# Mount Vernon Avenue Bridge Project

CITY OF SAN BERNARDINO, CALIFORNIA
08-SBd-0-Mount Vernon Avenue
BRLS-6507(003)
EA 965120

## Supplemental Noise Study Report

**Prepared by the
California Department of Transportation**

**January 2018**

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January 2018

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# Summary

The San Bernardino County Transportation Authority (SBCTA), in cooperation with the California Department of Transportation (Caltrans), is proposing to replace the existing Mount Vernon Avenue Bridge (Bridge Number 54C-066) over the Burlington Northern Santa Fe (BNSF) rail yard in the city of San Bernardino, San Bernardino County, California.

Preparation of a Noise Study Report (NSR) was originally completed in June 2006 and approved in July 2006. A National Environmental Policy Act (NEPA) Finding of No Significant Impact (FONSI) was adopted for the project in June 2011. The project, which involves a road/railroad grade separation, is statutorily exempt from the California Environmental Quality Act (CEQA). Since the NEPA document was adopted, it has been noted that additional project improvements/refinements are needed that were not included in the NEPA document. The purpose of this Supplemental Noise Study Report (SNSR) is to address potential noise impacts associated with the updated project. The results of the new analysis are briefly compared to the results of the original NSR to confirm general consistency. However, both Caltrans' Traffic Noise Analysis Protocol (Protocol) and Technical Noise Supplement (TeNS) have been updated since the previous NSR was prepared in 2006. As a result, in order to comply with current traffic noise study requirements, this SNSR effectively provides an entirely updated analysis.

Land uses within the project area consist of single-family residences, a motel, commercial (including retail, a carwash, and a nightclub), transportation (railyard), and undeveloped land. As part of the traffic noise study, two long-term (24 hours or longer) and ten short-term (16-minute) noise measurements were taken at representative land uses along the project alignment. To be consistent with the 2011 Protocol, all land uses were considered in this SNSR. Traffic counts were conducted during short-term measurements for use in calibrating the Traffic Noise Model (TNM). Per the methodology described in the 2013 TeNS, K-factors (calibration constants) were included to adjust modeled noise levels to account for deviations between the measured and modeled noise levels. K-factors were applied as necessary to adjust modeled noise levels to within 2 decibels (dB) of the measured noise levels. Calibration traffic volumes and K-factors are presented in Tables 6-1 and 6-4 of this report, respectively.

Existing Year (2017) and Design Year (2040) No-Build and Build worst-hour noise levels were modeled using the Federal Highway Administration (FHWA) TNM, version 2.5 (FHWA 2004), and are presented in Appendix B (Table B-1). Existing Year (2017) modeled worst noise hour levels were found to range from 48 A-weighted decibels (dBA) hourly equivalent sound level ($L_{eq}$[h]) (receiver M7) to 67 dBA $L_{eq}$(h) (receiver M8) at modeled land uses. Design Year (2040)

worst noise hour noise levels under both Build and No-Build conditions are predicted to range from 49 dBA $L_{eq}$(h) (receiver M7) to 68 dBA $L_{eq}$(h) (receiver M8) at modeled land uses and along the project alignment.

Based on the results of the traffic noise analysis, none of the predicted noise levels would approach or exceed the FHWA/Caltrans noise abatement criteria (NAC) for any land uses with the implementation of the project in the Build condition. As a result, traffic noise abatement was not considered. While the analyzed receiver locations and predicted traffic noise levels vary somewhat between this SNSR and the original 2006 NSR, the findings of both studies are fundamentally consistent with both studies finding no traffic noise impacts in the surrounding community as a result of the proposed project.

During construction of the proposed project, noise from construction would intermittently dominate the noise environment in the vicinity of construction activities. Typical construction equipment that is anticipated to be used for the project is expected to generate maximum noise levels ranging from 74 to 90 dBA at a distance of 50 feet, while anticipated pile driving would generate maximum noise levels of approximately 101 dBA at 50 feet. Noise produced by construction equipment would diminish at a rate of about 6 dBA per doubling of distance. Construction noise would be temporary and intermittent. No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans 2015 Standard Specifications Section 14.8-02, which would be supplemented as necessary by Standard Special Provision (SSP) Number 14-8.02 (Caltrans 2015).

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# List of Abbreviated Terms

| | |
|---|---|
| °F | degrees Fahrenheit |
| ANSI | American National Standard Institute |
| BMPs | best management practices |
| BNSF | Burlington Northern Santa Fe |
| CAD | computer-aided design |
| Caltrans | California Department of Transportation |
| CEQA | California Environmental Quality Act |
| CFR | Code of Federal Regulations |
| CNEL | Community Noise Equivalent Level |
| dB | decibels |
| dBA | A-weighted sound level |
| EBL | Eligible Bridge List |
| FHWA | Federal Highway Administration |
| FO | Functionally Obsolete |
| FONSI | Finding of No Significant Impact |
| HBP | Federal Highway Bridge Program |
| HOT | high-occupancy toll |
| HOV | high-occupancy vehicle |
| Hz | Hertz |
| kHz | kilohertz |
| $L_{dn}$ | day-night level |
| $L_{eq}$ | equivalent sound level |
| $L_{eq}(h)$ | 1-hour A-weighted equivalent sound level |
| $L_{max}$ | maximum sound level |
| LT | long-term |
| $L_{xx}$ | percentile-exceeded sound level |
| mPa | micro-Pascals |
| mph | miles per hour |
| NAC | noise abatement criteria |
| NADR | Noise Abatement Decision Report |
| NEPA | National Environmental Policy Act |
| NSR | Noise Study Report |

| | |
|---|---|
| PCI | paint condition index |
| Protocol | Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects |
| SBCTA | San Bernardino County Transportation Authority |
| SD | Structurally Deficient |
| SLM | sound level meter |
| SPL | sound pressure level |
| SSP | Standard Special Provision |
| ST | short-term |
| TeNS | Technical Noise Supplement |
| TIS | Traffic Impact Study |
| TNM 2.5 | Traffic Noise Model Version 2.5 |
| USGS | U.S. Geological Survey |

# Chapter 1. Introduction

The San Bernardino County Transportation Authority (SBCTA), in cooperation with the California Department of Transportation (Caltrans), is proposing to replace the existing Mount Vernon Avenue Bridge (Bridge Number 54C-066) over the Burlington Northern Santa Fe (BNSF) rail yard in the city of San Bernardino, San Bernardino County, California. See Figures 1-1 and 1-2 for the project location.

Preparation of a Noise Study Report (NSR) was originally completed in June 2006 and approved in July 2006. A National Environmental Policy Act (NEPA) Finding of No Significant Impact (FONSI) was adopted for the project in June 2011. The project, which involves a road/railroad grade separation, is statutorily exempt from the California Environmental Quality Act (CEQA). Since the NEPA document was adopted, it has been noted that additional project improvements/refinements are needed that were not included in the adopted NEPA document. The project and these additional improvements are discussed in detail in the following sections.

## 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 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 NSRs. Railroad grade separations are statutorily exempt from CEQA, as identified in Section 21080.13 of the Public Resources Code and in Section 15282(g) of the CEQA Guidelines. Statutorily exempt projects are excused entirely from the environmental review process and the requirements of CEQA. In addition, all activities performed to support these projects are included in the exemption.

## 1.2 Project Purpose and Need

### 1.2.1 Project Purpose

The purpose of the proposed project is to provide a bridge that is structurally safe, meeting current seismic, design, and roadway standards.

### 1.2.2 Project Need

#### 1.2.2.1 Seismically Deficient

The existing bridge was constructed in 1934 and incorporated steel girders salvaged from an earlier 1907 structure. As part of the Local Bridge Seismic Safety Retrofit Program, a seismic analysis and retrofit study were conducted in 1996. The Final Seismic Retrofit Strategy Report, issued in June 1997, determined that the bridge fell under Category 1, a category for bridges that could potentially collapse in a seismic event and threaten public safety.

#### 1.2.2.2 Sufficiency Rating

Caltrans maintains the *National Bridge Inventory—Structure Inventory and Appraisal* for bridges both on and off the federal highway system in the state. The inventory includes a sufficiency rating for each bridge. The sufficiency rating is typically determined by three considerations: (1) structural adequacy and safety; (2) serviceability and functional obsolescence; and (3) essentiality for public use. A special reduction factor is considered to account for conditions related to detours, traffic safety features, and structure type. When a bridge has a deficient sufficiency rating, it is placed on the FHWA Federal Eligible Bridge List (EBL) to receive high priority for retrofit/rehabilitation or replacement under the Federal Highway Bridge Program (HBP).[1] A deficient bridge is defined as having a sufficiency rating ≤ 80 and a status flag as Structurally Deficient (SD). Bridges with a sufficiency rating ≤ 80 and SD or Functionally Obsolete (FO) status are eligible for rehabilitation, while bridges with a sufficiency rating≤ 50 and SD or FO status are eligible candidates for replacement. In 2002, the sufficiency rating for the Mount Vernon Avenue Bridge was 45.6 with flags for both SD and FO. The major bridge deficiencies in 2002 were identified as poor deck condition, nonstandard deck geometry, and nonstandard underclearance at West 3rd Street. With the results of the 2004 bridge inspections, the sufficiency rating for the Mount Vernon Avenue Bridge has dropped to 2.0, which was reconfirmed in the latest bridge inspection report, dated December 27, 2016. The very low sufficiency rating for the bridge is the result of the following factors: low superstructure capacity, poor substructure condition, serious deck condition, inadequate deck geometry, and substandard vertical clearance at West 3rd Street. Additionally, the capacity of the existing bridge railing does not meet current standards.

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[1] Formerly known as the federal Highway Bridge Replacement and Rehabilitation (HBRR) program.

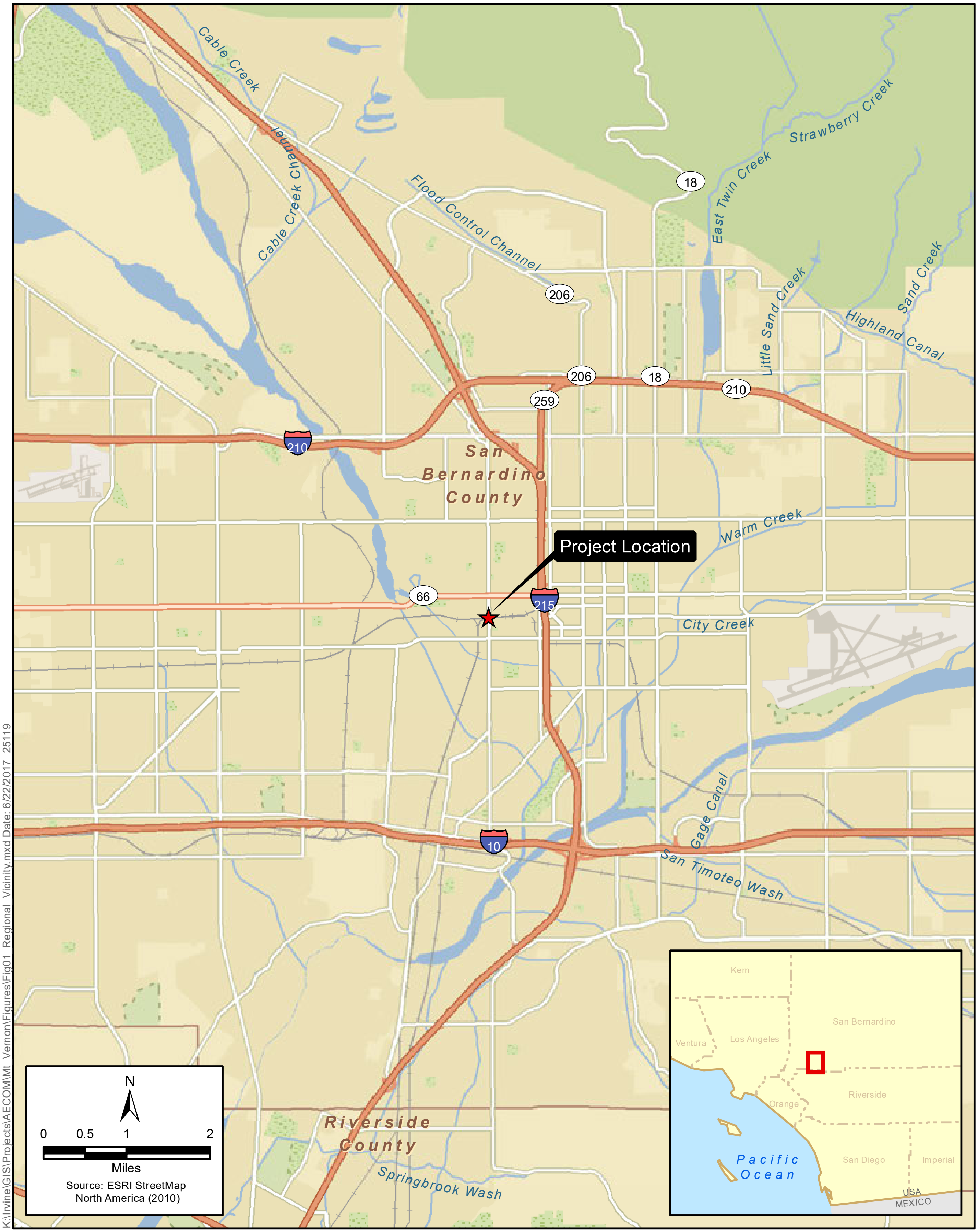


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**Figure 1-1**
**Regional Vicinity Map**
**Mount Vernon Avenue Bridge Project**

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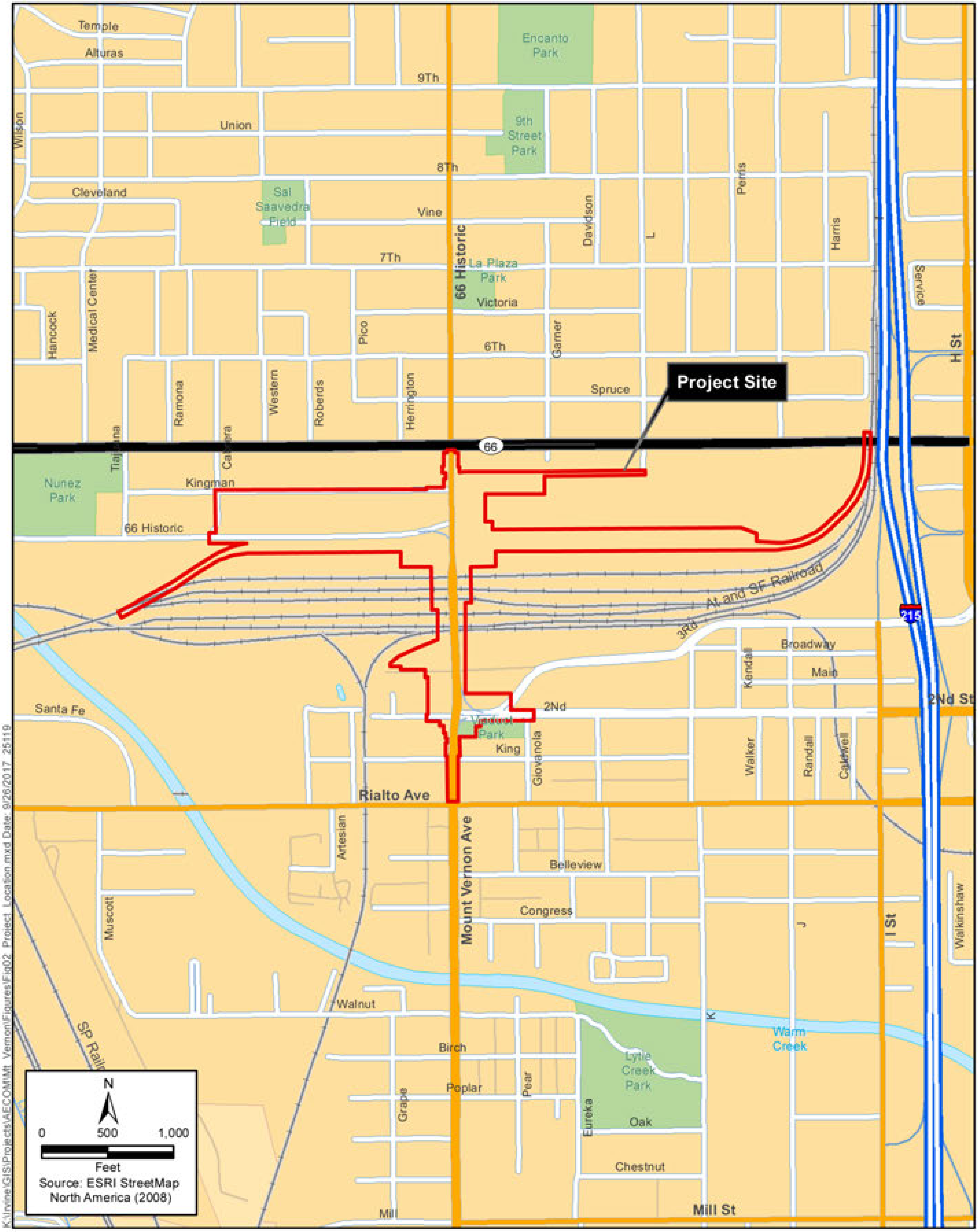


**Figure 1-2**
**Project Location**
**Mount Vernon Avenue Bridge Project**

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#### 1.2.2.3 Structurally Deficient (SD)

The bridge has a low superstructure capacity, poor substructure conditions, and deck deficiencies. The deck has moderate and severe transverse cracks and spalls at various locations. The steel bents have structural damage and heavy corrosion on almost all steel element connections. The girders receive a score of 0.0 for operating and inventory ratings due to several severe fatigue cracks on the girder-to-cap beam connections; however, the bridge remains open because of temporary supports that were installed in the early 2000s. Inventory and operating capacity is calculated at 20.8 and 35.4 metric tons, respectively.

#### 1.2.2.4 Functionally Obsolete (FO)

The existing bridge is considered to be FO because of the nonstandard deck geometry, misaligned south approach, and nonstandard vertical clearance at West 3$^{rd}$ Street.

#### 1.2.2.5 Other Deficiencies

In addition to the previously described deficiencies, other serious conditions exist, such as substandard vertical clearance over the railroad and substandard vertical clearance for 3$^{rd}$ Street. Additionally, the bridge was last painted in 1954. The paint condition index (PCI) dropped from 74.5 in 2000 to 38 in 2016. Bridges on the EBL with a PCI of 65.0 or less qualify as a stand-alone painting project under the Federal HBP guidelines. Additionally, the existing bridge has nonstandard vertical and horizontal clearances at the BNSF railroad yard.

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# Chapter 2. Project Description

The project is in the city of San Bernardino, San Bernardino County, California (Figures 1-1 and 1-2), along Mount Vernon Avenue Bridge 54C-066, Section 7, Township 1 South, and Range 4 West, on the San Bernardino South U.S. Geological Survey (USGS) 7.5-minute quadrangle map.

## 2.1 No-Build Alternative

Under the No-Build Alternative, no changes would be made to Mount Vernon Avenue in the project area. Describing and analyzing a No-Build Alternative helps decision-makers and the public compare the impacts of approving the proposed project with the consequences of not approving the proposed project.

## 2.2 Build Alternative

The Preferred Alternative (Alternative 3 – Bridge Replacement), identified in the adopted NEPA document, extended from just south of 5th Street to just north of King Street. Based on the identified project improvements/refinements, the project would now extend from just south of 5th Street to Rialto Avenue (see Figure 2-1). The proposed improvements/refinements to the project are listed below.

- A portion of the BNSF intermodal operations/parking area east of the bridge on the north side of the existing tracks would be removed, and a new paved area between Kingman Street and West 4th Street and from Cabrera Avenue to Mount Vernon Avenue would be constructed. (This would involve acquisition and removal of existing residences/businesses within these limits.) A 12-foot-tall block wall and a 20-foot-wide landscape buffer would be constructed along Kingman Street and Cabrera Avenue to shield this area from surrounding uses.
- Just west of Mount Vernon Avenue, West 4th Street would form an intersection with Cabrera Avenue.
- The existing Eagle Building and four associated buildings would be relocated from the east side of Mount Vernon Avenue to the west side of Mount Vernon Avenue.
- The two existing crane repair pads would be relocated north of their current location (one on either side of Mount Vernon Avenue).
- Temporary tracks identified in the adopted NEPA document would now be permanent rail tracks. A new permanent track (Track 219) would be constructed.

- Tracks 216 and 217 would be realigned in the immediate vicinity of the new bridge.
- The structures at the southwest end of the bridge—bordered by Mount Vernon Avenue to the east, the alley behind the structures to the west, West 3rd Street to the north, and West 2nd Street to the south—would be acquired and removed.
- The access associated with structures fronting Mount Vernon Avenue south of West 2nd Street and north of King Street would be reconstructed as needed to match the new road/sidewalk grade.

Consistent with the updated project layout, the following would be incorporated:

- Utilities would be relocated as needed to accommodate the proposed improvements.
- Best management practices (BMPs) for water quality treatment would be provided as part of the proposed project where feasible.
- Signage would be incorporated within the project's limits of disturbance where necessary.
- Pedestrian facilities would be compliant with Americans with Disabilities Act standards.
- Geotechnical borings would be conducted within the project's limits of disturbance as needed for the design of the project.
- Temporary advanced signage would be required during construction, which would involve portable changeable message signs or other temporary signage that would not require ground disturbance.

