	2	B	67	A/E																	
108	Residential/Community Garden	71	71	73	0	2	B	67	A/E																	
109	Residential	68	68	70	0	2	B	67	A/E																	
110	Place of Worship	71	71	73	0	2	C	67	A/E																	
111	Residential	68	68	70	0	2	B	67	A/E																	
112	Residential	69	69	70	0	1	B	67	A/E																	
113	Residential	71	72	73	1	2	B	67	A/E																	
114	Health Clinic	68	68	70	0	2	C	67	A/E																	
115	Residential	70	70	71	0	1	B	67	A/E																	
116	Office	69	69	71	0	2	E	72	A/E																	
117	Playground	67	67	69	0	2	C	67	A/E																	
118	Elementary School	69	69	71	0	2	C	67	A/E																	
119	Commercial/Indoor Restaurant	70	70	71	0	1	E	72	A/E																	
120	Commercial/Indoor Restaurant	68	68	70	0	2	E	72	None																	
121	Commercial/Indoor Restaurant	65	66	67	1	2	E	72	None																	
122	Residential	67	67	69	0	2	B	67	A/E																	
123	Residential	71	71	72	0	1	B	67	A/E																	
124	Residential	66	66	68	0	2	B	67	A/E																	
125	Residential	70	71	72	1	2	B	67	A/E																	
126	Place of Worship/Office	67	67	68	0	1	C	67	A/E																	
127	Residential	71	71	73	0	2	B	67	A/E																	
128	Office	67	67	68	0	1	E	72	None																	
129	Residential	71	71	73	0	2	B	67	A/E																	
130	Commercial/Indoor Restaurant	70	70	72	0	2	E	72	A/E																	
131	Elementary School	67	67	56	0	-11	C	67	None																	
132	Residential	67	68	58	1	-9	B	67	None																	
133	Residential	67	67	64	0	-3	B	67	None																	
134	Residential	70	70	66	0	-4	B	67	A/E																	
135	Residential	65	65	62	0	-3	B	67	None																	
136	Residential	68	68	64	0	-4	B	67	None																	
137	Residential	68	68	63	0	-5	B	67	None																	
138	Residential	65	65	60	0	-5	B	67	None																	
139	Residential	64	64	59	0	-5	B	67	None																	
140	Residential	68	68	62	0	-6	B	67	None																	
141	Residential	64	65	60	1	-4	B	67	None																	
142	Residential	67	67	62	0	-5	B	67	None																	
143	Residential	64	64	61	0	-3	B	67	None																	
144	Residential	67	68	64	1	-3	B	67	None																	
145	Residential	65	65	62	0	-3	B	67	None																	
146	Residential	68	68	65	0	-3	B	67	None																	
147	Place of Worship	66	66	62	0	-4	C	67	None																	
148	Residential	68	68	64	0	-4	B	67	None																	
149	Office	65	66	62	1	-3	E	72	None																	
150	Office	65	66	62	1	-3	E	72	None																	
151	Residential	67	68	64	1	-3	B	67	None																	

152	Commercial/Retail	66	66	62	0	-4	F	None	None																	
153	Commercial/Indoor Restaurant	67	67	63	0	-4	E	72	None																	
154	Commercial/Retail	67	67	63	0	-4	F	None	None																	
155	Commercial/Retail	67	67	63	0	-4	F	None	None																	
156	Residential	67	67	63	0	-4	B	67	None																	
157	Residential	70	70	66	0	-4	B	67	A/E																	
158	Residential	69	69	65	0	-4	B	67	None																	
159	Residential	66	66	62	0	-4	B	67	None																	
160	Residential	65	65	61	0	-4	B	67	None																	
161	Residential	69	70	65	1	-4	B	67	None																	
162	Commercial/Indoor Restaurant	65	66	61	1	-4	E	72	None																	
163	Commercial/Indoor Restaurant	64	65	61	1	-3	E	72	None																	
164	Elementary School	67	70	64	3	-3	C	67	None																	
165	Residential	64	65	61	1	-3	B	67	None																	
166	Residential	65	65	62	0	-3	B	67	None																	
167	Office	67	67	67	0	0	E	72	None																	
168	Office	66	68	69	2	3	E	72	None																	
169	Office	62	63	66	1	4	E	72	None																	
170	Office	57	58	57	1	0	E	72	None																	
171	Office	68	69	67	1	-1	E	72	None																	
172	Office	69	69	67	0	-2	E	72	None																	
173	Residential	64	64	68	0	4	B	67	None																	
174	Residential	65	65	69	0	4	B	67	None																	
175	Residential	65	66	67	1	2	B	67	A/E																	
176	Residential	62	63	65	1	3	B	67	None																	
177	Residential	65	65	66	0	1	B	67	A/E																	
178	Residential	64	65	67	1	3	B	67	A/E																	
179	Residential	67	67	68	0	1	B	67	A/E																	
180	Residential	66	66	68	0	2	B	67	A/E																	
181	Residential	67	68	69	1	2	B	67	A/E																	
182	Residential	66	66	69	0	3	B	67	A/E																	
183	Residential	66	66	68	0	2	B	67	A/E																	
184	Residential	67	68	69	1	2	B	67	A/E																	
185	Residential	65	66	69	1	4	B	67	A/E																	
186	Residential	69	69	70	0	1	B	67	A/E																	
187	Restaurant/Outdoor Eating Area	69	69	70	0	1	E	72	None																	
188	Office	70	70	71	0	1	E	72	A/E																	
189	Restaurant/Outdoor Eating Area	69	69	69	0	0	E	72	None																	

Appendix D. Sound Level Meter Calibration Certifications

This appendix contains the sound level meter calibration certifications.

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PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2016-204447

Instrument Model 820, Serial Number 1332, was calibrated on 16 Dec 2016. The instrument meets factory specifications per Procedure D0001.8160, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 16 Dec 2016
Calibration due: 16 Dec 2017

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0445 / 0111	12 Months	16 Nov 2017	2016-204299

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 30 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.
Tested with PRM828-2181

. Signed: Eric Olson
Technician: Eric Olson

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2008 Certified

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