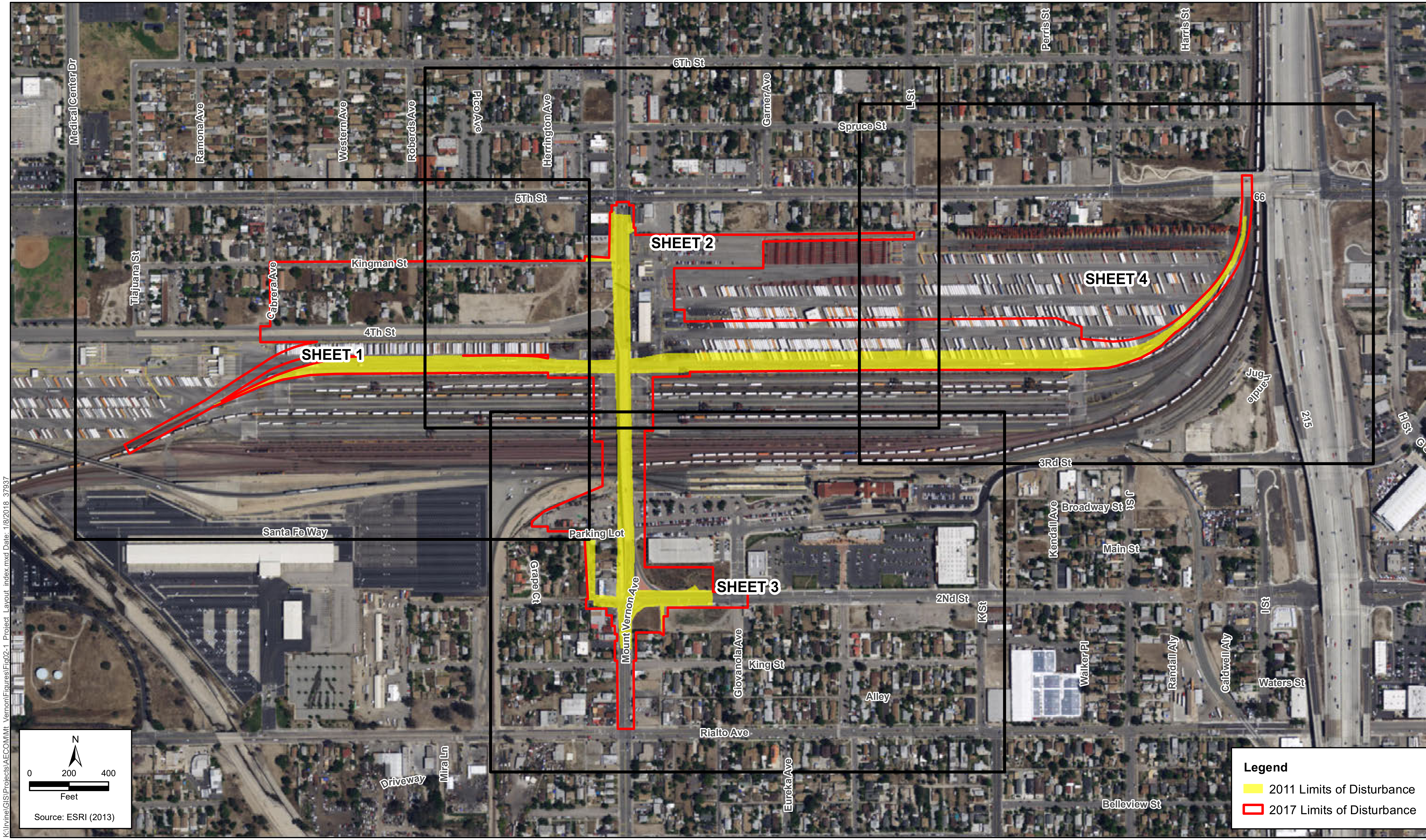


**Figure 2-1**
**Project Layout Map Sheet Index**
**Mount Vernon Avenue Bridge Project**

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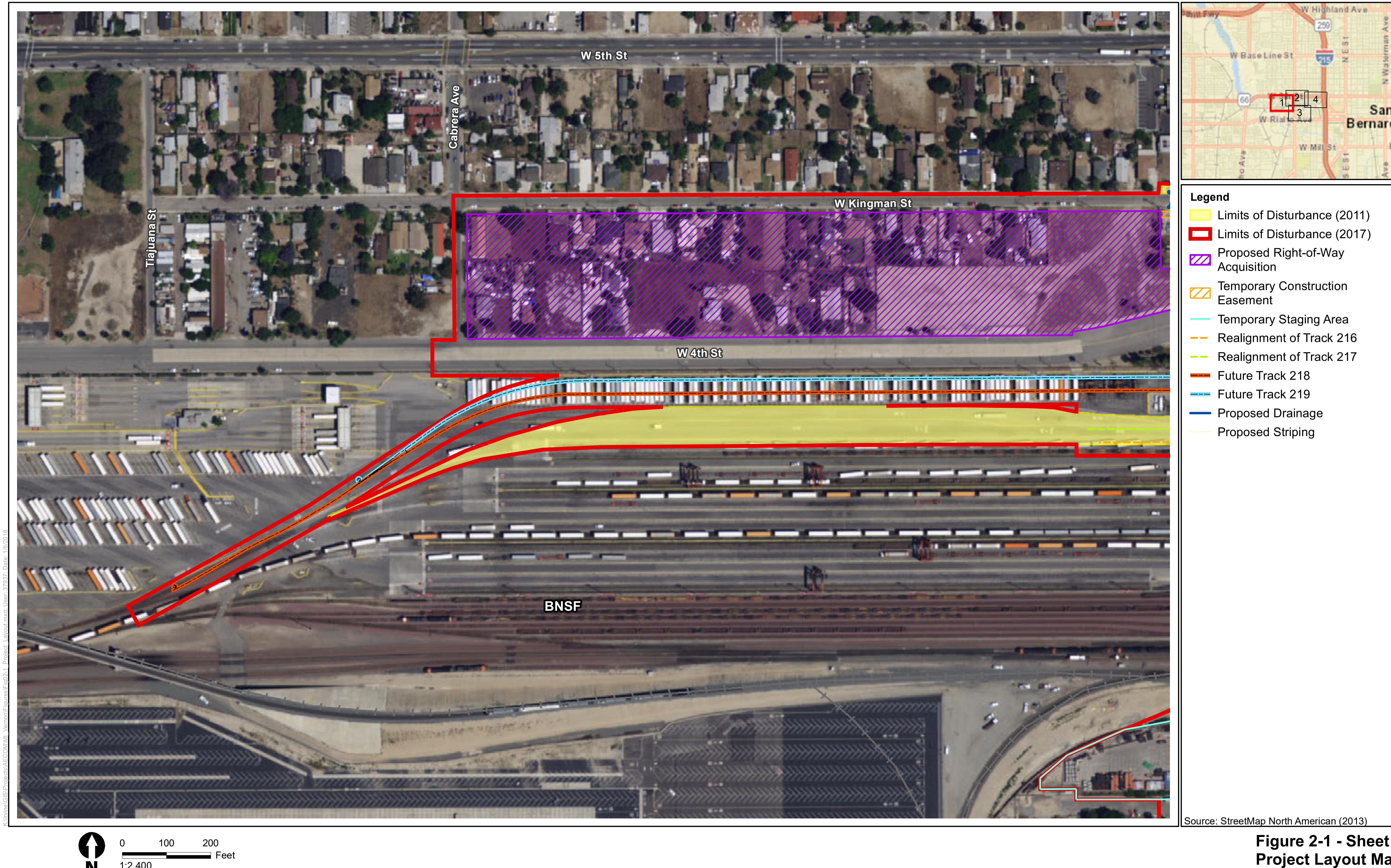


**Figure 2-1 - Sheet 1**
**Project Layout Map**
**Mount Vernon Avenue Bridge Project**

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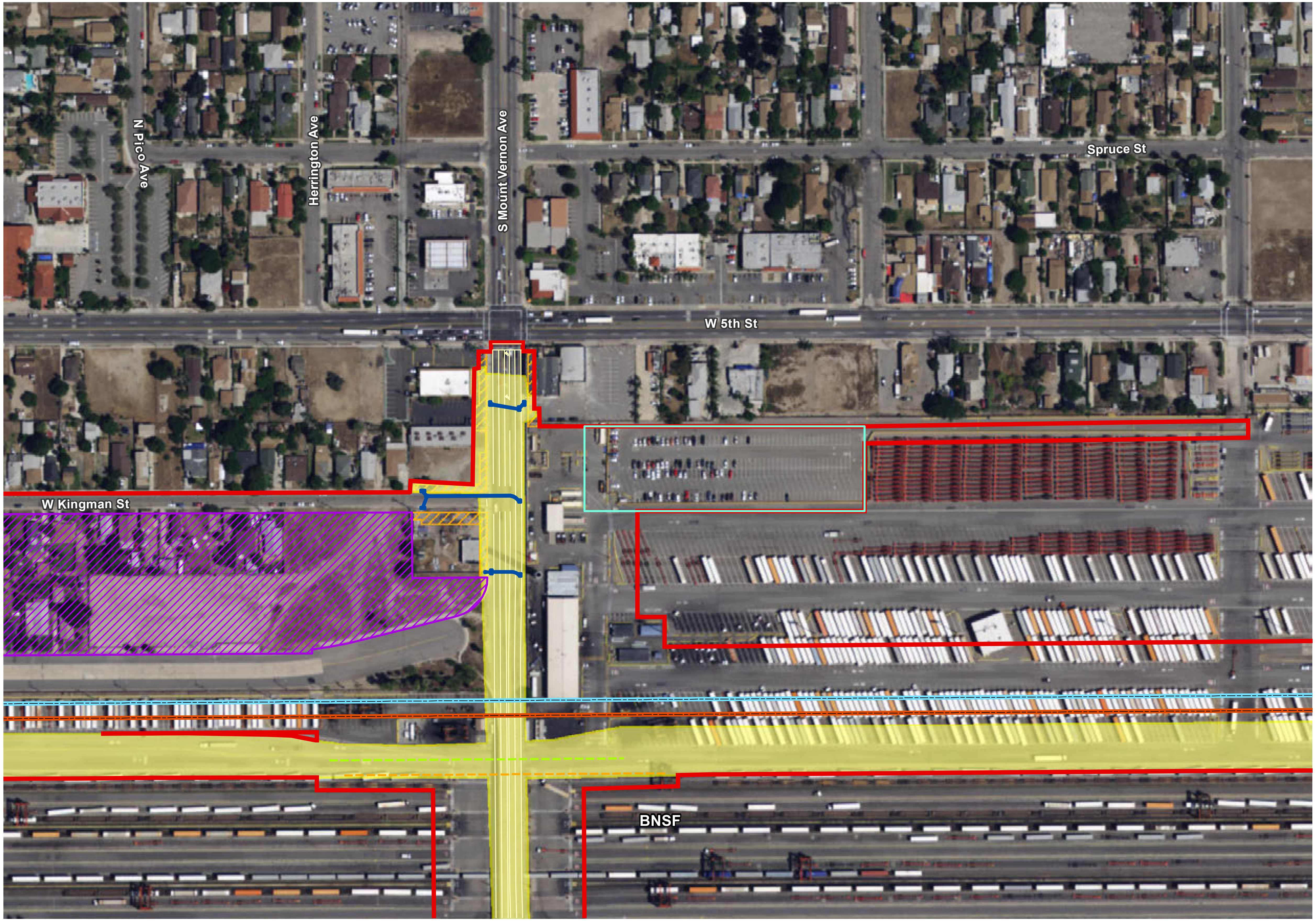


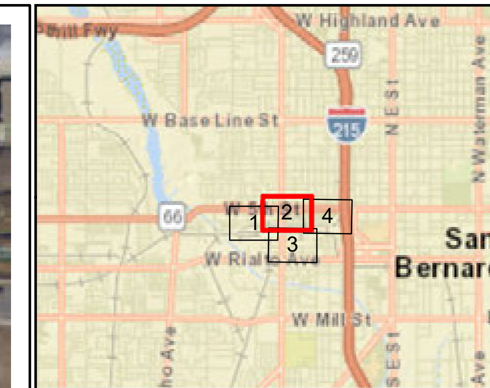


**Legend**

- Limits of Disturbance (2011)
- Limits of Disturbance (2017)
- Proposed Right-of-Way Acquisition
- Temporary Construction Easement
- Temporary Staging Area
- Realignment of Track 216
- Realignment of Track 217
- Future Track 218
- Future Track 219
- Proposed Drainage
- Proposed Striping

Source: StreetMap North American (2013)

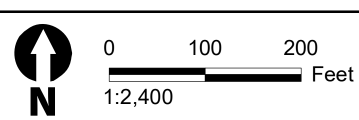


**Figure 2-1 - Sheet 2**
**Project Layout Map**
**Mount Vernon Avenue Bridge Project**

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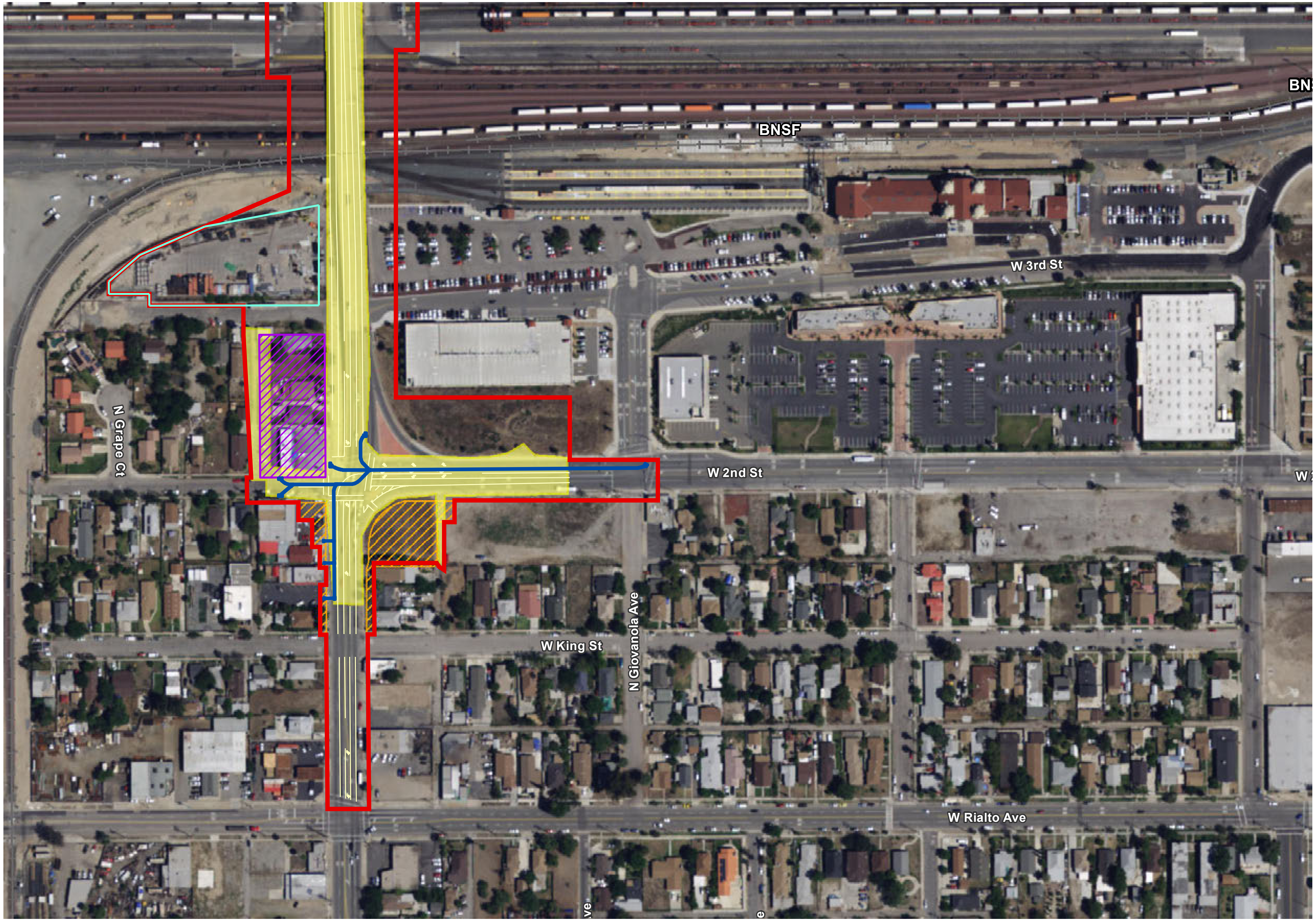


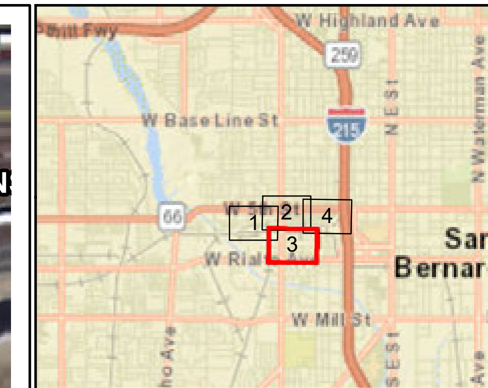


**Legend**

- Limits of Disturbance (2011)
- Limits of Disturbance (2017)
- Proposed Right-of-Way Acquisition
- Temporary Construction Easement
- Temporary Staging Area
- Realignment of Track 216
- Realignment of Track 217
- Future Track 218
- Future Track 219
- Proposed Drainage
- Proposed Striping

Source: StreetMap North American (2013)

N

0 100 200 Feet

1:2,400

**Figure 2-1 - Sheet 3**
**Project Layout Map**
**Mount Vernon Avenue Bridge Project**

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**Figure 2-1 - Sheet 4**
**Project Layout Map**
**Mount Vernon Avenue Bridge Project**

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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, please refer to Caltrans' *Technical Noise Supplement* (TeNS) (Caltrans 2013), a technical supplement to the Protocol that is available on Caltrans' website (http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf).

## 3.1 Sound, Noise, and Acoustics

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

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

## 3.2 Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hz. 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 (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this huge range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). The threshold of hearing for young people is about 0 dB, which corresponds to 20 mPa.

## 3.4 Addition of Decibels

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

## 3.5 A-Weighted Decibels

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

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

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway-traffic noise. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels or dBA. Table 3-1 describes typical A-weighted noise levels for various noise sources.

**Table 3-1. Typical A-Weighted Noise Levels**

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

Source: Caltrans 2013.

## 3.6 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 (1,000 Hz–8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dB are generally not perceptible. However, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Further, a

5 dB increase is generally perceived as a distinctly noticeable increase, and a 10 dB increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3 dB increase in sound would generally be perceived as barely detectable.

## 3.7 Noise Descriptors

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

- **Equivalent Sound Level ($L_{eq}$):** $L_{eq}$ represents an average of the sound energy occurring over a specified period. In effect, $L_{eq}$ is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level ($L_{eq}$[h]) is the energy average of A-weighted sound levels occurring during a one-hour period, and is the basis for noise abatement criteria (NAC) used by Caltrans and FHWA.
- **Percentile-Exceeded Sound Level ($L_{xx}$):** $L_{xx}$ represents the sound level exceeded for a given percentage of a specified period (e.g., $L_{10}$ is the sound level exceeded 10% of the time, and $L_{90}$ is the sound level exceeded 90% of the time).
- **Maximum Sound Level ($L_{max}$):** $L_{max}$ is the highest instantaneous sound level measured during a specified period.
- **Day-Night Level ($L_{dn}$):** $L_{dn}$ is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10 dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m.
- **Community Noise Equivalent Level (CNEL):** Similar to $L_{dn}$, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10 dB penalty applied to A-weighted sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m., and a 5 dB penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m.

## 3.8 Sound Propagation

When sound propagates over a distance, it changes in level and frequency content. The manner in which noise reduces with distance depends on the 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 decibels for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path and therefore can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 decibels for each doubling of distance from a line source.

### 3.8.2 Ground Absorption

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

### 3.8.3 Atmospheric Effects

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

### 3.8.4 Shielding by Natural or Human-Made Features

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

# Chapter 4. Federal Regulations and State Policies

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

## 4.1 Federal Regulations

### 4.1.1 23 CFR 772

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

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

- The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a high-occupancy vehicle (HOV) lane, high-occupancy toll (HOT) lane, bus lane, or truck climbing lane.
- The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane.
- The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange.
- Restriping existing pavement for the purpose of adding a through traffic lane or an auxiliary lane.
- The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza.

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

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

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

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

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

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

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

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

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

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

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

## 4.2 State Regulations and Policies

### 4.2.1 California Environmental Quality Act

Noise analysis under 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. However, because the proposed project involves a road/railroad grade separation, it is statutorily exempt from CEQA. Therefore, no CEQA noise analysis is required for the project.

### 4.2.2 Section 216 of the California Streets and Highways Code

Section 216 of the California Streets and Highways Code relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under this code, a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed 52 dBA-$L_{eq}$(h) in the interior of public or private elementary or secondary classrooms, libraries, multipurpose rooms, or spaces. This requirement does not replace the “approach or exceed” NAC criterion for FHWA Activity Category E for classroom interiors, but it is a requirement that must be addressed in addition to the requirements of 23 CFR 772.

If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below 52 dBA-$L_{eq}$(h). If the noise levels generated from freeway and roadway sources exceed 52 dBA-$L_{eq}$(h) prior to the construction of the proposed freeway project, then noise abatement must be provided to reduce the noise to the level that existed prior to construction of the project.

# Chapter 5. Study Methods and Procedures

## 5.1 Methods for Identifying Land Uses and Selecting Noise Measurement and Modeled Receiver Locations

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Land uses in the project area were categorized by land use type, activity category (as defined in Table 4-1), and the extent of frequent human use. As directed by the Protocol, although all developed land uses were considered in this analysis, the focus was on outdoor locations with frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focused on locations with defined outdoor activity areas, such as residential front and back yards. The geometry of the project area relative to nearby existing land uses was also identified.

In addition, the possibility for undeveloped land with permits for construction being located in the project vicinity was investigated by reviewing the City of San Bernardino Community Development Department's Major Projects List and the city's Planning Division documents that are available on the city's Community Development website.[2] This search indicated that there are no planned and permitted projects within 500 feet of the proposed roadway improvements.

Ten short-term (ST) measurement locations were selected to represent the various land use categories and activities within the project area. Two of these sites were also used to obtain long-term (LT) measurements to capture the diurnal traffic noise level patterns in the project area. The ST measurements were used to validate/calibrate the traffic noise modeling used in the study and were used as modeled receivers for the analysis of the worst noise hour under existing and future (No-Build and Build) conditions. Non-measurement locations were selected as additional modeled receivers to gain a more complete understanding of the noise environment in the project area.

## 5.2 Field Measurement Procedures

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

[2] https://www.ci.san-bernardino.ca.us/cityhall/community_development/planning/planning_documents.asp

### 5.2.1 Short-Term Measurements

Existing noise levels were measured on Wednesday, June 28, and Thursday, June 29, 2017. The noise measurement locations are shown in Figure 5-1. All ST measurements were conducted in accordance with the TeNS (Caltrans 2013).

Land uses within the project area consist of single-family residences, a motel, commercial (including retail, a carwash, and a nightclub), transportation (railyard), and undeveloped land. ST measurements were taken at ten sites, ST1 through ST10, as identified in Figure 5-1. All ST measurements representing residential land uses were conducted at areas of frequent human use, or at the closest accessible location that was considered acoustically equivalent to the area of frequent human use. Measurements at locations ST2, ST3, ST6, and ST8 were conducted directly within residential yards. Measurements ST1 and ST9 were conducted at vacant lots adjacent to single-family homes. Measurements ST4 and ST5 were conducted in alleys immediately adjacent to residential yards. These locations were considered acoustically equivalent to the areas of frequent human use they are intended to represent. ST10 was conducted in a vacant lot adjacent to the El Patio motel (the motel did not have any exterior areas of frequent human use). ST7 was conducted at the parking lot of Pepe's Nightclub. (The nightclub did not have any exterior areas of frequent human use adjacent to the project alignment.)

At each of the ST measurement locations, two consecutive 16-minute measurements were obtained. Each consecutive measurement at the same location is identified with a run number. For instance ST2 Run 1 is followed by ST2 Run 2, etc. The results of the ST noise monitoring are provided in Table 6-1 in Chapter 6 of this report.

ST noise measurements were conducted using one Larson Davis model LxT1 sound level meter (SLM), one Larson Davis model 831 SLM, and two RION model NL-21 SLMs (serial numbers 0004005, 0003786, 00776887, and 00676771 respectively). The SLMs are classified as Type 1 (LxT1 and 831) and Type 2 (NL-21) instruments, as defined in American National Standard Institute (ANSI) specification S1.4-1984 and International Electrotechnical Commission publications 804 and 651. The meters were set to the "slow" time-response mode and the A-weighting filter network. The calibration of all sound level meters was checked before and after the measurements using Larson Davis Model CAL200 acoustical calibrators (serial numbers 2916 and 6645).

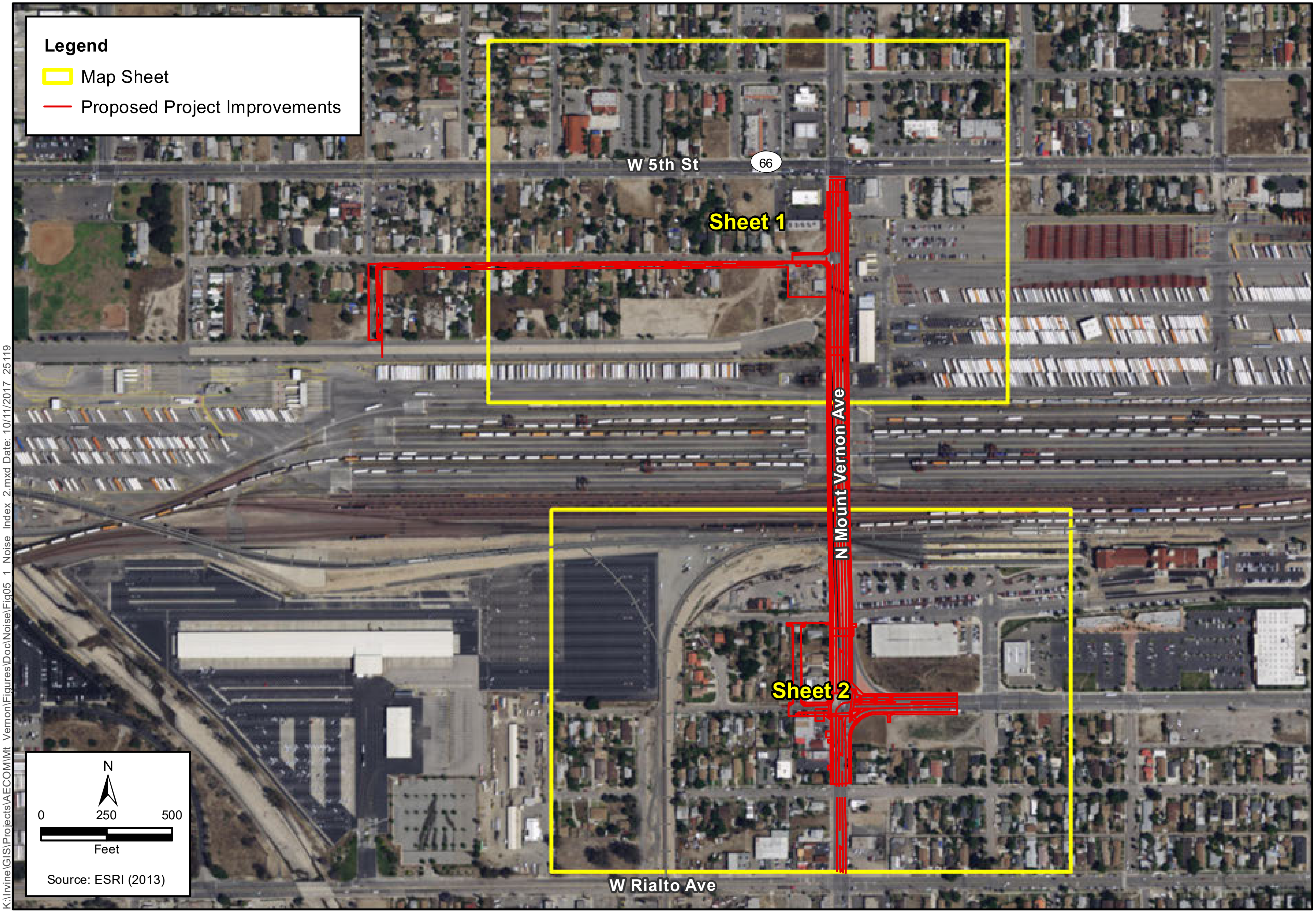


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**Figure 5-1 - Sheet Index**
**Noise Measurement and Modeling Locations**
**Mount Vernon Avenue Bridge Project**

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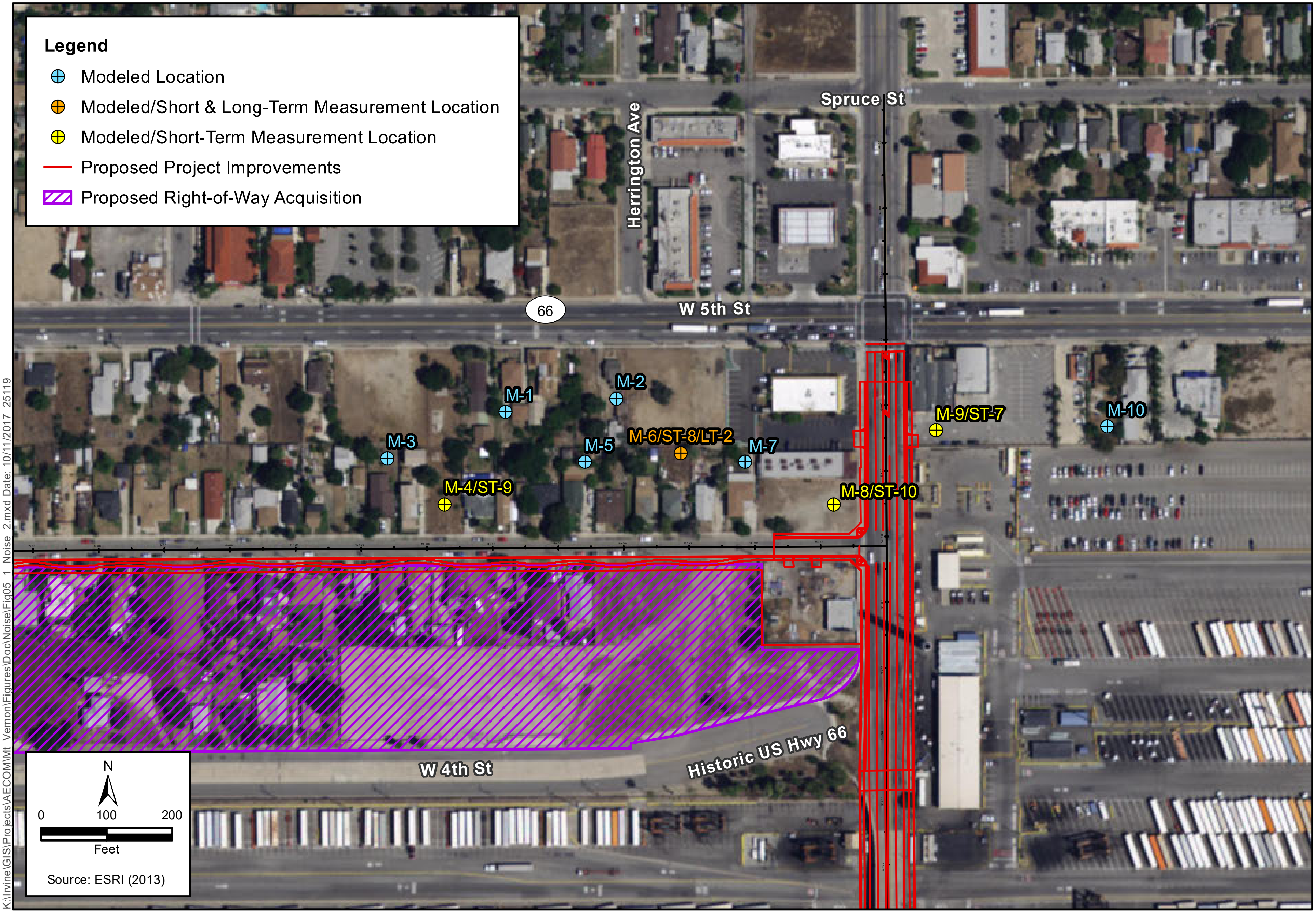


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**Figure 5-1 - Sheet 1**
**Noise Measurement and Modeling Locations**
**Mount Vernon Avenue Bridge Project**

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**Figure 5-1 - Sheet 2**
**Noise Measurement and Modeling Locations**
**Mount Vernon Avenue Bridge Project**

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During ST measurements, a noise analyst attended the SLM at all times. The only exceptions were at ST6 and ST8, where the data was extracted from unattended LT noise monitoring results. The noise level data at these two locations were gathered on a minute-by-minute basis, and the results were reviewed later by a noise analyst to identify and exclude any extraneous noise; no such extraneous noise was detected within the ST run data for either ST6 or ST8. The $L_{eq}$ values collected during each measurement period (16 minutes in duration) were automatically recorded with the digital integrating SLM and subsequently logged manually on the field datasheets for each measurement location. Dominant noise sources observed and other relevant measurement conditions were also identified and logged manually on the field datasheets. At all locations, traffic noise was the dominant contributor to the measured noise levels.

Temperature, wind speed, and humidity were recorded manually using a Kestrel 3000 portable weather station during the ST monitoring sessions. During the ST measurements, wind speeds typically ranged from 0 to 7 miles per hour (mph). Temperatures ranged from 71–100 degrees Fahrenheit (°F), with relative humidity typically in the range of 11–60%.

The relevant traffic data during each ST measurement was captured using video recordings. For all measurements, traffic in the north- and southbound lanes of Mount Vernon Avenue was videotaped. Additional videotaping and/or manual traffic counts were conducted for measurement locations where traffic on other nearby streets was observed to potentially contribute to the overall traffic noise level. Depending on the noise measurement location(s), these additional streets included 2$^{nd}$ Street, 5$^{th}$ Street, King Street, and Kingman Street.

Traffic volumes during each measurement were subsequently counted and classified using the video recordings gathered in the field. Vehicles were classified as automobiles, medium-duty trucks, heavy-duty trucks, buses, or motorcycles. Average vehicle speeds for Mount Vernon Avenue, 2$^{nd}$ Street, and 5$^{th}$ Street were checked periodically by driving the roads and pacing vehicles. The observed vehicle speeds were generally close to the posted speed limits and, as a result, the posted speed limit for each modeled roadway was used in TNM for calibration modeling.

### 5.2.2 Long-Term Measurements

LT monitoring was conducted from June 28 to 29, 2017, at two locations (LT1 and LT2) using Rion NL-21 SLMs (serial numbers 00776887 and 00676771). These are Type 2 instruments, as defined in ANSI specification S1.4-1984 and International Electrotechnical Commission publications 804 and 651. The LT measurement locations are identified in Figure 5-1. The purpose of these measurements was to identify diurnal noise traffic noise patterns throughout a typical day/night cycle. The results of LT monitoring are provided in Chapter 6 of this report.

## 5.3 Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using FHWA Traffic Noise Model Version 2.5 (TNM 2.5). The TNM 2.5 computer model is based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). Key geometric inputs for the traffic noise model were the locations of roadways, shielding features (e.g., topography and buildings), noise barriers, and receivers. Three-dimensional representations of these inputs were developed using computer-aided design (CAD) drawings, profiles, and topographic contours provided by the project design team. MicroStation software was the primary tool used to digitize the geometric inputs, based on the available CAD files, for input into TNM 2.5.

### 5.3.1 Validation of the Traffic Noise Model

To validate/calibrate the accuracy of the model, TNM 2.5 was used to compare measured traffic noise levels with modeled noise levels at the ST measurement locations. For each receiver, traffic volumes counted during the ST measurement periods were normalized to one-hour volumes. These normalized volumes were assigned to corresponding roadways in the project area to simulate the strength of the noise source during the actual measurement period. Modeled and measured sound levels were then compared to determine the accuracy of the model and whether additional calibration was necessary. The results of calibration modeling are described in Chapter 6 of this report.

### 5.3.2 Traffic Noise Modeling

Traffic noise was evaluated under Existing, design-year No-Build, and design-year Build conditions. Appendix A summarizes the traffic volumes and assumptions used for each case. The primary source of traffic volumes used in the modeling was the Traffic/Circulation Study (TCS) (AECOM 2017) for the project, which is included in Appendix D on the CD attached to this report.

The TCS indicates that overall traffic volumes throughout the study area are higher during the PM peak hour than during the AM peak hour. This is consistent with the results of the LT noise monitoring, described in Chapter 6, which indicated that the worst noise hour occurred in the afternoon. The vehicle mix (i.e., percentage of automobiles, medium trucks, and heavy trucks) used throughout the modeling was based on an email memorandum prepared by the project traffic engineer (included in Appendix D on the CD attached to this report). This memo indicates a PM peak hour vehicle mix with one percent medium trucks and three percent heavy trucks at the Mount Vernon Avenue and 5$^{th}$ Street intersection, and one percent medium trucks and one percent heavy trucks at both Mount Vernon Ave and 2$^{nd}$ Street, and Mount Vernon Avenue and Rialto Avenue. As a result, a traffic mix of 96% - 1% - 3% (automobiles - medium trucks - heavy trucks) was assigned to 5$^{th}$ Street, and 98% - 1% - 1% was assigned to all other roadways.

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

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

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dB is predicted for at least one affected receptor with implementation of the abatement measures. Any receptor that is predicted to receive 5 dB or more of noise reduction from an abatement measure is identified as a *benefited* receptor. 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 stated in Caltrans' *Highway Design Manual*, Chapter 1100 (Caltrans 2014). Other factors that affect feasibility include topography, access requirements for driveways and ramps, the presence of local cross streets, utility conflicts, other noise sources in the area, and safety considerations.

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

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

As stated in the Protocol, Caltrans' acoustical design goal is that a barrier must be predicted to provide at least 7 dB of noise reduction at one or more benefited receptors. This design goal applies to any receptor and is not limited to impacted receptors.

The Protocol defines the procedure for assessing reasonableness of noise barriers from a cost perspective. Based on 2017 construction costs, an allowance of $ 92,000[3] is provided for each benefited receptor (i.e., receptors that receive at least 5 dB of noise reduction from a noise barrier). The total allowance for each barrier is calculated by multiplying the number of benefited receptors by $92,000. If the estimated construction cost of a barrier is less than the total calculated allowance for the barrier, the barrier is considered reasonable from a cost perspective.

[3] The allowance is derived from a base allowance of $55,000 defined in the 2011 Protocol and adjusted for 2017 based on the published annual Caltrans Construction Price Index.

The viewpoints of benefited receptors are determined by a survey that is typically conducted after completion of the NSR. The process for conducting the survey is described in detail in the Protocol.

This SNSR identifies traffic noise impacts and analyzes and assesses whether noise abatement is feasible (providing at least 5 dB of noise reduction at one or more impacted receptors), whether the design goal has been met (providing at least 7 dB of noise reduction at one or more benefited receptors), and whether noise barriers intercept the line of sight from the exhaust stack of a heavy truck to the first row of receptors. This SNSR also calculates the reasonable cost allowance based on the number of benefited receptors. However, this SNSR does not calculate the actual costs of construction and does not make any conclusions on the overall reasonableness of noise abatement. The analysis of construction costs and the subsequent determination of overall abatement reasonableness are provided in a separate Noise Abatement Decision Report (NADR). Any discussions of reasonableness within this SNSR are limited solely to whether abatement meets the design goal of 7 dB insertion loss.

# Chapter 6. Existing Noise Environment

## 6.1 Existing Land Uses

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Land uses in the project area consist of single-family residences (Activity Category B); a motel and a nightclub (Activity Category E); a railyard, carwash, and retail stores (Activity Category F); and undeveloped land (Activity Category G).

Although all developed land uses are addressed under the Protocol, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, which consisted solely of residential yards (Activity Category B). No other land uses in the study area had noise-sensitive exterior areas of frequent human use adjacent to the project alignment. However, for informational purposes noise levels were analyzed at the vacant lot immediately south of the motel (measurement site M8/ST10) and the parking lot of the nightclub (measurement site M9/ST7) adjacent to Mount Vernon Avenue.

## 6.2 Noise Measurement Results

The existing noise environment in the project area is characterized below. The characterizations are based on the ST and LT noise monitoring conducted for the proposed project.

### 6.2.1 Short-Term Monitoring

Table 6-1 summarizes the results of ST noise monitoring conducted in the project area. It lists the receiver name; general location or address; land use/activity category; run number, measurement start time, date, and duration; and the measured $L_{eq}$. Table 6-1 also identifies the normalized (1-hour) traffic volumes based on the traffic videos and manual counts obtained at the time of each measurement, and the corresponding traffic speeds; these are the traffic data used in the model validation/calibration runs. Field photos and noise measurement field sheets are included in Appendix C of this document.

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**Table 6-1. Summary of Short-Term Measurements**

| Receiver | Address | Land Uses/ Activity Category | Run # Start Date/Start Time | Duration (minutes) | $L_{eq}$ (dBA) | Roadway Segment [1] | Autos[2] (Speed mph) | Medium Trucks[2] (Speed mph) | Heavy Trucks[2] (Speed mph) | Buses[2] (Speed mph) | Motorcycles[2] (Speed mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ST1 | 240 N Mt Vernon Ave San Bernardino, CA | Residential/B | Run 1 06-29-2017/10:04 a.m. (Simultaneous with ST2 Run 1, below) | 16 | 58.6 | NB Mt Vernon Ave, south of 2nd St (before dedicated right-turn lane exits) | 353 (35) | 4 (35) | 26 (35) | 4 (35) | — |
| | | | | | | NB Mt Vernon Ave, north of 2nd St (before dedicated right-turn lane merges) | 266 (35) | 4 (35) | — | — | — |
| | | | | | | SB Mt Vernon Ave, north of 2nd St | 345 (35) | 4 (35) | — | — | — |
| | | | | | | SB Mt Vernon, south of 2nd St | 345 (35) | 4 (35) | 8 (35) | — | — |
| | | | | | | WB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane exits) | 75 (35) | — | 8 (35) | 4 (35) | — |
| | | | | | | WB 2nd St, west of Mt Vernon Ave | 11 (25) | — | — | — | — |
| | | | | | | EB 2nd St, west of Mt Vernon Ave | 15 (25) | — | — | — | — |
| | | | | | | EB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane merges) | 146 (35) | — | 26(35) | 4 (35) | — |
| | | | | | | Dedicated turn lane from WB 2nd St to NB Mt Vernon Ave | 71 (25) | — | — | — | — |
| | | | | | | Dedicated turn lane from NB Mt Vernon Ave to EB 2nd St | 71 (25) | — | 26 (25) | 4 (25) | — |
| | | | Run 2 06-29-2017/10:22 a.m. (Simultaneous with ST2 Run 2, below) | 16 | 54.7 | NB Mt Vernon Ave, south of 2nd St (before dedicated right-turn lane exits) | 349 (35) | 8 (35) | 23 (35) | 8 (35) | — |
| | | | | | | NB Mt Vernon Ave, north of 2nd St (before dedicated right-turn lane merges) | 266 (35) | 4 (35) | — | 4 (35) | — |
| | | | | | | SB Mt Vernon Ave, north of 2nd St | 270 (35) | — | 4 (35) | 8 (35) | — |
| | | | | | | SB Mt Vernon Ave, south of 2nd St | 304 (35) | 4 (35) | 15 (35) | 15 (35) | — |
| | | | | | | WB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane exits) | 124 (35) | 4 (35) | 11 (35) | 8 (35) | — |
| | | | | | | WB 2nd St, west of Mt Vernon Ave | 4 (25) | — | — | — | — |
| | | | | | | EB 2nd St, west of Mt Vernon Ave | 34 (25) | — | — | — | — |
| | | | | | | EB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane merges) | 169 (35) | 4 (35) | 23 (35) | 8 (35) | — |
| | | | | | | Dedicated turn lane from WB 2nd St to NB Mt Vernon Ave | 79 (25) | — | — | 4 (25) | — |
| | | | | | | Dedicated turn lane from NB Mt Vernon Ave to EB 2nd St | 68 (25) | 4 (25) | 23 (25) | 8 (25) | — |
| | | | Run 3 06-29-2017/10:40 a.m. | 16 | 54.0 | NB Mt Vernon Ave, south of 2nd St (before dedicated right-turn lane exits) | 304 (35) | 15 (35) | 8 (35) | 4 (35) | — |
| | | | | | | NB Mt Vernon Ave, north of 2nd St (before dedicated right-turn lane merges) | 221 (35) | 11 (35) | — | — | — |
| | | | | | | SB Mt Vernon Ave, north of 2nd St | 450 (35) | 4 (35) | — | — | — |
| | | | | | | SB Mt Vernon Ave, south of 2nd St | 416 (35) | 11 (35) | 15 (35) | 4 (35) | — |
| | | | | | | WB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane exits) | 113 (35) | 4 (35) | 15 (35) | 4 (35) | — |

| Receiver | Address | Land Uses/ Activity Category | Run # Start Date/Start Time | Duration (minutes) | $L_{eq}$ (dBA) | Roadway Segment [1] | Autos[2] (Speed mph) | Medium Trucks[2] (Speed mph) | Heavy Trucks[2] (Speed mph) | Buses[2] (Speed mph) | Motorcycles[2] (Speed mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | WB 2nd St, west of Mt Vernon Ave | 8 (25) | — | — | — | — |
| | | | | | | EB 2nd St, west of Mt Vernon Ave | 23 (25) | — | — | — | — |
| | | | | | | EB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane merges) | 146 (35) | 8 (35) | 8 (35) | 4 (35) | — |
| | | | | | | Dedicated turn lane from WB 2nd St to NB Mt Vernon Ave | 143 (25) | 4 (25) | — | — | — |
| | | | | | | Dedicated turn lane from NB Mt Vernon Ave to EB 2nd St | 75 (25) | 4 (25) | 4 (25) | 4 (25) | — |
| ST2 | 1323 W 3rd St San Bernardino, CA | Residential/B | Run 1 06-29-2017/10:04 a.m. (Simultaneous with ST1 Run 1, above) | 16 | 52.6 | All traffic data is identical to ST1 Run 1, above. ST1 and ST2 were conducted simultaneously. | | | | | |
| | | | Run 2 06-29-2017/10:22 a.m. (Simultaneous with ST1 Run 2, above) | | 52.0 | All traffic data is identical to ST1 Run 2, above. ST1 and ST2 were conducted simultaneously. | | | | | |
| ST3 | 1335 W 2nd St San Bernardino, CA | Residential/B | Run 1 06-28-2017/9:54 a.m. (Simultaneous with ST4 Run 1, below) | 16 | 52.2 | NB Mt Vernon Ave, south of 2nd St (before dedicated right-turn lane exits) | 360 (35) | 4 (35) | 15 (35) | 4 (35) | 4 (35) |
| | | | | | | NB Mt Vernon Ave, north of 2nd St (before dedicated right-turn lane merges) | 285 (35) | 4 (35) | — | — | 4 (35) |
| | | | | | | SB Mt Vernon Ave, north of 2nd St | 240 (35) | 11 (35) | — | — | 4 (35) |
| | | | | | | SB Mt Vernon Ave, south of 2nd St | 304 (35) | 8 (35) | 8 (35) | 8 (35) | — |
| | | | | | | WB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane exits) | 131 (35) | 4 (35) | 8 (35) | 8 (35) | — |
| | | | | | | WB 2nd St, west of Mt Vernon Ave | 19 (25) | — | — | — | — |
| | | | | | | EB 2nd St, west of Mt Vernon Ave | 11 (25) | — | — | — | — |
| | | | | | | EB 2nd St, east of Mt Vernon Ave (before dedicated right-turn lane merges) | 56 (35) | 4 (35) | — | — | — |
| | | | | | | Dedicated turn lane from WB 2nd St to NB Mt Vernon Ave | 90 (25) | — | — | — | — |
| | | | | | | Dedicated turn lane from NB Mt Vernon Ave to EB 2nd St | 94 (25) | — | 15 (25) | 4 (25) | — |
| | | | Run 2 06-28-2017/10:14 a.m. (Simultaneous with ST4 Run 2, below) | 16 | 52.1 | NB Mt Vernon Ave, south of 2nd St (before dedicated right-turn lane exits) | 405 (35) | 8 (35) | 19 (35) | 4 (35) | — |
| | | | | | | NB Mt Vernon Ave, north of 2nd St (before dedicated right-turn lane merges) | 319 (35) | 8 (35) | — | — | — |
| | | | | | | SB Mt Vernon Ave, north of 2nd St | 274 (35) | 8 (35) | — | — | 4 (35) |
| | | | | | | SB Mt Vernon Ave, south of 2nd St | 326 (35) | 8 (35) | 11 (35) | 4 (35) | 8 (35) |
| | | | | | | WB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane exits) | 101 (35) | 4 (35) | 11 (35) | 4 (35) | 4 (35) |
| | | | | | | WB 2nd St, west of Mt Vernon Ave | 19 (25) | — | — | — | — |
| | | | | | | EB 2nd St, west of Mt Vernon Ave | 34 (25) | — | — | — | — |

| Receiver | Address | Land Uses/ Activity Category | Run # Start Date/Start Time | Duration (minutes) | $L_{eq}$ (dBA) | Roadway Segment [1] | Autos[2] (Speed mph) | Medium Trucks[2] (Speed mph) | Heavy Trucks[2] (Speed mph) | Buses[2] (Speed mph) | Motorcycles[2] (Speed mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | EB 2nd St, east of Mt Vernon Ave (before dedicated right-turn lane merges) | 56 (35) | 4 (35) | — | — | — |
| | | | | | | Dedicated turn lane from WB 2nd St to NB Mt Vernon Ave | 60 (25) | 4 (25) | — | — | — |
| | | | | | | Dedicated turn lane from NB Mt Vernon Ave to EB 2nd St | 83 (25) | — | 19 (25) | 4 (25) | 4 (25) |
| ST4 | 1323 W 2nd St San Bernardino, CA | Residential/B | Run 1 06-28-2017/9:54 a.m. (Simultaneous with ST3 Run 1, above) | 16 | 51.1 | All traffic data is identical to ST3 Run 1, above. ST3 and ST4 were conducted simultaneously. | | | | | |
| | | | Run 2 06-28-2017/10:14 a.m. (Simultaneous with ST3 Run 2, above) | 16 | 51.3 | All traffic data is identical to ST3 Run 2, above. ST3 and ST4 were conducted simultaneously. | | | | | |
| ST5 | 1320 W King St San Bernardino, CA | Residential/B | Run 1 06-28-2017/10:58 a.m. (Simultaneous with ST6 Run 1, below) | 16 | 55.1 | NB Mt Vernon Ave, south of 2nd St (before dedicated right-turn lane exits) | 278 (35) | — | 11 (35) | 4 (35) | — |
| | | | | | | NB Mt Vernon Ave, north of 2nd St (before dedicated right-turn lane merges) | 210 (35) | — | — | — | — |
| | | | | | | SB Mt Vernon Ave, north of 2nd St | 308 (35) | 4 (35) | — | — | — |
| | | | | | | SB Mt Vernon Ave, south of 2nd St | 368 (35) | 4 (35) | 4 (35) | 4 (35) | — |
| | | | | | | WB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane exits) | 128 (35) | — | 4 (35) | 4 (35) | — |
| | | | | | | WB 2nd St, west of Mt Vernon Ave | 4 (25) | — | — | — | — |
| | | | | | | EB 2nd St, west of Mt Vernon Ave | 26 (25) | — | — | — | — |
| | | | | | | EB 2nd St, east of Mt Vernon Ave (before dedicated right-turn lane merges) | 71 (35) | — | — | — | — |
| | | | | | | Dedicated turn lane from WB 2nd St to NB Mt Vernon Ave | 120 (25) | 4 (25) | — | — | — |
| | | | | | | Dedicated turn lane from NB Mt Vernon Ave to EB 2nd St | 60 (25) | — | 11 (25) | 4 (25) | — |
| | | | | | | EB King St | — | — | — | 4 (25) | — |
| | | | | | | WB King St | 4 (25) | — | — | — | — |
| | | | Run 2 06-28-2017/11:18 a.m. (Simultaneous with ST6 Run 2, below) | 16 | 56.5 | NB Mt Vernon Ave, south of 2nd St (before dedicated right-turn lane exits) | 405 (35) | — | 4 (35) | 8 (35) | 4 (35) |
| | | | | | | NB Mt Vernon Ave, north of 2nd St (before dedicated right-turn lane merges) | 311 (35) | — | — | — | — |
| | | | | | | SB Mt Vernon Ave, north of 2nd St | 233 (35) | 4 (35) | 4 (35) | — | — |
| | | | | | | SB Mt Vernon Ave, south of 2nd St | 296 (35) | 4 (35) | 11 (35) | 4 (35) | — |
| | | | | | | WB 2nd St, east of Mt Vernon Ave (after dedicated right-turn lane exits) | 83 (35) | 4 (35) | 8 (35) | 4 (35) | — |
| | | | | | | WB 2nd St, west of Mt Vernon Ave | 15 (25) | 4 (25) | — | — | — |
| | | | | | | EB 2nd St, west of Mt Vernon Ave | 30 (25) | — | — | — | — |

| Receiver | Address | Land Uses/ Activity Category | Run # Start Date/Start Time | Duration (minutes) | $L_{eq}$ (dBA) | Roadway Segment [1] | Autos[2] (Speed mph) | Medium Trucks[2] (Speed mph) | Heavy Trucks[2] (Speed mph) | Buses[2] (Speed mph) | Motorcycles[2] (Speed mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | EB 2nd St, east of Mt Vernon Ave (before dedicated right-turn lane merges) | 45 (35) | — | — | — | — |
| | | | | | | Dedicated turn lane from WB 2nd St to NB Mt Vernon Ave | 109 (25) | 4 (25) | — | — | — |
| | | | | | | Dedicated turn lane from NB Mt Vernon Ave to EB 2nd St | 105 (25) | — | 4 (25) | 8 (25) | — |
| | | | | | | EB King St | — | — | — | — | — |
| | | | | | | WB King St | 11 (25) | — | — | — | — |
| ST6 (LT1) | 1278 W King St San Bernardino, CA | Residential/B | Run 1 06-28-2017/10:58 a.m. (Simultaneous with ST5 Run 1, above) | 16 | 53.5 | All traffic data is identical to corresponding ST5 Run 1, above. ST5 and ST6 were conducted simultaneously. | | | | | |
| | | | Run 2 06-28-2017/11:18 a.m. (Simultaneous with ST5 Run 2, above) | 16 | 54.9 | All traffic data is identical to corresponding ST5 Run 2, above. ST5 and ST6 were conducted simultaneously. | | | | | |
| ST7 | 1293 W 5th St San Bernardino, CA | Nightclub/F | Run 1 6-29-17/8:54 a.m. (Simultaneous with ST8 Run 1, below) | 16 | 63.5 | EB 5th St, W of Mt Vernon Ave | 326 (40) | 4 (40) | 26 (40) | 11 (40) | — |
| | | | | | | EB 5th St, E of Mt Vernon Ave | 379 (40) | 8 (40) | 30 (40) | 11 (40) | — |
| | | | | | | WB 5th St, E of Mt Vernon Ave | 330 (40) | 8 (40) | 19 (40) | 15 (40) | — |
| | | | | | | WB 5th St, W of Mt Vernon Ave | 334 (40) | 8 (40) | 19 (40) | 8 (40) | — |
| | | | | | | NB Mt Vernon Ave, N of 5th St | 218 (35) | 15 (35) | — | 8 (35) | — |
| | | | | | | SB Mt Vernon Ave, N of 5th St | 338 (35) | 4 (35) | 4 (35) | — | 4 (35) |
| | | | | | | NB Mt Vernon Ave | 281 (35) | 8 (35) | 4 (35) | — | — |
| | | | | | | SB Mt Vernon Ave | 300 (35) | — | — | — | — |
| | | | | | | EB Kingman St | 30 (25) | — | — | — | — |
| | | | | | | WB Kingman St | 15 (25) | — | — | — | — |
| | | | Run 2 6-29-17/9:14 a.m. (Simultaneous with ST8 Run 2, below) | 16 | 62.4 | EB 5th St, W of Mt Vernon Ave | 383 (40) | 4 (40) | 30 (40) | 8 (40) | — |
| | | | | | | EB 5th St, E of Mt Vernon Ave | 469 (40) | 8 (40) | 34 (40) | 15 (40) | — |
| | | | | | | WB 5th St, E of Mt Vernon Ave | 263 (40) | 4 (40) | 30 (40) | 15 (40) | — |
| | | | | | | WB 5th St, W of Mt Vernon Ave | 401 (40) | 4 (40) | 38 (40) | 11 (40) | — |
| | | | | | | NB Mt Vernon Ave, N of 5th St | 229 (35) | 8 (35) | — | 8 (35) | — |
| | | | | | | SB Mt Vernon Ave, N of 5th St | 334 (35) | 4 (35) | 4 (35) | — | 4 (35) |
| | | | | | | NB Mt Vernon Ave | 199 (35) | 11 (35) | — | 4 (35) | — |
| | | | | | | SB Mt Vernon Ave | 315 (35) | — | — | — | 8 (35) |
| | | | | | | EB Kingman St | 11 (25) | — | — | — | — |
| | | | | | | WB Kingman St | 15 (25) | — | — | — | — |

| Receiver | Address | Land Uses/ Activity Category | Run # Start Date/Start Time | Duration (minutes) | $L_{eq}$ (dBA) | Roadway Segment [1] | Autos[2] (Speed mph) | Medium Trucks[2] (Speed mph) | Heavy Trucks[2] (Speed mph) | Buses[2] (Speed mph) | Motorcycles[2] (Speed mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ST8 (LT2) | 1328 W Kingman St San Bernardino, CA | Residential/B | Run 1 6-29-17/8:54 a.m. (Simultaneous with ST7 Run 1, above) | 16 | 54.1 | All traffic data is identical to corresponding ST7 Run 1, above. ST8 and ST7 were conducted simultaneously. | | | | | |
| | | | Run 2 6-29-17/9:14 a.m. (Simultaneous with ST7 Run 2, above) | 16 | 53.5 | All traffic data is identical to corresponding ST7 Run 2, above. ST8 and ST7 were conducted simultaneously. | | | | | |
| ST9 | 1414 W Kingman St San Bernardino, CA | Vacant Lot/G | Run 1 6-28-17/2:26 p.m. (Simultaneous with ST10 Run 1, below) | 16 | 56.5 | EB 5th St | 626 (40) | 4 (40) | 45 (40) | 8 (40) | — |
| | | | | | | WB 5th St | 563 (40) | 4 (40) | 68 (40) | 8 (40) | — |
| | | | | | | SB Mt Vernon Ave | 413 (35) | 8 (35) | — | — | — |
| | | | | | | NB Mt Vernon Ave | 503 (35) | 4 (35) | — | — | 4 (35) |
| | | | | | | EB W Kingman St | 11 (25) | — | — | — | — |
| | | | | | | WB E Kingman St | 11 (25) | 4 (25) | — | — | — |
| | | | Run 2 6-28-17/2:46 p.m. (Simultaneous with ST10 Run 2, below) | 16 | 54.7 | EB 5th St | 619 (40) | 11 (40) | 53 (40) | 11 (40) | — |
| | | | | | | WB 5th St | 585 (40) | 11 (40) | 75 (40) | 8 (40) | — |
| | | | | | | SB Mt Vernon Ave | 439 (35) | 4 (35) | — | — | — |
| | | | | | | NB Mt Vernon Ave | 420 (35) | 4 (35) | — | — | — |
| | | | | | | EB W Kingman St | 8 (25) | — | — | — | — |
| | | | | | | WB E Kingman St | 15 (25) | — | — | — | — |
| ST10 | 1328 W Kingman St San Bernardino, CA | Residential/B | Run 1 6-28-17/2:26 p.m. (Simultaneous with ST9 Run 1, above) | 16 | 63.9 | All data identical to corresponding ST9 Run 1, above. ST9 and ST10 were conducted simultaneously. | | | | | |
| | | | Run 2 6-28-17/2:46 p.m. (Simultaneous with ST9 Run 2, above) | 16 | 64.9 | All data identical to corresponding ST9 Run 2, above. ST9 and ST10 were conducted simultaneously. | | | | | |

**Notes:**

1. The terms "before" and "after" are specified relative to the direction of travel on the roadway segment.
2. All vehicle volumes are normalized to 1 hour, as required for input into TNM.

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### 6.2.2 Long-Term Monitoring

Long-term monitoring was conducted at two locations (LT1 and LT2) from June 28 to 29, 2017. The purpose of the LT noise measurements was to determine changes in noise levels within the project area throughout a typical day. The hourly noise monitoring data are tabulated in Table 6-2 and Table 6-3 for LT1 and LT2, respectively. They are also presented graphically in Figure 6-1 and Figure 6-2. The LT monitoring locations are shown in Figure 5-1.

**Table 6-2. Long-Term Monitoring at Site LT1**

| Date | Beginning Hour | Hourly dBA ($L_{eq}$[h]) | Difference from Loudest Hour |
|---|---|---|---|
| 6/28/2017 | 9:00 AM | 54.3 | -3.5 |
| | 10:00 AM | 54.5 | -3.2 |
| | 11:00 AM | 53.8 | -3.9 |
| | 12:00 PM | 54.7 | -3.0 |
| | 1:00 PM | 56.2 | -1.5 |
| | 2:00 PM | 56.3 | -1.4 |
| | 3:00 PM | 56.8 | -0.9 |
| | **4:00 PM** | **57.7** | **0.0** |
| | **5:00 PM** | **57.7** | **0.0** |
| | 6:00 PM | 57.3 | -0.4 |
| | 7:00 PM | 56.2 | -1.5 |
| | 8:00 PM | 56.3 | -1.4 |
| | 9:00 PM | 55.1 | -2.7 |
| | 10:00 PM | 53.4 | -4.3 |
| | 11:00 PM | 51.4 | -6.3 |
| 6/29/2017 | 12:00 AM | 52.0 | -5.8 |
| | 1:00 AM | 52.0 | -5.7 |
| | 2:00 AM | 47.6 | -10.2 |
| | 3:00 AM | 51.3 | -6.4 |
| | 4:00 AM | 51.4 | -6.3 |
| | 5:00 AM | 55.7 | -2.0 |
| | 6:00 AM | 55.0 | -2.8 |
| | 7:00 AM | 56.0 | -1.7 |
| | 8:00 AM | 54.4 | -3.3 |
| | 9:00 AM | 54.6 | -3.1 |
| | 10:00 AM | 54.2 | -3.5 |
| Maximum | | 57.7 | |
| Minimum | | 47.6 | |
| **Note: Worst-hour noise levels are bolded.** | | | |

**Figure 6-1. Long-Term Monitoring at Location LT1**

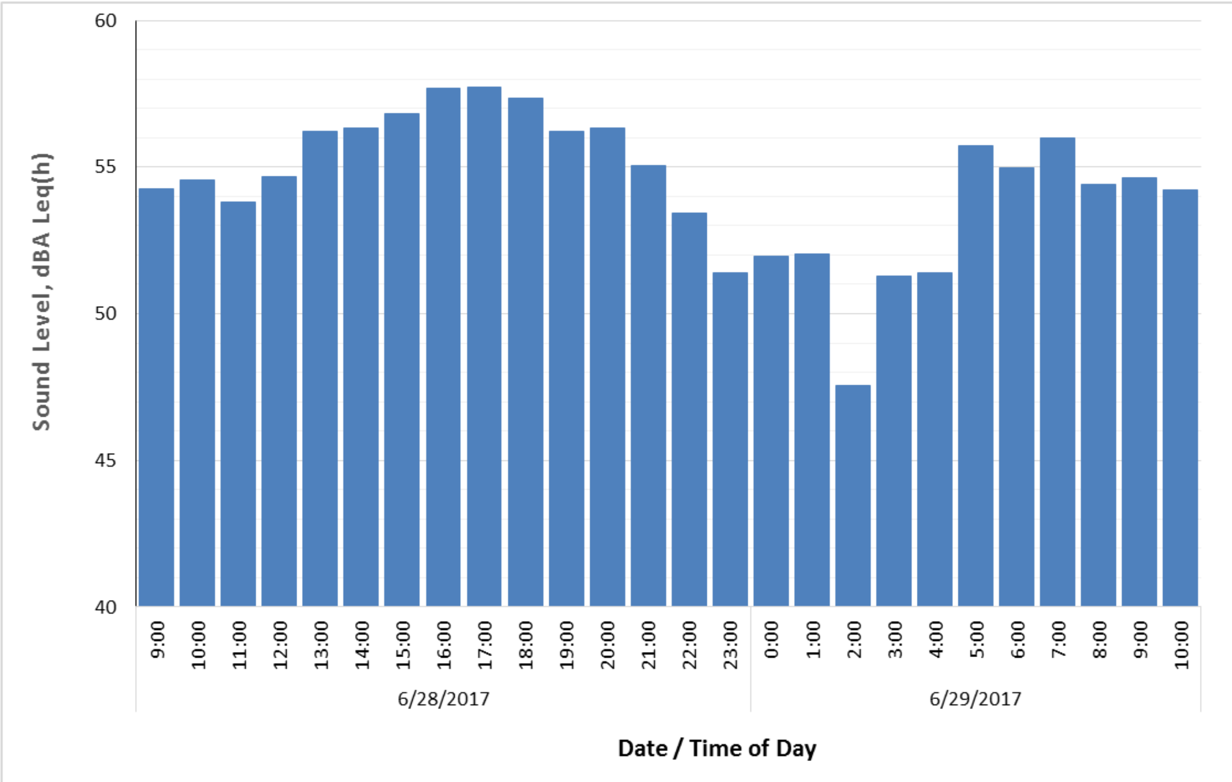
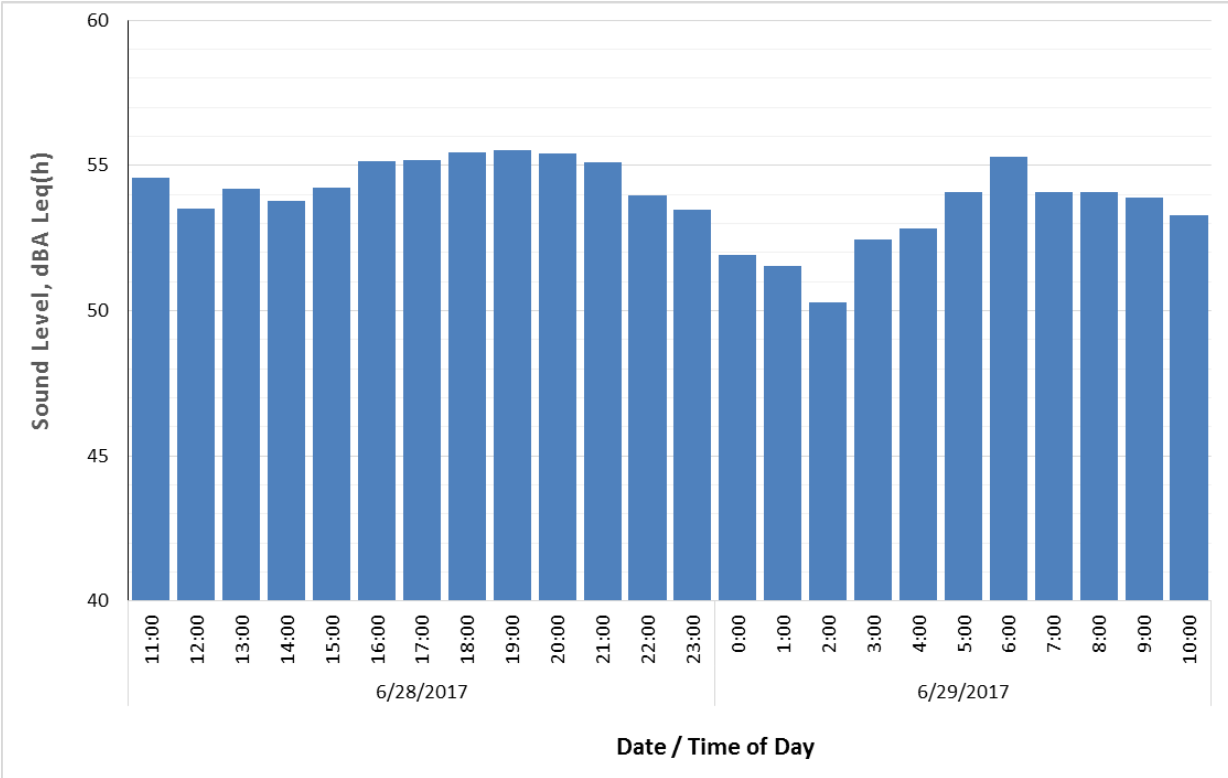


**Table 6-3. Long-Term Monitoring at Site LT2**

| Date | Beginning Hour | Hourly dBA ($L_{eq}$[h]) | Difference from Loudest Hour |
|---|---|---|---|
| 6/28/2017 | 11:00 AM | 54.6 | -0.9 |
| | 12:00 PM | 53.5 | -2.0 |
| | 1:00 PM | 54.2 | -1.3 |
| | 2:00 PM | 53.8 | -1.7 |
| | 3:00 PM | 54.2 | -1.3 |
| | 4:00 PM | 55.1 | -0.4 |
| | 5:00 PM | 55.2 | -0.3 |
| | 6:00 PM | 55.4 | -0.1 |
| | **7:00 PM** | **55.5** | **0.0** |
| | 8:00 PM | 55.4 | -0.1 |
| | 9:00 PM | 55.1 | -0.4 |
| | 10:00 PM | 54.0 | -1.5 |
| | 11:00 PM | 53.5 | -2.0 |
| 6/29/2017 | 12:00 AM | 51.9 | -3.6 |
| | 1:00 AM | 51.5 | -4.0 |
| | 2:00 AM | 50.3 | -5.2 |
| | 3:00 AM | 52.5 | -3.0 |
| | 4:00 AM | 52.8 | -2.7 |
| | 5:00 AM | 54.1 | 2.6 |
| | 6:00 AM | 55.3 | -0.2 |
| | 7:00 AM | 54.1 | -1.4 |
| | 8:00 AM | 54.1 | -1.4 |
| | 9:00 AM | 53.9 | -1.6 |
| | 10:00 AM | 53.3 | -2.2 |
| Maximum | | 55.5 | |
| Minimum | | 50.3 | |
| **Note: Worst-hour noise levels are bolded.** | | | |

**Figure 6-2. Long-Term Monitoring at Location LT2**




### 6.2.3 Traffic Noise Model Calibration

TNM 2.5 was used to compare measured traffic noise levels with modeled noise levels at field measurement locations ST1 through ST10 using the traffic count data collected at the time of the noise measurements. The comparison was made by subtracting the modeled sound level from the measured sound level to quantify the difference. This calculation was repeated for both of the measurement runs at each location, and the average (arithmetic mean) difference was used to determine the K-factor (if any) to be used for that location. Table 6-4 compares the measured and modeled noise levels at each measurement location. Good agreement (within 4.5 dBA) was achieved between the measured and modeled results.

Calibration results were adjusted, as applicable, to use K-factors for the subsequent modeling of existing and future worst-hour noise levels. Table 6-4 shows which adjustment factors were applied to each respective modeled receiver. If the average "measured minus predicted" value was 2.0 dBA or less for a given measurement location, then the TNM result was not adjusted for that receiver. The K-factor for each additional modeled receiver (i.e., location where ST noise measurements were not obtained) were based on the K-factor for the measurement site that was closest and/or most acoustically equivalent.

**Table 6-4. Comparison of Measured and Modeled Sound Levels in the TNM 2.5 Model**

| Measurement Site (Modeled Receiver Number) | Run | Measured Sound Level (dBA) | Predicted Sound Level (dBA) | Measured Minus Predicted (dB) | Average Measured Minus Predicted (dB) | K-Factor Used | K-Factor Applied to Additional Modeled Receiver(s) |
|---|---|---|---|---|---|---|---|
| ST1 (M11) | 2 | 54.7 | 53.0 | +1.7 | +1.4 | 0 | — |
| | 3 | 54.0 | 53.0 | +1.0 | | | |
| ST2 (M13) | 1 | 52.6 | 49.3 | +3.3 | +2.5 | +2.5 | M12, M14, M15, M16 |
| | 2 | 52.0 | 50.3 | +1.7 | | | |
| ST3 (M18) | 1 | 52.2 | 49.5 | +2.7 | +2.1 | +2.1 | M19 |
| | 2 | 52.1 | 50.7 | +1.4 | | | |
| ST4 (M20) | 1 | 51.1 | 48.3 | +2.8 | +2.6 | +2.6 | — |
| | 2 | 51.3 | 49.0 | +2.3 | | | |
| ST5 (M21) | 1 | 55.1 | 54.3 | +0.8 | +1.5 | 0 | M22 |
| | 2 | 56.5 | 54.3 | +2.2 | | | |
| ST6/LT1 (M23) | 1 | 53.5 | 55.4 | -1.9 | -1.2 | 0 | — |
| | 2 | 54.9 | 55.4 | -0.5 | | | |
| ST7 (M9) | 1 | 63.5 | 59.9 | +3.6 | +3.1 | +3.1 | M10 |
| | 2 | 62.4 | 59.8 | +2.6 | | | |
| ST8/LT2 (M6) | 1 | 54.1 | 57.6 | -3.5 | -4.3 | -4.3 | M5, M7 |
| | 2 | 53.5 | 58.6 | -5.1 | | | |
| ST9 (M4) | 1 | 56.5 | 54.3 | +2.2 | +0.2 | 0 | M1, M2, M3 |
| | 2 | 54.7 | 56.6 | -1.9 | | | |
| ST10 (M8) | 1 | 63.9 | 60.0 | +3.9 | +4.1 | +4.1 | — |
| | 2 | 64.9 | 60.6 | +4.3 | | | |

Existing worst-hour traffic noise levels were modeled using the traffic volumes and assumptions summarized in Appendix A. Table B-1 in Appendix B summarizes the modeled noise levels at all receivers. Existing worst-hour traffic noise levels are predicted to be in the range of 48 to 67 dBA $L_{eq}$(h). None of the existing noise levels approach or exceed the applicable NAC for the modeled land uses and Activity Categories.

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

## 7.1 Future Noise Environment and Impacts

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

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

The traffic noise modeling results in Table B-1 indicate worst-hour traffic noise levels at the modeled receivers are predicted to be in the range of 49 to 68 dBA $L_{eq}$(h) in the design year (2040) for both No-Build and Build conditions. The increase in noise levels under No-Build conditions relative to existing conditions is predicted to be in the range of 0 to 2 dB. The change in noise levels under Build conditions relative to existing conditions is predicted to be in the range of -1 dB (i.e., a 1 dB decrease) to +3 dB (i.e., a 3 dB increase).

The results indicate that none of the predicted noise levels would approach or exceed the applicable NAC for any of the land uses and Activity Categories affected by traffic noise from the proposed project. Therefore, no traffic noise impacts are predicted and consideration or analysis of noise abatement is not required.

## 7.2 Comparison with Results of Previous NSR

The findings of the SNSR are fundamentally consistent with those of the original NSR, with both studies finding no traffic noise impacts in the surrounding community as a result of the proposed project. However, the precise results vary, as indicated in Table 7-1.

**Table 7-1. Comparison of Results from NSR and SNSR**

| Noise Study | Receivers | Range of Predicted Worst-Hour Noise Levels, $L_{eq}(h)$, dBA: Existing[1] | Design Year No-Build[2] | Design Year Build[2] | Traffic Noise Impacts |
|---|---|---|---|---|---|
| 2006 NSR | Residential | 56-60 | 56-60 | 56-60 | None |
| | Other | -- | -- | -- | None |
| Current SNSR | Residential | 48-63 | 49-63 | 49-63 | None |
| | Other | 54-67 | 55-68 | 55-68 | None |

[1] Existing Year for 2006 NSR was 2004 and for this SNSR is 2017
[2] Design Year for 2006 NSR was 2025 and for this SNSR is 2040
**Note**: 2006 NSR considered only residential receivers.

The difference in results is not surprising given the important differences between the two studies. In addition to the fact the proposed project itself has been refined, the analysis in the 2006 NSR was substantially different from that in the current SNSR in several other important ways:

- The 2006 NSR was completed 11 years ago.
- The 2006 NSR was based on the 1998 versions of Caltrans' Protocol and TeNS, both of which have since been superseded.
- The 2006 NSR used Caltrans' Sound32 traffic noise model, which has since been replaced with the FHWA TNM used in this SNSR.
- The 2006 NSR analyzed five receiver locations, compared to the 23 locations analyzed in the SNSR.

# Chapter 8. Construction Noise

The following discussion related to addressing construction noise supersedes the discussion included in Section H of the 2006 NSR. During construction of the project, noise from construction would intermittently dominate the noise environment in the vicinity of construction activities. Table 8-1 summarizes noise levels produced by construction equipment that is anticipated to be used for the project. Standard construction equipment is expected to generate maximum noise levels ranging from 74 to 90 dBA at a distance of 50 feet, while pile driving would generate maximum noise levels of approximately 101 dBA at 50 feet. Noise produced by construction equipment would be reduced at a rate of about 6 dB per doubling of distance.

**Table 8-1. Construction Equipment Noise**

| Equipment | $L_{max}$ @ 50 feet (dBA, slow) |
|---|---|
| Asphalt paver | 77 |
| Backhoe | 78 |
| Bulldozer | 82 |
| Compactor | 83 |
| Crane | 81 |
| Drill rig | 84 |
| Hoe rams | 90 |
| Loader | 79 |
| Man lift | 75 |
| Pile hammer | 101 |
| Road grader | 85 |
| Roller/sheeps foot roller/vibrating roller | 80 |
| Scraper | 84 |
| Sweeper | 82 |
| Trencher | 80 |
| Trucks (asphalt emulsion, bucket, boom, concrete, flat bed, haul, pickup, water) | 74-81 |

Source: FHWA 2008. See also: http://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdfhttp://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf

Noise associated with construction is controlled by Caltrans 2015 Standard Specifications Section 14-8.02, "Noise Control," which states the following:

> Control and monitor noise resulting from work activities.
>
> Do not exceed 86 dBA $L_{max}$ at 50 feet from the job site from 9:00 p.m. to 6:00 a.m.

In addition, Section 14-8.02 may be edited specifically for this project during the plans, specifications, and estimates phase to incorporate all or part of 2015 Standard Special Provision (SSP) Number 14-8.02, which states the following:

**Replace the 2nd paragraph of section 14-8.02 with:**

Noise from job site activities must not exceed 86 dBA Lmax at 50 feet from the job site from _____ p.m. to _____ a.m., except the following activities may exceed this noise restriction during the hours and on the days shown in the following table:

**Noise Restriction Exceptions**

| Activity | Hours | | Days | |
|---|---|---|---|---|
| | From | To | From | Through |
| | | | | |
| | | | | |
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Do not operate construction equipment or run equipment engines from 7:00 p.m. to 7:00 a.m. or on Sundays at the job site except to:

1. Service traffic-control facilities
2. Service construction equipment

**Add to section 14-8.02:**

Furnish 1 Type 1 sound-level meter and 1 acoustic calibrator for the Department to use until Contract acceptance to monitor noise.

The sound-level meter must:

1. Be calibrated and certified by the manufacturer or an independent acoustical laboratory before delivery to the Department
2. Be capable of taking measurements using the A-weighting network and the slow-response settings
3. Have a microphone fitted with a windscreen
4. Be recalibrated annually by the manufacturer or an independent acoustical laboratory

Provide training in noise monitoring to 1 Department employee designated by the Engineer. The person delivering the training must be trained in noise monitoring.

The Department returns the equipment to you at Contract acceptance.

Construction noise would be temporary and intermittent. No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans 2015 Standard Specifications Section 14.8-02, which would be supplemented as necessary by Standard Special Provision (SSP) Number 14-8.02.

# Chapter 9. References


AECOM. 2017. Mt. Vernon Avenue Overhead Replacement Project Traffic/Circulation Study. Final. Prepared for the City of San Bernardino. October 2017.

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

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

———. 2014. *Highway Design Manual*. September. Available: http://www.dot.ca.gov/hq/oppd/hdm/pdf/english/HDM_Complete_22Sep2014.pdf.

———. 2015. *Standard Special Provisions, 2015 SSP No.: 14-8.02*. Available: http://www.dot.ca.gov/hq/esc/oe/construction_contract_standards/SSPs/2015-SSPs/division_2/14-8.02_A10-30-15__2015.docx

Federal Highway Administration (FHWA). 1998a. Traffic Noise Model, Version 1.0 User's Guide. January. FHWA-PD-96-009. Washington D.C.: Available: http://www.fhwa.dot.gov/environment/noise/traffic_noise_model/old_versions/tnm_version_10/users_guide/tnm10usersguide.pdf.

———. 1998b. Traffic Noise Model, Version 1.0. February. FHWA-PD-96-010. Washington, D.C.

———. 2004. Traffic Noise Model, Version 2.5. February. Washington D.C.

———. 2008. Roadway Construction Noise Model (RCNM), Software Version 1.1. December 8, 2008.

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# Chapter 10. Preparer Qualifications

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

Mari Piantka. Senior Project Manager. 20 years of experience. BA, Environmental Studies, University of California, Santa Barbara. 1997.

Brian Calvert. Senior Transportation Planner. 23 years of experience. BA (cum laude), Geography and Regional Science, The George Washington University, Washington, D.C., 1993. MEP, Master of Environmental Planning, Arizona State University, Arizona, 2000.

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# Appendix A Traffic Data

This appendix contains summary tables, presenting the traffic data used for the traffic noise modeling, for existing conditions and for the design-year under No-Build and Build conditions.

## Table A-1 Existing PM Peak Hour Traffic Volumes

| Roadway | Segment | Number of Lanes | Total Peak Hour Volume | Auto | | Medium Trucks | | Heavy Trucks | | Speed |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | % | Volume | % | Volume | % | Volume | (A/MT/HT) |
| NB Mt Vernon Ave Ln 1 | South of King Street | 1 | 714 | 98% | 350 | 1% | 4 | 1% | 4 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 350 | | 3 | | 3 | |
| NB Mt Vernon Ave Ln 1 | South of 2nd Street | 1 | 702 | 98% | 344 | 1% | 4 | 1% | 4 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 344 | | 3 | | 3 | |
| NB Mt Vernon Ave Ln 1 | South of 2nd Street Intersection | 1 | 541 | 98% | 266 | 1% | 3 | 1% | 3 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 265 | | 2 | | 2 | |
| NB Mt Vernon Ave Ln 1 | North of 2nd Street Intersection | 1 | 539 | 98% | 265 | 1% | 3 | 1% | 3 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 264 | | 2 | | 2 | |
| NB Mt Vernon Ave Ln 1 | Over Mt Vernon Ave Bridge | 1 | 733 | 98% | 360 | 1% | 4 | 1% | 4 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 359 | | 3 | | 3 | |
| NB Mt Vernon Ave Ln 1 | South of 5th Street | 1 | 730 | 98% | 358 | 1% | 4 | 1% | 4 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 358 | | 3 | | 3 | |
| NB Mt Vernon Ave Ln 1 | North of 5th Street | 1 | 712 | 98% | 349 | 1% | 4 | 1% | 4 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 349 | | 3 | | 3 | |
| NB Mt Vernon->EB 2nd | South of 2nd Street | 1 | 161 | 98% | 157 | 1% | 2 | 1% | 2 | 25/25/25 |
| WB 2nd->NB Mt Vernon | North of 2nd Street | 1 | 194 | 98% | 190 | 1% | 2 | 1% | 2 | 25/25/25 |
| SB Mt Vernon Ave Ln 1 | North of 5th Street | 1 | 605 | 98% | 297 | 1% | 3 | 1% | 3 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 296 | | 3 | | 3 | |
| SB Mt Vernon Ave Ln 1 | South of 5th Street | 1 | 578 | 98% | 283 | 1% | 3 | 1% | 3 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 283 | | 3 | | 3 | |
| SB Mt Vernon Ave Ln 1 | Over Mt Vernon Ave Bridge | 1 | 585 | 98% | 287 | 1% | 3 | 1% | 3 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 286 | | 3 | | 3 | |
| SB Mt Vernon Ave Ln 1 | South of 2nd Street | 1 | 634 | 98% | 311 | 1% | 3 | 1% | 3 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 311 | | 3 | | 3 | |
| SB Mt Vernon Ave Ln 1 | South of King Street | 1 | 635 | 98% | 312 | 1% | 3 | 1% | 3 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 311 | | 3 | | 3 | |
| EB 5th St Ln 1 | West of Mt Vernon Ave | 1 | 696 | 96% | 334 | 1% | 4 | 3% | 11 | 40/40/40 |
| EB 5th St Ln 2 | | 1 | | | 334 | | 3 | | 10 | |

| Roadway | Segment | Number of Lanes | Total Peak Hour Volume | Auto | | Medium Trucks | | Heavy Trucks | | Speed |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | % | Volume | % | Volume | % | Volume | (A/MT/HT) |
| EB 5th St Ln 1 | East of Mt Vernon Ave | 1 | 705 | 96% | 339 | 1% | 4 | 3% | 11 | 40/40/40 |
| EB 5th St Ln 2 | | 1 | | | 338 | | 3 | | 10 | |
| WB 5th St Ln 1 | East of Mt Vernon Ave | 1 | 710 | 96% | 341 | 1% | 4 | 3% | 11 | 40/40/40 |
| WB 5th St Ln 2 | | 1 | | | 341 | | 3 | | 10 | |
| WB 5th St Ln 1 | West of Mt Vernon Ave | 1 | 746 | 96% | 359 | 1% | 4 | 3% | 11 | 40/40/40 |
| WB 5th St Ln 2 | | 1 | | | 358 | | 3 | | 11 | |
| EB 2nd St | West of Mt Vernon Ave | 1 | 37 | 100% | 37 | 0% | 0 | 0% | 0 | 25/25/25 |
| EB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 133 | 98% | 66 | 1% | 1 | 1% | 1 | 35/35/35 |
| EB 2nd St Ln 2 | | 1 | | | 65 | | 0 | | 0 | |
| EB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 294 | 98% | 144 | 1% | 2 | 1% | 2 | 35/35/35 |
| EB 2nd St Ln 2 | | 1 | | | 144 | | 1 | | 1 | |
| WB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 367 | 98% | 180 | 1% | 2 | 1% | 2 | 35/35/35 |
| WB 2nd St Ln 2 | | 1 | | | 179 | | 2 | | 2 | |
| WB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 173 | 98% | 85 | 1% | 1 | 1% | 1 | 35/35/35 |
| WB 2nd St Ln 2 | | 1 | | | 84 | | 1 | | 1 | |
| WB 2nd St | West of Mt Vernon Ave | 1 | 30 | 100% | 30 | 0% | 0 | 0% | 0 | 25/25/25 |

## Table A-2 Future No Build PM Peak Hour Traffic Volumes

| Roadway | Segment | Number of Lanes | Total Peak Hour Volume | Auto | | Medium Trucks | | Heavy Trucks | | Speed |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | % | Volume | % | Volume | % | Volume | (A/MT/HT) |
| NB Mt Vernon Ave Ln 1 | South of King Street | 1 | 1,083 | 98% | 531 | 1% | 6 | 1% | 6 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 530 | | 5 | | 5 | |
| NB Mt Vernon Ave Ln 1 | South of 2nd Street | 1 | 1,075 | 98% | 527 | 1% | 6 | 1% | 6 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 526 | | 5 | | 5 | |
| NB Mt Vernon Ave Ln 1 | South of 2nd Street Intersection | 1 | 950 | 98% | 465 | 1% | 5 | 1% | 5 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 465 | | 5 | | 5 | |
| NB Mt Vernon Ave Ln 1 | North of 2nd Street Intersection | 1 | 955 | 98% | 468 | 1% | 5 | 1% | 5 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 467 | | 5 | | 5 | |
| NB Mt Vernon Ave Ln 1 | Over Mt Vernon Ave Bridge | 1 | 1,193 | 98% | 585 | 1% | 6 | 1% | 6 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 584 | | 6 | | 6 | |
| NB Mt Vernon Ave Ln 1 | South of 5th Street | 1 | 870 | 98% | 426 | 1% | 5 | 1% | 5 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 426 | | 4 | | 4 | |
| NB Mt Vernon Ave Ln 1 | North of 5th Street | 1 | 840 | 98% | 412 | 1% | 4 | 1% | 4 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 412 | | 4 | | 4 | |
| NB Mt Vernon->EB 2nd | South of 2nd Street | 1 | 125 | 98% | 123 | 1% | 1 | 1% | 1 | 25/25/25 |
| WB 2nd->NB Mt Vernon | North of 2nd Street | 1 | 238 | 98% | 234 | 1% | 2 | 1% | 2 | 25/25/25 |
| SB Mt Vernon Ave Ln 1 | North of 5th Street | 1 | 561 | 98% | 275 | 1% | 3 | 1% | 3 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 274 | | 3 | | 3 | |
| SB Mt Vernon Ave Ln 1 | South of 5th Street | 1 | 621 | 98% | 305 | 1% | 3 | 1% | 3 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 304 | | 3 | | 3 | |
| SB Mt Vernon Ave Ln 1 | Over Mt Vernon Ave Bridge | 1 | 780 | 98% | 382 | 1% | 4 | 1% | 4 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 382 | | 4 | | 4 | |
| SB Mt Vernon Ave Ln 1 | South of 2nd Street | 1 | 763 | 98% | 374 | 1% | 4 | 1% | 4 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 373 | | 4 | | 4 | |
| SB Mt Vernon Ave Ln 1 | South of King Street | 1 | 766 | 98% | 375 | 1% | 4 | 1% | 4 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 375 | | 4 | | 4 | |
| EB 5th St Ln 1 | West of Mt Vernon Ave | 1 | 761 | 96% | 365 | 1% | 4 | 3% | 12 | 40/40/40 |
| EB 5th St Ln 2 | | 1 | | | 365 | | 4 | | 11 | |

| Roadway | Segment | Number of Lanes | Total Peak Hour Volume | Auto | | Medium Trucks | | Heavy Trucks | | Speed |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | % | Volume | % | Volume | % | Volume | (A/MT/HT) |
| EB 5th St Ln 1 | East of Mt Vernon Ave | 1 | 750 | 96% | 360 | 1% | 4 | 3% | 12 | 40/40/40 |
| EB 5th St Ln 2 | | 1 | | | 359 | | 4 | | 11 | |
| WB 5th St Ln 1 | East of Mt Vernon Ave | 1 | 801 | 96% | 385 | 1% | 4 | 3% | 12 | 40/40/40 |
| WB 5th St Ln 2 | | 1 | | | 384 | | 4 | | 12 | |
| WB 5th St Ln 1 | West of Mt Vernon Ave | 1 | 782 | 96% | 376 | 1% | 4 | 3% | 12 | 40/40/40 |
| WB 5th St Ln 2 | | 1 | | | 375 | | 4 | | 11 | |
| EB 2nd St | West of Mt Vernon Ave | 1 | 37 | 100% | 37 | 0% | 0 | 0% | 0 | 25/25/25 |
| EB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 140 | 97% | 68 | 1% | 1 | 1% | 1 | 35/35/35 |
| EB 2nd St Ln 2 | | 1 | | | 68 | | 1 | | 1 | |
| EB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 265 | 98% | 130 | 1% | 2 | 1% | 2 | 35/35/35 |
| EB 2nd St Ln 2 | | 1 | | | 129 | | 1 | | 1 | |
| WB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 359 | 98% | 176 | 1% | 2 | 1% | 2 | 35/35/35 |
| WB 2nd St Ln 2 | | 1 | | | 175 | | 2 | | 2 | |
| WB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 121 | 97% | 59 | 2% | 1 | 2% | 1 | 35/35/35 |
| WB 2nd St Ln 2 | | 1 | | | 58 | | 1 | | 1 | |
| WB 2nd St | West of Mt Vernon Ave | 1 | 30 | 100% | 30 | 0% | 0 | 0% | 0 | 25/25/25 |

## Table A-3 Future Build PM Peak Hour Traffic Volumes

| Roadway | Segment | Number of Lanes | Total Peak Hour Volume | Auto | | Medium Trucks | | Heavy Trucks | | Speed |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | % | Volume | % | Volume | % | Volume | (A/MT/HT) |
| NB Mt Vernon Ave Ln 1 | South of King Street | 1 | 1,083 | 98% | 531 | 1% | 6 | 1% | 6 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 530 | | 5 | | 5 | |
| NB Mt Vernon Ave Ln 1 | South of 2nd Street | 1 | 1,075 | 98% | 527 | 1% | 6 | 1% | 6 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 526 | | 5 | | 5 | |
| NB Mt Vernon Ave Ln 1 | South of 2nd Street Intersection | 1 | 950 | 98% | 465 | 1% | 5 | 1% | 5 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 465 | | 5 | | 5 | |
| NB Mt Vernon Ave Ln 1 | Over Mt Vernon Ave Bridge / North of 2nd Street Intersection | 1 | 1,193 | 98% | 585 | 1% | 6 | 1% | 6 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 584 | | 6 | | 6 | |
| NB Mt Vernon Ave Ln 1 | South of 5th Street | 1 | 870 | 98% | 426 | 1% | 5 | 1% | 5 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 426 | | 4 | | 4 | |
| NB Mt Vernon Ave Ln 1 | North of 5th Street | 1 | 840 | 98% | 412 | 1% | 4 | 1% | 4 | 35/35/35 |
| NB Mt Vernon Ave Ln 2 | | 1 | | | 412 | | 4 | | 4 | |
| NB Mt Vernon->EB 2nd | South of 2nd Street | 1 | 125 | 98% | 123 | 1% | 1 | 1% | 1 | 25/25/25 |
| SB Mt Vernon Ave Ln 1 | North of 5th Street | 1 | 561 | 98% | 275 | 1% | 3 | 1% | 3 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 274 | | 3 | | 3 | |
| SB Mt Vernon Ave Ln 1 | South of 5th Street | 1 | 621 | 98% | 305 | 1% | 3 | 1% | 3 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 304 | | 3 | | 3 | |
| SB Mt Vernon Ave Ln 1 | Over Mt Vernon Ave Bridge / North of 2nd Street Intersection | 1 | 780 | 98% | 382 | 1% | 4 | 1% | 4 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 382 | | 4 | | 4 | |
| SB Mt Vernon Ave Ln 1 | South of 2nd Street | 1 | 763 | 98% | 374 | 1% | 4 | 1% | 4 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 373 | | 4 | | 4 | |
| SB Mt Vernon Ave Ln 1 | South of King Street | 1 | 766 | 98% | 375 | 1% | 4 | 1% | 4 | 35/35/35 |
| SB Mt Vernon Ave Ln 2 | | 1 | | | 375 | | 4 | | 4 | |
| EB 5th St Ln 1 | West of Mt Vernon Ave | 1 | 761 | 96% | 365 | 1% | 4 | 3% | 12 | 40/40/40 |
| EB 5th St Ln 2 | | 1 | | | 365 | | 4 | | 11 | |
| EB 5th St Ln 1 | East of Mt Vernon Ave | 1 | 750 | 96% | 360 | 1% | 4 | 3% | 12 | 40/40/40 |
| EB 5th St Ln 2 | | 1 | | | 359 | | 4 | | 11 | |

| Roadway | Segment | Number of Lanes | Total Peak Hour Volume | Auto | | Medium Trucks | | Heavy Trucks | | Speed |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | % | Volume | % | Volume | % | Volume | (A/MT/HT) |
| WB 5th St Ln 1 | East of Mt Vernon Ave | 1 | 801 | 96% | 385 | 1% | 4 | 3% | 12 | 40/40/40 |
| WB 5th St Ln 2 | | 1 | | | 384 | | 4 | | 12 | |
| WB 5th St Ln 1 | West of Mt Vernon Ave | 1 | 782 | 96% | 376 | 1% | 4 | 3% | 12 | 40/40/40 |
| WB 5th St Ln 2 | | 1 | | | 375 | | 4 | | 11 | |
| EB 2nd St | West of Mt Vernon Ave | 1 | 37 | 100% | 37 | 0% | 0 | 0% | 0 | 25/25/25 |
| EB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 140 | 97% | 136 | 1% | 2 | 1% | 2 | 35/35/35 |
| EB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 265 | 98% | 130 | 1% | 2 | 1% | 2 | 35/35/35 |
| EB 2nd St Ln 2 | | 1 | | | 129 | | 1 | | 1 | |
| WB 2nd St Ln 1 | East of Mt Vernon Ave | 1 | 359 | 98% | 176 | 1% | 2 | 1% | 2 | 35/35/35 |
| WB 2nd St Ln 2 | | 1 | | | 175 | | 2 | | 2 | |
| WB 2nd St | West of Mt Vernon Ave | 1 | 30 | 100% | 30 | 0% | 0 | 0% | 0 | 25/25/25 |

# Appendix B Predicted Existing and Future Noise Levels

## Table B-1. Predicted Future Noise Levels and Noise Barrier Analysis

**Mount Vernon Avenue Bridge Project Future Worst Hour Noise Levels (Traffic Noise Only) - $L_{eq}$(h), dBA**

| Receiver I.D. | Measurement Location | Land Use / Activity Category | Number of Dwelling Units or Equivalent | Address | Existing Noise Level $L_{eq}$(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 | Design Year Noise Level with Project minus Existing Conditions Leq(h), dBA | Activity Category (NAC) | Impact Type (None, or A/E) | Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (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 |
| M1 | -- | Residential/B | 3 | 1373 W 5th St, San Bernardino, CA | 56 | 57 | 57 | 1 | 0 | 1 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M2 | -- | Residential/B | 1 | 1355 W 5th St, San Bernardino, CA | 61 | 61 | 62 | 0 | 1 | 1 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M3 | -- | Residential/B | 4 | 1414 W Kingman St, San Bernardino, CA | 56 | 56 | 56 | 0 | 0 | 0 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M4 | ST9 | Undeveloped Land/G | 1 | N/A | 55 | 55 | 55 | 0 | 0 | 0 | G (-) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M5 | -- | Residential/B | 5 | 1358 W Kingman St, San Bernardino, CA | 53 | 54 | 54 | 1 | 0 | 1 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M6 | ST8 (LT2) | Residential/B | 3 | 1328 W Kingman St, San Bernardino, CA | 55 | 55 | 55 | 0 | 0 | 0 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M7 | -- | Residential/B | 1 | 1314 W Kingman St, San Bernardino, CA | 48 | 49 | 49 | 1 | 0 | 1 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M8 | ST10 | Undeveloped Land/G | 1 | N/A | 67 | 68 | 68 | 1 | 0 | 1 | G (-) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M9 | ST7 | Nightclub/E | 1 | 1293 W 5th St, San Bernardino, CA | 66 | 67 | 67 | 1 | 0 | 1 | E (72) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M10 | -- | Residential/B | 2 | 1257 W 5th St, San Bernardino, CA | 63 | 63 | 63 | 0 | 0 | 0 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M11 | ST1 | Undeveloped Land/G | 4 | N/A | 56 | 58 | 57 | 2 | -1 | 1 | G (-) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M12 | -- | Residential/B | 2 | 1335 W 3rd St, San Bernardino, CA | 53 | 54 | 55 | 1 | 1 | 2 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**Mount Vernon Avenue Bridge Project Future Worst Hour Noise Levels (Traffic Noise Only) - $L_{eq}(h)$, dBA**

| Receiver I.D. | Measurement Location | Land Use / Activity Category | Number of Dwelling Units or Equivalent | Address | Existing Noise Level $L_{eq}(h)$, 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 | Design Year Noise Level with Project minus Existing Conditions Leq(h), dBA | Activity Category (NAC) | Impact Type (None, or A/E) | Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (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 |
| M13 | ST2 | Residential/B | 2 | 1323 W 3rd St, San Bernardino, CA | 56 | 57 | 59 | 1 | 2 | 3 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M14 | -- | Residential/B | 3 | 1344 W 2nd St, San Bernardino, CA | 52 | 54 | 54 | 2 | 0 | 2 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M15 | -- | Residential/B | 1 | 1324 W 2nd St, San Bernardino, CA | 56 | 57 | 59 | 1 | 2 | 3 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M16 | -- | Undeveloped Land/G | 1 | N/A | 54 | 56 | 56 | 2 | 0 | 2 | G (-) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M17 | -- | Undeveloped Land/G | 1 | N/A | 63 | 64 | 62 | 1 | -2 | -1 | G (-) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M18 | ST3 | Residential/B | 1 | 1335 W 2nd St, San Bernardino, CA | 55 | 56 | 56 | 1 | 0 | 1 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M19 | -- | Residential/B | 2 | 1341 W 2nd St, San Bernardino, CA | 49 | 51 | 51 | 2 | 0 | 2 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M20 | ST4 | Residential/B | 3 | 1323 W 2nd St, San Bernardino, CA | 52 | 54 | 54 | 2 | 0 | 2 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M21 | ST5 | Residential/B | 1 | 160 N Mt Vernon Ave, San Bernardino, CA | 56 | 57 | 57 | 1 | 0 | 1 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M22 | -- | Residential/B | 3 | 155 N Mt Vernon Ave, San Bernardino, CA | 56 | 58 | 58 | 2 | 0 | 2 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| M23 | ST6 (LT1) | Residential/B | 1 | 1278 W King St, San Bernardino, CA | 57 | 58 | 58 | 1 | 0 | 1 | B (67) | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Note: Under Existing and No Build conditions, M11/ST1 is representative of one vacant lot and three residences. However, these properties will all be acquired as part opf the proposed project and, therefore, M11/ST1 does not represent any sensitive receptors under the Build condition.

# Appendix C Supplemental Data

Appendix C-1

# Calibration Certificates

**Scantek, Inc.**
CALIBRATION LABORATORY

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

NVLAP
CALIBRATION
NVLAP Lab Code: 200625-0

# Calibration Certificate No.37557

| | |
|---|---|
| *Instrument:* | **Sound Level Meter** |
| *Model:* | **NL21** |
| *Manufacturer:* | **Rion** |
| *Serial number:* | **00776887** |
| *Tested with:* | **Microphone UC52 s/n 114985**<br>**Preamplifier NH21 s/n 24692** |
| *Type (class):* | **2** |
| *Customer:* | **ICF International** |
| *Tel/Fax:* | **949-333-6119 /** |

*Date Calibrated:* **12/21/2016** *Cal Due:* **12/21/2017**

| *Status:* | **Received** | **Sent** |
|---|---|---|
| *In tolerance:* | **X** | **X** |
| *Out of tolerance:* | | |
| *See comments:* | | |

*Contains non-accredited tests:* __ **Yes** **X** **No**
*Calibration service:* __ **Basic** **X** **Standard**
*Address:* **1 Ada, Suite 100**
**Irvine, CA 92618**

**Tested in accordance with the following procedures and standards:**
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

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

| Instrument - Manufacturer | Description | S/N | Cal. Date | Traceability evidence<br>Cal. Lab / Accreditation | Cal. Due |
|---|---|---|---|---|---|
| 483B-Norsonic | SME Cal Unit | 31061 | Jul 27, 2016 | Scantek, Inc./ NVLAP | Jul 27, 2017 |
| DS-360-SRS | Function Generator | 88077 | Sep 15, 2016 | ACR Env./ A2LA | Sep 15, 2018 |
| 34401A-Agilent Technologies | Digital Voltmeter | MY47011118 | Sep 15, 2016 | ACR Env./ A2LA | Sep 15, 2017 |
| HM30-Thommen | Meteo Station | 1040170/39633 | Nov 1, 2016 | ACR Env./ A2LA | Nov 1, 2017 |
| PC Program 1019 Norsonic | Calibration software | v.6.1T | Validated Nov 2014 | Scantek, Inc. | - |
| 1251-Norsonic | Calibrator | 30878 | Nov 10, 2016 | Scantek, Inc./ NVLAP | Nov 10, 2017 |
| 4226-Brüel&Kjær | Multifunction calibrator | 2305103 | Jul 25, 2016 | Scantek, Inc./ NVLAP | Jul 25, 2017 |

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

**Environmental conditions:**

| Temperature (°C) | Barometric pressure (kPa) | Relative Humidity (%) |
|---|---|---|
| 22.5 | 100.72 | 37.5 |

| **Calibrated by:** | Jeremy Gotwalt | **Authorized signatory:** | Steven E. Marshall |
|---|---|---|---|
| Signature | Jeremy Gotwalt | Signature | Steven E Marshall |
| Date | 12/21/16 | Date | 12/22/2016 |


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**Results summary:** Device complies with following clauses of mentioned specifications:

| CLAUSES [1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES: | RESULT[2,3] | EXPANDED UNCERTAINTY (coverage factor 2) [dB] |
|---|---|---|
| INDICATION AT THE CALIBRATION CHECK FREQUENCY - IEC61672-3 ED.2 CLAUSE 10 | Passed | 0.15 |
| SELF-GENERATED NOISE - IEC 61672-3 ED.2 CLAUSE 11 | For Info | 0.3 |
| ACOUSTICAL TEST OF A FREQUENCY WEIGHTING - IEC 61672-3 ED.2.0 CLAUSE 12 | Passed | 0.3 |
| FREQUENCY WEIGHTINGS: A NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13 | Passed | 0.2 |
| FREQUENCY WEIGHTINGS: C NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13 | Passed | 0.2 |
| FREQUENCY WEIGHTINGS: Z NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13 | Passed | 0.2 |
| FREQUENCY AND TIME WEIGHTINGS AT 1 KHZ IEC 61672-3 ED.2.0 CLAUSE 14 | Passed | 0.2 |
| LEVEL LINEARITY ON THE REFERENCE LEVEL RANGE - IEC 61672-3 ED.2 CLAUSE 16 | Passed | 0.25 |
| LEVEL LINEARITY INCLUDING THE LEVEL RANGE CONTROL - IEC 61672-3 ED.2.0 CLAUSE 17 | Passed | 0.25 |
| TONEBURST RESPONSE - IEC 61672-3 ED.2.0 CLAUSE 18 | Passed | 0.3 |
| PEAK C SOUND LEVEL - IEC 61672-3 ED.2.0 CLAUSE 19 | Passed | 0.35 |
| OVERLOAD INDICATION - IEC 61672-3 ED.2.0 CLAUSE 20 | Passed | 0.25 |
| HIGH LEVEL STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 21 | Passed | 0.1 |
| LONG TERM STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 15 | Passed | 0.1 |
| FILTER TEST 1/3OCTAVE: RELATIVE ATTENUATION - IEC 61260, CLAUSE 4.4 & #5.3 | Passed | 0.25 |
| COMBINED ELECTRICAL AND ACOUSTICAL TEST - IEC 61672-3 ED.2.0 CLAUSE 13 | Passed | See test report |

1 The results of this calibration apply only to the instrument type with serial number identified in this report.

2 Parameters are certified at actual environmental conditions.

3 The tests marked with (*) are not covered by the current NVLAP accreditation.

**Comments:** The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3, for the environmental conditions under which the tests were performed. However, No general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1 because evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conforms to the requirements of IEC 61672-1:2002, and because the periodic tests of IEC 61672-3 cover only a limited subset of the specifications in IEC 61672-1.

***Note:*** The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

**Tests made with the following attachments to the instrument:**

| |
|---|
| Microphone: Rion UC52 s/n 114985 for acoustical test |
| Preamplifier: Rion NH21 s/n 24692 for all tests |
| Other: Rion EC04 extension cable for all tests and line adaptor ADP005 (18pF) for electrical tests |
| Accompanying acoustical calibrator: none |
| Windscreen: none |

**Measured Data:** in Test Report # 37557 of nine pages.

**Place of Calibration: Scantek, Inc.**
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

**Scantek, Inc.**
CALIBRATION LABORATORY

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

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

# Calibration Certificate No.37558

| | | | | |
|---|---|---|---|---|
| *Instrument:* | **Sound Level Meter** | *Date Calibrated:* **12/21/2016** | *Cal Due:* **12/21/2017** | |
| *Model:* | **NL21** | *Status:* | **Received** | **Sent** |
| *Manufacturer:* | **Rion** | *In tolerance:* | X | X |
| *Serial number:* | **00676771** | *Out of tolerance:* | | |
| *Tested with:* | **Microphone UC52 s/n 113476**<br>**Preamplifier NH21 s/n 23983** | *See comments:* | | |
| | | *Contains non-accredited tests:* __Yes _X_ No | | |
| *Type (class):* | **2** | *Calibration service:* __ Basic _X_ Standard | | |
| *Customer:* | **ICF International** | *Address:* **1 Ada, Suite 100**<br>**Irvine, CA 92618** | | |
| *Tel/Fax:* | **949-333-6119 /** | | | |

**Tested in accordance with the following procedures and standards:**
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

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

| Instrument - Manufacturer | Description | S/N | Cal. Date | Traceability evidence<br>Cal. Lab / Accreditation | Cal. Due |
|---|---|---|---|---|---|
| 483B-Norsonic | SME Cal Unit | 31061 | Jul 27, 2016 | Scantek, Inc./ NVLAP | Jul 27, 2017 |
| DS-360-SRS | Function Generator | 88077 | Sep 15, 2016 | ACR Env./ A2LA | Sep 15, 2018 |
| 34401A-Agilent Technologies | Digital Voltmeter | MY47011118 | Sep 15, 2016 | ACR Env./ A2LA | Sep 15, 2017 |
| HM30-Thommen | Meteo Station | 1040170/39633 | Nov 1, 2016 | ACR Env./ A2LA | Nov 1, 2017 |
| PC Program 1019 Norsonic | Calibration software | v.6.1T | Validated Nov 2014 | Scantek, Inc. | - |
| 1251-Norsonic | Calibrator | 30878 | Nov 10, 2016 | Scantek, Inc./ NVLAP | Nov 10, 2017 |
| 4226-Brüel&Kjær | Multifunction calibrator | 2305103 | Jul 25, 2016 | Scantek, Inc./ NVLAP | Jul 25, 2017 |

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

**Environmental conditions:**

| Temperature (°C) | Barometric pressure (kPa) | Relative Humidity (%) |
|---|---|---|
| 22.7 | 100.74 | 38.5 |

| **Calibrated by:** | Jeremy Gotwalt | **Authorized signatory:** | Steven E. Marshall |
|---|---|---|---|
| Signature | *[signature]* | Signature | *Steven E Marshall* |
| Date | 12/21/16 | Date | 12/22/2016 |


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**Results summary:** Device complies with following clauses of mentioned specifications:

| CLAUSES [1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES: | RESULT[2,3] | EXPANDED UNCERTAINTY (coverage factor 2) [dB] |
|---|---|---|
| INDICATION AT THE CALIBRATION CHECK FREQUENCY - IEC61672-3 ED.2 CLAUSE 10 | Passed | 0.15 |
| SELF-GENERATED NOISE - IEC 61672-3 ED.2 CLAUSE 11 | For Info | 0.3 |
| ACOUSTICAL TEST OF A FREQUENCY WEIGHTING - IEC 61672-3 ED.2.0 CLAUSE 12 | Passed | 0.3 |
| FREQUENCY WEIGHTINGS: A NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13 | Passed | 0.2 |
| FREQUENCY WEIGHTINGS: C NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13 | Passed | 0.2 |
| FREQUENCY WEIGHTINGS: Z NETWORK - IEC 61672-3 ED.2.0 CLAUSE 13 | Passed | 0.2 |
| FREQUENCY AND TIME WEIGHTINGS AT 1 KHZ IEC 61672-3 ED.2.0 CLAUSE 14 | Passed | 0.2 |
| LEVEL LINEARITY ON THE REFERENCE LEVEL RANGE - IEC 61672-3 ED.2 CLAUSE 16 | Passed | 0.25 |
| LEVEL LINEARITY INCLUDING THE LEVEL RANGE CONTROL - IEC 61672-3 ED.2.0 CLAUSE 17 | Passed | 0.25 |
| TONEBURST RESPONSE - IEC 61672-3 ED.2.0 CLAUSE 18 | Passed | 0.3 |
| PEAK C SOUND LEVEL - IEC 61672-3 ED.2.0 CLAUSE 19 | Passed | 0.35 |
| OVERLOAD INDICATION - IEC 61672-3 ED.2.0 CLAUSE 20 | Passed | 0.25 |
| HIGH LEVEL STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 21 | Passed | 0.1 |
| LONG TERM STABILITY TEST - IEC 61672-3 ED.2.0 CLAUSE 15 | Passed | 0.1 |

1 The results of this calibration apply only to the instrument type with serial number identified in this report.

2 Parameters are certified at actual environmental conditions.

3 The tests marked with (*) are not covered by the current NVLAP accreditation.

**Comments:** The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3, for the environmental conditions under which the tests were performed. However, No general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1 because evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conforms to the requirements of IEC 61672-1:2002, and because the periodic tests of IEC 61672-3 cover only a limited subset of the specifications in IEC 61672-1.

***Note:*** The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

**Tests made with the following attachments to the instrument:**

| | |
|---|---|
| Microphone: | Rion UC52 s/n 113476 for acoustical test |
| Preamplifier: | Rion NH21 s/n 23983 for all tests |
| Other: Rion EC04 extension cable for all tests and line adaptor ADP005 (18pF) for electrical tests | |
| Accompanying acoustical calibrator: | none |
| Windscreen: | none |

**Measured Data:** in Test Report # 37558 of nine pages.

**Place of Calibration: Scantek, Inc.**
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

# Calibration Certificate

***Certificate Number 2017000056***

***Customer:***

**IFC International**
**1 Ada**
**Irvine, CA 92618, United States**

| | | | |
|---|---|---|---|
| ***Model Number*** | 831 | ***Procedure Number*** | D0001.8384 |
| ***Serial Number*** | 0003786 | ***Technician*** | Ron Harris |
| ***Test Results*** | **Pass** | ***Calibration Date*** | 4 Jan 2017 |
| ***Initial Condition*** | AS RECEIVED same as shipped | ***Calibration Due*** | 4 Jan 2018 |
| | | ***Temperature*** | 23.46 °C ± 0.25 °C |
| ***Description*** | Larson Davis Model 831<br>Class 1 Sound Level Meter<br>Firmware Revision: 2.311 | ***Humidity*** | 48.7 %RH ± 2.0 %RH |
| | | ***Static Pressure*** | 85.45 kPa ± 0.13 kPa |

***Evaluation Method*** ***Tested with:*** ***Data reported in dB re 20 μPa.***

Larson Davis PRM831. S/N 029611
PCB 377B02. S/N 147191
Larson Davis CAL200. S/N 9079
Larson Davis CAL291. S/N 0203

***Compliance Standards*** Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

| | |
|---|---|
| IEC 60651:2001 Type 1 | ANSI S1.4-2014 Class 1 |
| IEC 60804:2000 Type 1 | ANSI S1.4 (R2006) Type 1 |
| IEC 61252:2002 | ANSI S1.11 (R2009) Class 1 |
| IEC 61260:2001 Class 1 | ANSI S1.25 (R2007) |
| IEC 61672:2013 Class 1 | ANSI S1.43 (R2007) Type 1 |

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.

**Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis Model 831 Sound Level Meter Manual, I831.01 Rev O, 2016-09-19

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to

1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 μPa; Reference Range: 0 dB gain

Periodic tests were performed in accordance with precedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2016-02-24 certificate number DE-15-M-PTB-0056.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

**Standards Used**

| Description | Cal Date | Cal Due | Cal Standard |
|---|---|---|---|
| SRS DS360 Ultra Low Distortion Generator | 2016-06-21 | 2017-06-21 | 006311 |
| Hart Scientific 2626-S Humidity/Temperature Sensor | 2016-06-17 | 2017-06-17 | 006946 |
| Larson Davis CAL200 Acoustic Calibrator | 2016-07-26 | 2017-07-26 | 007027 |
| Larson Davis Model 831 | 2016-03-01 | 2017-03-01 | 007182 |
| PCB 377A13 1/2 inch Prepolarized Pressure Microphone | 2016-03-07 | 2017-03-07 | 007185 |
| Larson Davis CAL291 Residual Intensity Calibrator | 2016-09-22 | 2017-09-22 | 007287 |

## Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

| Measurement | Test Result [dB] | Lower Limit [dB] | Upper Limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|
| 1000 Hz | 114.00 | 113.80 | 114.20 | 0.14 | Pass |

As Received Level: 113.88
Adjusted Level: 114.00

-- End of measurement results--

## Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

| Frequency [Hz] | Test Result [dB] | Expected [dB] | Lower Limit [dB] | Upper Limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|---|
| 125 | -0.10 | -0.20 | -1.20 | 0.80 | 0.23 | Pass |
| 1000 | 0.13 | 0.00 | -0.70 | 0.70 | 0.23 | Pass |
| 8000 | -3.81 | -3.00 | -5.50 | -1.50 | 0.32 | Pass |

-- End of measurement results--

## Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

| Measurement | Test Result [dB] |
|---|---|
| A-weighted, 20 dB gain | 37.58 |

-- End of measurement results--

-- End of Report--

Signatory: Ron Harris

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA A2LA ACCREDITED Cert. #3622.01

LARSON DAVIS A PCB PIEZOTRONICS DIV.

# Calibration Certificate

***Certificate Number 2016010561***

***Customer:***

**IFC International**
**1 Ada**
**Irvine, CA 92618, United States**

| | | | |
|---|---|---|---|
| ***Model Number*** | LxT1 | ***Procedure Number*** | D0001.8384 |
| ***Serial Number*** | 0004005 | ***Technician*** | Ron Harris |
| ***Test Results*** | **Pass** | ***Calibration Date*** | 29 Nov 2016 |
| ***Initial Condition*** | AS RECEIVED same as shipped | ***Calibration Due*** | 29 Nov 2017 |
| | | ***Temperature*** | 23.11 °C ± 0.25 °C |
| ***Description*** | SoundTrack LxT Class 1<br>Class 1 Sound Level Meter<br>Firmware Revision: 2.301 | ***Humidity*** | 50.2 %RH ± 2.0 %RH |
| | | ***Static Pressure*** | 86.16 kPa ± 0.13 kPa |

***Evaluation Method*** ***Tested with:*** ***Data reported in dB re 20 μPa.***

Larson Davis PRMLxT1L. S/N 029341
PCB 377B02. S/N 147979
Larson Davis CAL200. S/N 9079
Larson Davis CAL291. S/N 0203

***Compliance Standards*** Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

| | |
|---|---|
| IEC 60651:2001 Type 1 | ANSI S1.4-2014 Class 1 |
| IEC 60804:2000 Type 1 | ANSI S1.4 (R2006) Type 1 |
| IEC 61252:2002 | ANSI S1.11 (R2009) Class 1 |
| IEC 61260:2001 Class 1 | ANSI S1.25 (R2007) |
| IEC 61672:2013 Class 1 | ANSI S1.43 (R2007) Type 1 |

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.

**Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.



Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert Lxt, I770.01 Rev J Supporting Firmware Version 2.301, 2015-04-30

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to 1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 μPa

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2007-10-09 reference number PTB-1.72-4034218.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organization responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013 / ANSI/ASA S1.4-2014/Part 2, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1; the sound level meter submitted for testing conforms to the class 1specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

**Standards Used**

| Description | Cal Date | Cal Due | Cal Standard |
|---|---|---|---|
| SRS DS360 Ultra Low Distortion Generator | 2016-06-21 | 2017-06-21 | 006311 |
| Hart Scientific 2626-S Humidity/Temperature Sensor | 2016-06-17 | 2017-06-17 | 006946 |
| Larson Davis CAL200 Acoustic Calibrator | 2016-07-26 | 2017-07-26 | 007027 |
| Larson Davis Model 831 | 2016-03-01 | 2017-03-01 | 007182 |
| PCB 377A13 1/2 inch Prepolarized Pressure Microphone | 2016-03-07 | 2017-03-07 | 007185 |
| Larson Davis CAL291 Residual Intensity Calibrator | 2016-09-22 | 2017-09-22 | 007287 |

## Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

| Measurement | Test Result [dB] | Lower Limit [dB] | Upper Limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|
| 1000 Hz | 114.01 | 113.80 | 114.20 | 0.14 | Pass |

As Received Level: 114.54
Adjusted Level: 114.01

-- End of measurement results--

## Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

| Frequency [Hz] | Test Result [dB] | Expected [dB] | Lower Limit [dB] | Upper Limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|---|
| 125 | -0.01 | -0.20 | -1.20 | 0.80 | 0.23 | Pass |
| 1000 | 0.12 | 0.00 | -0.70 | 0.70 | 0.23 | Pass |
| 8000 | -4.72 | -3.00 | -5.50 | -1.50 | 0.32 | Pass |

-- End of measurement results--

## Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

| Measurement | Test Result [dB] |
|---|---|
| A-weighted | 37.33 |

-- End of measurement results--

-- End of Report--

Signatory: *Ron Harris*

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1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ilac-MRA ACCREDITED Cert. #3622.01

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# Calibration Certificate

***Certificate Number 2016010598***

***Customer:***
**IFC International**
**1 Ada**
**Irvine, CA 92618, United States**

| | | | | | |
|---|---|---|---|---|---|
| ***Model Number*** | CAL200 | ***Procedure Number*** | D0001.8386 | | |
| ***Serial Number*** | 2916 | ***Technician*** | Scott Montgomery | | |
| ***Test Results*** | **Pass** | ***Calibration Date*** | 30 Nov 2016 | | |
| ***Initial Condition*** | Adjusted | ***Calibration Due*** | 30 Nov 2017 | | |
| | | ***Temperature*** | 24 | °C | ± 0.3 °C |
| ***Description*** | Larson Davis CAL200 Acoustic Calibrator | ***Humidity*** | 28 | %RH | ± 3 %RH |
| | | ***Static Pressure*** | 101.3 | kPa | ± 1 kPa |

***Evaluation Method*** The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 μPa.

***Compliance Standards*** Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2003 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005.
**Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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**Standards Used**

| Description | Cal Date | Cal Due | Cal Standard |
|---|---|---|---|
| Agilent 34401A DMM | 09/07/2016 | 09/07/2017 | 001021 |
| Sound Level Meter / Real Time Analyzer | 04/07/2016 | 04/07/2017 | 001051 |
| Microphone Calibration System | 08/17/2016 | 08/17/2017 | 005446 |
| 1/2" Preamplifier | 10/06/2016 | 10/06/2017 | 006506 |
| Larson Davis 1/2" Preamplifier 7-pin LEMO | 08/22/2016 | 08/22/2017 | 006507 |
| 1/2 inch Microphone - RI - 200V | 03/15/2016 | 03/15/2017 | 006510 |
| Pressure Transducer | 07/01/2016 | 07/01/2017 | 007368 |

## Output Level

| Nominal Level [dB] | Pressure [kPa] | Test Result [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|---|
| 114 | 101.3 | 114.00 | 113.80 | 114.20 | 0.13 | Pass |
| 94 | 101.3 | 93.99 | 93.80 | 94.20 | 0.14 | Pass |

-- End of measurement results--

## Frequency

| Nominal Level [dB] | Pressure [kPa] | Test Result [Hz] | Lower limit [Hz] | Upper limit [Hz] | Expanded Uncertainty [Hz] | Result |
|---|---|---|---|---|---|---|
| 94 | 101.3 | 1,000.11 | 990.00 | 1,010.00 | 0.20 | Pass |
| 114 | 101.3 | 1,000.11 | 990.00 | 1,010.00 | 0.20 | Pass |

-- End of measurement results--

## Total Harmonic Distortion + Noise (THD+N)

| Nominal Level [dB] | Pressure [kPa] | Test Result [%] | Lower limit [%] | Upper limit [%] | Expanded Uncertainty [%] | Result |
|---|---|---|---|---|---|---|
| 94 | 101.3 | 0.39 | 0.00 | 2.00 | 0.25 | Pass |
| 114 | 101.3 | 0.33 | 0.00 | 2.00 | 0.25 | Pass |

-- End of measurement results--

## Level Change Over Pressure

Tested at: 114 dB, 24 °C, 27 %RH

| Nominal Pressure [kPa] | Pressure [kPa] | Test Result [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|---|
| 101.3 | 101.0 | 0.00 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 108.0 | 107.9 | -0.05 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 92.0 | 92.0 | 0.05 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 83.0 | 83.2 | 0.08 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 74.0 | 74.2 | 0.08 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 65.0 | 65.1 | 0.01 | -0.30 | 0.30 | 0.04 ‡ | Pass |

-- End of measurement results--

## Frequency Change Over Pressure

Tested at: 114 dB, 24 °C, 27 %RH

| Nominal Pressure [kPa] | Pressure [kPa] | Test Result [Hz] | Lower limit [Hz] | Upper limit [Hz] | Expanded Uncertainty [Hz] | Result |
|---|---|---|---|---|---|---|
| 101.3 | 101.0 | 0.00 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 108.0 | 107.9 | -0.01 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 92.0 | 92.0 | -0.01 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 83.0 | 83.2 | -0.01 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 74.0 | 74.2 | -0.01 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 65.0 | 65.1 | -0.01 | -10.00 | 10.00 | 0.20 ‡ | Pass |

-- End of measurement results--

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Provo, UT 84601, United States
716-684-0001

## Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 24 °C, 27 %RH

| Nominal Pressure [kPa] | Pressure [kPa] | Test Result [%] | Lower limit [%] | Upper limit [%] | Expanded Uncertainty [%] | Result |
|---|---|---|---|---|---|---|
| 74.0 | 74.2 | 0.30 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 108.0 | 107.9 | 0.34 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 101.3 | 101.0 | 0.33 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 92.0 | 92.0 | 0.32 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 83.0 | 83.2 | 0.31 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 65.0 | 65.1 | 0.31 | 0.00 | 2.00 | 0.25 ‡ | Pass |

-- End of measurement results--

Signatory: *Scott Montgomery*

Larson Davis, a division of PCB Piezotronics, Inc
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED
Cert. #3622.01

LARSON DAVIS
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# Calibration Certificate

***Certificate Number 2017000100***

***Customer:***
**IFC International**
**1 Ada**
**Irvine, CA 92618, United States**

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Model Number*** | CAL200 | ***Procedure Number*** | D0001.8386 | | | |
| ***Serial Number*** | 6645 | ***Technician*** | Scott Montgomery | | | |
| ***Test Results*** | **Pass** | ***Calibration Date*** | 5 Jan 2017 | | | |
| ***Initial Condition*** | Adjusted | ***Calibration Due*** | 5 Jan 2018 | | | |
| | | ***Temperature*** | 23 | °C | ± 0.3 °C | |
| ***Description*** | Larson Davis CAL200 Acoustic Calibrator | ***Humidity*** | 33 | %RH | ± 3 %RH | |
| | | ***Static Pressure*** | 101.1 | kPa | ± 1 kPa | |

***Evaluation Method*** The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 μPa.

***Compliance Standards*** Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2003 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.



**Standards Used**

| Description | Cal Date | Cal Due | Cal Standard |
|---|---|---|---|
| Agilent 34401A DMM | 09/07/2016 | 09/07/2017 | 001021 |
| Sound Level Meter / Real Time Analyzer | 04/07/2016 | 04/07/2017 | 001051 |
| Microphone Calibration System | 08/17/2016 | 08/17/2017 | 005446 |
| 1/2" Preamplifier | 10/06/2016 | 10/06/2017 | 006506 |
| Larson Davis 1/2" Preamplifier 7-pin LEMO | 08/22/2016 | 08/22/2017 | 006507 |
| 1/2 inch Microphone - RI - 200V | 03/15/2016 | 03/15/2017 | 006510 |
| Pressure Transducer | 07/01/2016 | 07/01/2017 | 007368 |

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## Output Level

| Nominal Level [dB] | Pressure [kPa] | Test Result [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|---|
| 94 | 101.1 | 94.03 | 93.80 | 94.20 | 0.14 | Pass |
| 114 | 101.4 | 114.01 | 113.80 | 114.20 | 0.13 | Pass |

-- End of measurement results--

## Frequency

| Nominal Level [dB] | Pressure [kPa] | Test Result [Hz] | Lower limit [Hz] | Upper limit [Hz] | Expanded Uncertainty [Hz] | Result |
|---|---|---|---|---|---|---|
| 94 | 101.1 | 1,000.20 | 990.00 | 1,010.00 | 0.20 | Pass |
| 114 | 101.4 | 1,000.18 | 990.00 | 1,010.00 | 0.20 | Pass |

-- End of measurement results--

## Total Harmonic Distortion + Noise (THD+N)

| Nominal Level [dB] | Pressure [kPa] | Test Result [%] | Lower limit [%] | Upper limit [%] | Expanded Uncertainty [%] | Result |
|---|---|---|---|---|---|---|
| 94 | 101.1 | 0.47 | 0.00 | 2.00 | 0.25 | Pass |
| 114 | 101.4 | 0.39 | 0.00 | 2.00 | 0.25 | Pass |

-- End of measurement results--

## Level Change Over Pressure

Tested at: 114 dB, 22 °C, 35 %RH

| Nominal Pressure [kPa] | Pressure [kPa] | Test Result [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|---|---|---|---|---|---|---|
| 101.3 | 101.2 | 0.00 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 108.0 | 107.7 | 0.03 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 92.0 | 92.2 | -0.03 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 83.0 | 83.1 | -0.03 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 74.0 | 74.1 | 0.03 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 65.0 | 65.1 | 0.16 | -0.30 | 0.30 | 0.04 ‡ | Pass |

-- End of measurement results--

## Frequency Change Over Pressure

Tested at: 114 dB, 22 °C, 35 %RH

| Nominal Pressure [kPa] | Pressure [kPa] | Test Result [Hz] | Lower limit [Hz] | Upper limit [Hz] | Expanded Uncertainty [Hz] | Result |
|---|---|---|---|---|---|---|
| 108.0 | 107.7 | 0.00 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 101.3 | 101.2 | 0.00 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 92.0 | 92.2 | 0.00 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 83.0 | 83.1 | 0.00 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 74.0 | 74.1 | 0.00 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 65.0 | 65.1 | 0.00 | -10.00 | 10.00 | 0.20 ‡ | Pass |

-- End of measurement results--

## Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 22 °C, 35 %RH

| Nominal Pressure [kPa] | Pressure [kPa] | Test Result [%] | Lower limit [%] | Upper limit [%] | Expanded Uncertainty [%] | Result |
|---|---|---|---|---|---|---|
| 108.0 | 107.7 | 0.41 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 101.3 | 101.2 | 0.39 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 92.0 | 92.2 | 0.35 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 83.0 | 83.1 | 0.31 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 74.0 | 74.1 | 0.27 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 65.0 | 65.1 | 0.24 | 0.00 | 2.00 | 0.25 ‡ | Pass |

**-- End of measurement results--**

Signatory: *Scott Montgomery*

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716-684-0001

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Appendix C-2
# Field Data Sheets

Traffic data was gathered simultaneously with the field noise measurements detailed in this appendix, using video camera(s), and the resulting videos were reviewed later to provide the vehicle counts used in model calibration runs.

The decision regarding which local streets, if any, to count for each noise measurement was made in the field by the noise analyst performing the measurements. Streets that were not observed to contribute to the overall measured noise level were not counted. Typical reasons that a local street was found to be a negligible contributor to the overall noise level were:

- The street had a very low traffic volume; and/or,
- The street was a substantial distance from the measurement location; and/or,
- The measurement location was shielded from the street by intervening barriers such as walls or buildings.

All the normalized (1-hour) calibration traffic data for this NSR is summarized in the body of the report, in Table 6-1.

# FIELD NOISE MEASUREMENT DATA

PROJECT: Mt Vernon Ave Bridge PROJ. # 365.17

**SITE IDENTIFICATION:** LT-1 OBSERVER(S): JGM
ADDRESS: 1278 W King St San Bernardino
START DATE / TIME: 8:30am 6/28/2017 END DATE / TIME: 11:25am 6/29/2017

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

**ACOUSTIC MEASUREMENTS:**
INSTRUMENT: Rion NL-21 TYPE: 1 2 SERIAL #: 00776887
CALIBRATOR: LD Cal 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN V

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{25}$ | $L_{10}$ | $L_{8.33}$ | $L_{1.67}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

COMMENTS:

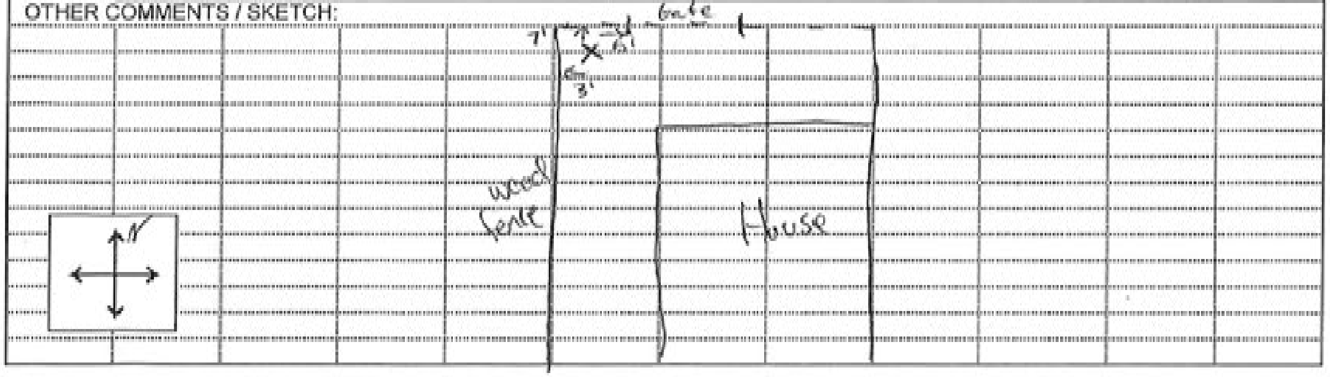
**SOURCE INFO AND TRAFFIC COUNTS:**
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: -MIN SPEED #2 COUNT SPEED

| | NB / EB | SB / WB | NB / EB | SB / WB | NB / EB | SB / WB | NB / EB | SB / WB |
|---|---|---|---|---|---|---|---|---|
| AUTOS: | | | | | | | | |
| MED. TRUCKS: | | | | | | | | |
| HVY TRUCKS: | | | | | | | | |
| BUSES: | | | | | | | | |
| MOTORCYCLES: | | | | | | | | |

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

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

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



# FIELD NOISE MEASUREMENT DATA

PROJECT: Mt Vernon Bridge PROJ. #: 365.17

**SITE IDENTIFICATION:** LT-2 OBSERVER(S): JCH
ADDRESS: 1328 W Kingman
START DATE / TIME: Clear @ 9:30AM END DATE / TIME: 11:10 am

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

**ACOUSTIC MEASUREMENTS:**
INSTRUMENT: RION NL-21 TYPE: 1 2 SERIAL #: 00676771
CALIBRATOR: CAL200 SERIAL #: 2916
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 113.6 dBA SPL WINDSCREEN ✓

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{10}$ | OTHER: | (TYPE?) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

COMMENTS:

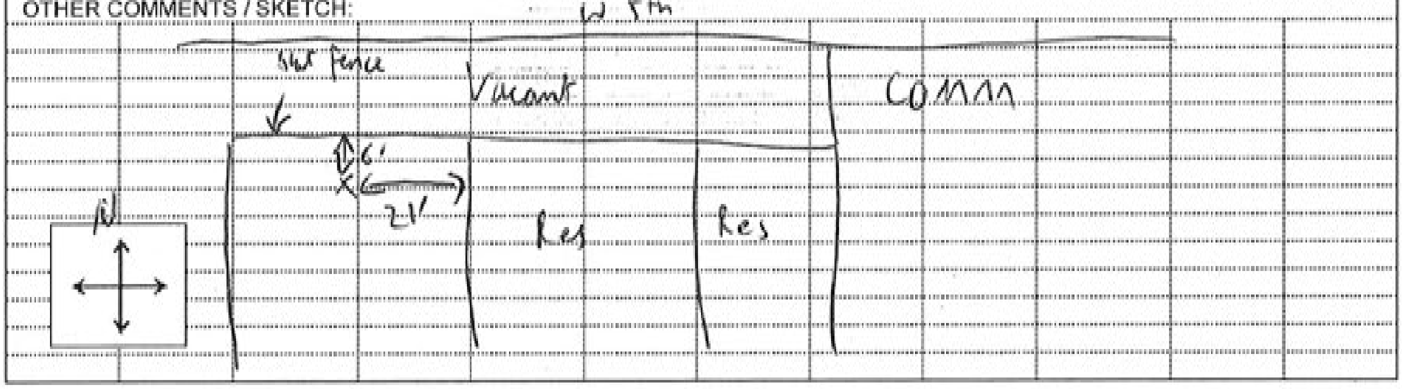
**SOURCE INFO AND TRAFFIC COUNTS:**
PRIMARY NOISE SOURCE: **TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT** OTHER: ____
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____ -MIN

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

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

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

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



FIELD NOISE MEASUREMENT DATA

PROJECT: Mt Vernon Bridge    PROJ. # 365.17

SITE IDENTIFICATION: ST-1    OBSERVER(S): JGM
ADDRESS: Vacant Lot (240 N Mt. Vernon Ave San Bernardino)
START DATE / TIME: 10:04am 6/29/2017    END DATE / TIME: 10:56am 6/29/2017

METEROLOGICAL CONDITIONS:
TEMP: 81 °F    HUMIDITY: 44 %R.H.    WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0-5 MPH    DIR: N NE E SE S SW W NW    STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN    OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 831    TYPE: 1 2    SERIAL #: 3786
CALIBRATOR: LD Cal 200    SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL    POST-TEST 114.21 dBA SPL    WINDSCREEN ✓

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{25}$ | $L_{10}$ | $L_{8.33}$ | $L_{1.67}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 479 | 10:04 | 10:20 | 58.6 | 76.6 | 42.8 | 47.4 | 53.3 | 56.9 | 60.5 | 66.1 | 68.4 |
| 480 | 10:22 | 10:38 | 54.7 | 71.6 | 46.2 | 48.5 | 52.2 | 55.4 | 57.7 | 58.2 | 61.7 |
| 481 | 10:40 | 10:56 | 54.0 | 65.9 | 43.7 | 49.0 | 52.8 | 54.4 | 56.3 | 56.7 | 61.2 |

COMMENTS:

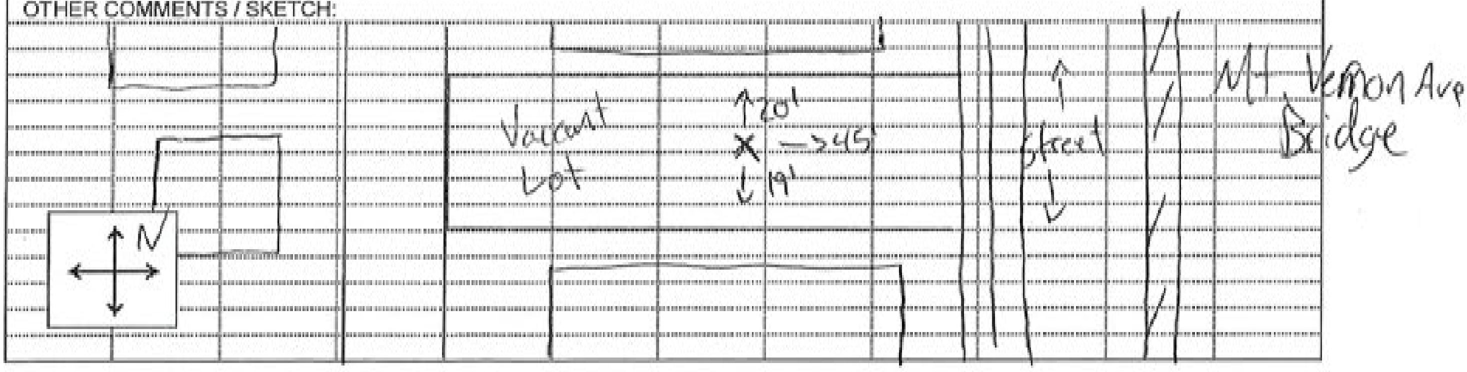
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL (horn) INDUSTRIAL AMBIENT OTHER: Car Wash, Dogs
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ___-MIN

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

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Dogs wouldn't stop barking, vacuum/compressors at car wash.

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




Note: Do not use Run 1 due to excess variation in Leq relative to Runs 2 & 3

# FIELD NOISE MEASUREMENT DATA

PROJECT: Mt. Vernon Bridge PROJ. # 365.17

SITE IDENTIFICATION: ST-2
ADDRESS: 1323
START DATE / TIME: 6/29/17
OBSERVER(S): JLH
END DATE / TIME: 6/29/17

**METEROLOGICAL CONDITIONS:**

TEMP: 81 °F HUMIDITY: 44 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0-5 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

**ACOUSTIC MEASUREMENTS:**

INSTRUMENT: LD LxT1 TYPE: 1 2 SERIAL #: 4005
CALIBRATOR: LD CAL200 SERIAL #: 2916
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 113.50 dBA SPL WINDSCREEN ✓

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{25}$ | $L_{10}$ | $L_{8.33}$ | $L_{1.67}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 182 | 10:04 | 10:20 | 52.6 | 62.8 | 46.8 | 48.4 | 50.4 | 52.8 | 54.5 | 54.8 | 57.3 |
| 183 | 10:22 | 10:38 | 52.0 | 61.3 | 48.5 | 49.3 | 50.7 | 51.7 | 53.6 | 53.9 | 57.6 |
| 184 | 10:40 | 10:56 | 51.1 | 60.8 | 47.6 | 48.5 | 50.2 | 51.1 | 52.5 | 53.2 | 54.8 |

COMMENTS:
ST-3 had to be paused for car wash, use 1 & 2

**SOURCE INFO AND TRAFFIC COUNTS:**

PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:

TRAFFIC COUNT DURATION: ____-MIN

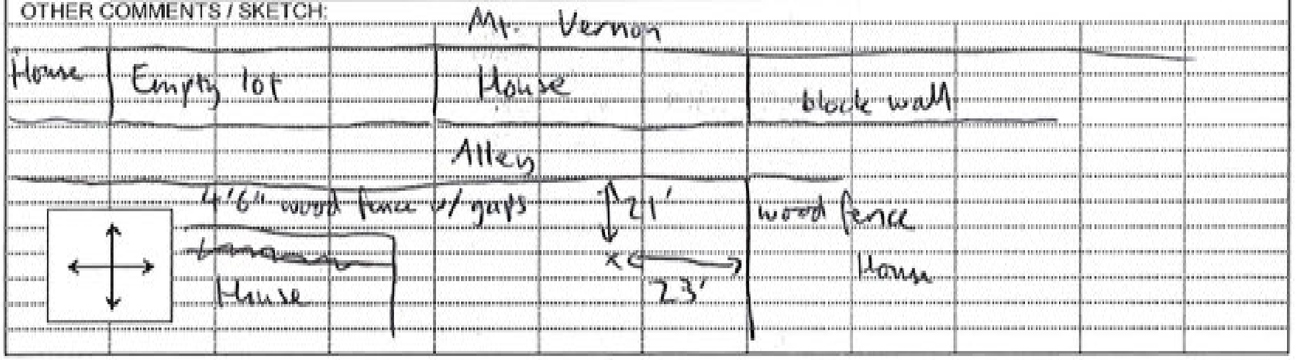
| | SPEED | | | | #2 COUNT | | SPEED | |
|---|---|---|---|---|---|---|---|---|
| | NB / EB | SB / WB | NB / EB | SB / WB | NB / EB | SB / WB | NB / EB | SB / WB |
| AUTOS: | | | | | | | | |
| MED. TRUCKS: | | | | | | | | |
| HVY TRUCKS: | | | | | | | | |
| BUSES: | | | | | | | | |
| MOTORCYCLES: | |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

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Rail yard. Car wash - vacuums, blowers

**DESCRIPTION / SKETCH:**

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



# FIELD NOISE MEASUREMENT DATA

PROJECT: Mt Vernon Bridge PROJ. # 365.17

SITE IDENTIFICATION: ST-3
ADDRESS: 1335 W. 2nd St. San Bernardino
START DATE / TIME: 9:54 am 6/28/2017
OBSERVER(S): JGM
END DATE / TIME: 10:30 am 6/28/2017

**METEROLOGICAL CONDITIONS:**
TEMP: 84 °F HUMIDITY: 16 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

**ACOUSTIC MEASUREMENTS:**
INSTRUMENT: LD 831 TYPE: 1 2 SERIAL #: 3786
CALIBRATOR: LD Cal 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.14 dBA SPL WINDSCREEN ✓

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{25}$ | $L_{10}$ | $L_{8.33}$ | $L_{1.67}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 470 | 9:54 | 10:10 | 52.2 | 67.4 | 44.0 | 46.8 | 50.7 | 53.3 | 55.1 | 65.4 | 67.7 |
| 471 | 10:14 | 10:30 | 52.1 | 64.5 | 43.0 | 45.7 | 49.6 | 52.0 | 55.5 | 56.6 | 59.8 |

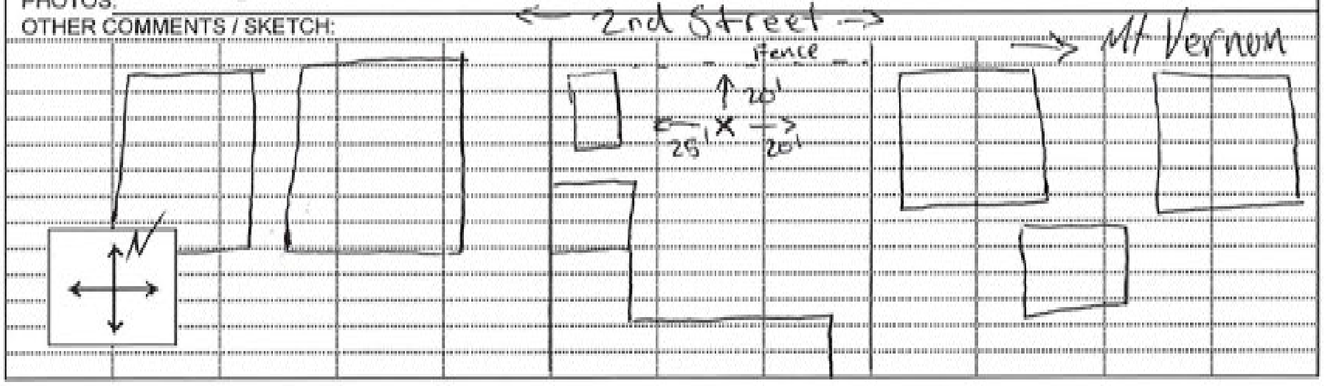
COMMENTS:
1 pickup truck on street each run (NB)

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

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

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Distant construction, Distant music, chickens/roosters, only a few trucks audible from Mt. Vernon., distant freight rail, helicopters, jet aircraft, nearby car wash.

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



# FIELD NOISE MEASUREMENT DATA

PROJECT: Mt. Vernon Bridge　　PROJ. #: 365.17

SITE IDENTIFICATION: ST4　　OBSERVER(S): JLH
ADDRESS: Alley next to 1323 W. 2nd Street
START DATE / TIME: 6/28/17 9:54　　END DATE / TIME: 6/28/17 10:30

**METEROLOGICAL CONDITIONS:**
TEMP: 84 °F　HUMIDITY: 16 %R.H.　WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0-7 MPH　DIR: N NE E SE S SW W NW　STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN　OTHER:

**ACOUSTIC MEASUREMENTS:**
INSTRUMENT: LD LxT1　TYPE: 1 2　SERIAL #: 4005
CALIBRATOR: LD CAL200　SERIAL #: #2916
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL　POST-TEST 114.07 dBA SPL　WINDSCREEN ✓

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{10}$ | OTHER: | (TYPE?) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 175 | 9:54 | 10:10 | 51.1 | 64.5 | 43.6 | 45.9 | 49.5 | 53.8 | | | |
| 176 | 10:14 | 10:30 | 51.9 | 64.2 | 42.1 | 46.0 | 49.3 | 53.8 | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

COMMENTS:

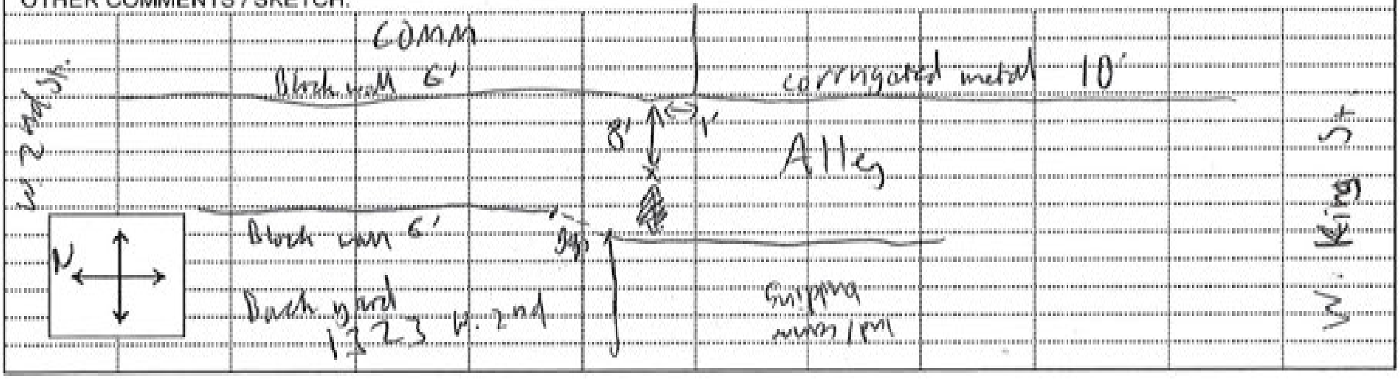
**SOURCE INFO AND TRAFFIC COUNTS:**
PRIMARY NOISE SOURCE: TRAFFIC　AIRCRAFT　RAIL　INDUSTRIAL　AMBIENT　OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN

| | NB / EB | SB / WB | SPEED NB / EB | SPEED SB / WB | #2 COUNT NB / EB | #2 COUNT SB / WB | SPEED NB / EB | SPEED SB / WB |
|---|---|---|---|---|---|---|---|---|
| AUTOS: | 1 | 1 | | | | | | |
| MED. TRUCKS: | 1 | 1 | | | | | | |
| HVY TRUCKS: | | | | | | | | |
| BUSES: | | | | | | | | |
| MOTORCYCLES: | | | | | | | | |

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Distant rail. With low traffic noise, may not calibrate. Carwash

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



FIELD NOISE MEASUREMENT DATA

PROJECT: Mt. Vernon Bridge PROJ. # 365.17

SITE IDENTIFICATION: ST-5 OBSERVER(S): JGM
ADDRESS: 1320 W King St. San Bernardino
START DATE / TIME: 10:58am 6/28/2017 END DATE / TIME: 11:34am 6/28/2017

METEROLOGICAL CONDITIONS:
TEMP: 87 °F HUMIDITY: 17 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0-4 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 831 TYPE: 1 2 SERIAL #: 3786
CALIBRATOR: LD Cal 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.07 dBA SPL WINDSCREEN ✓

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{25}$ | $L_{10}$ | $L_{8.33}$ | $L_{1.67}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 472 | 10:58 | 11:14 | 55.7 | 71.7 | 43.6 | 46.8 | 51.6 | 54.6 | 58.1 | 58.6 | 63.5 |
| 473 | 11:18 | 11:34 | 56.5 | 68.2 | 44.9 | 48.6 | 54.0 | 56.9 | 60.0 | 60.3 | 63.8 |

COMMENTS:

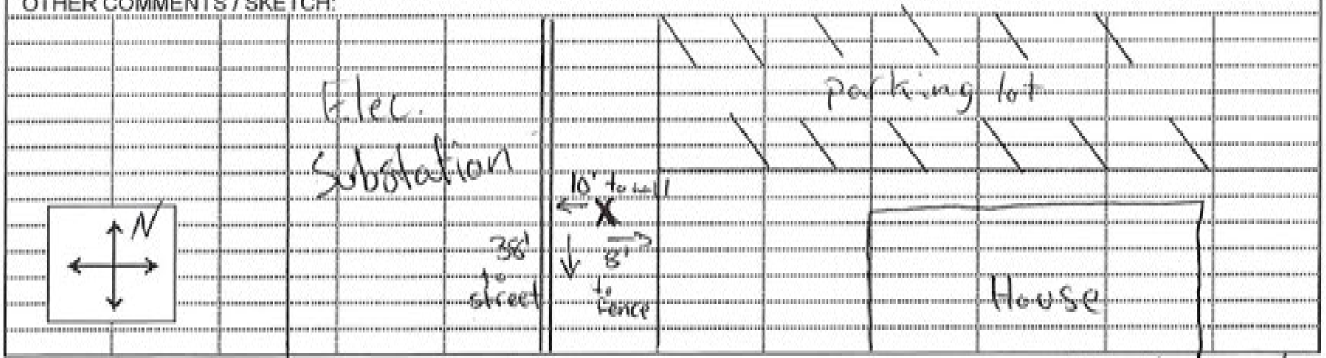
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN SPEED #2 COUNT SPEED

| | NB / EB | SB / WB | NB / EB | SB / WB | #2 NB / EB | #2 SB / WB | NB / EB | SB / WB |
|---|---|---|---|---|---|---|---|---|
| AUTOS: | | | | | | | | |
| MED. TRUCKS: | | | | | | | | |
| HVY TRUCKS: | | | | | | | | |
| BUSES: | | | | | | | | |
| MOTORCYCLES: | | | | | | | | |

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Police activity, Birds extremely loud at this location, truck traffic very audible, garbage trucks, motorcycles, dogs barking, people pushing shopping carts.

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




← King St. →  → Mt. Vernon Ave

# FIELD NOISE MEASUREMENT DATA

PROJECT: Mt Vernon Bridge PROJ. # 365.17

**SITE IDENTIFICATION:** LT-7 OBSERVER(S): JLH
ADDRESS: 1293 Pepe's Nightclub
START DATE / TIME: 6/29/17 8:54AM END DATE / TIME: 6/29/17

**METEROLOGICAL CONDITIONS:**
TEMP: 71 °F HUMIDITY: 60 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0-4 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

**ACOUSTIC MEASUREMENTS:**
INSTRUMENT: LD LxT1 TYPE: 1 2 SERIAL #: 4005
CALIBRATOR: LD CAL200 SERIAL #: 2916
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 113.61 dBA SPL WINDSCREEN ✓

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{10}$ | OTHER: | (TYPE?) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 180 | 8:54am | 9:10am | 63.5 | 81.5 | 54.2 | 56.7 | 61.0 | 65.7 | | | |
| 181 | 9:14AM | 9:30AM | 62.4 | 73.4 | 51.6 | 56.1 | 60.7 | 65.7 | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

COMMENTS:

**SOURCE INFO AND TRAFFIC COUNTS:**
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE: Mt Vernon

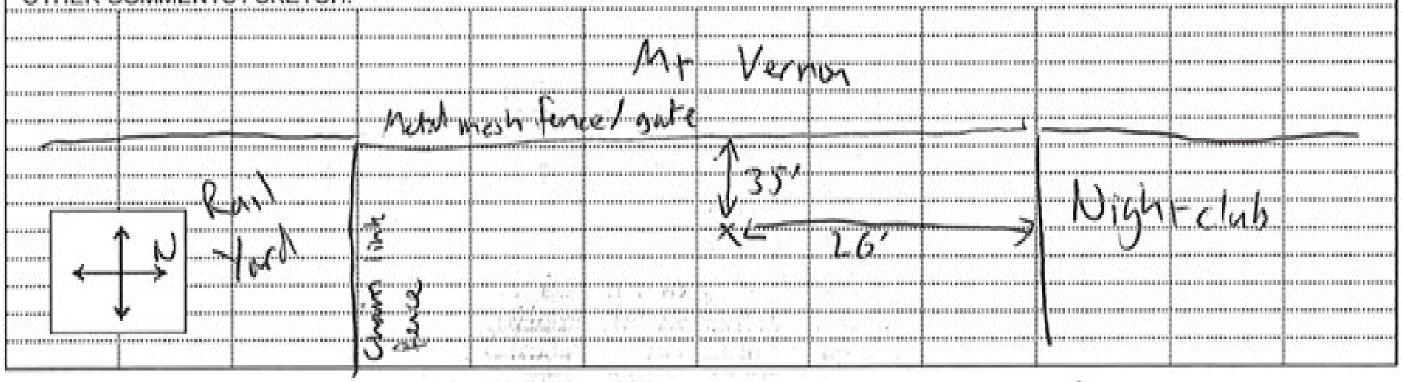
TRAFFIC COUNT DURATION: ____-MIN

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

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Rail yard activity - backup beeper

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



FIELD NOISE MEASUREMENT DATA

PROJECT: Mt. Vernon Bridge PROJ. # 365.17

SITE IDENTIFICATION: ST-9 OBSERVER(S): JGM
ADDRESS: Vacant lot adjacent 1414 Kingman St. San Bernardino
START DATE / TIME: 2:26pm 6/28/2017 END DATE / TIME: 3:02pm 6/28/2017

METEROLOGICAL CONDITIONS:
TEMP: 100 °F HUMIDITY: 11 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 2-7 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 831 TYPE 1 2 SERIAL #: 3786
CALIBRATOR: LD Cal 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.16 dBA SPL WINDSCREEN ✓

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{25}$ | $L_{10}$ | $L_{8.33}$ | $L_{1.67}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 476 | 2:26 | 2:42 | 56.5 | 70.5 | 46.4 | 48.9 | 52.7 | 55.2 | 59.2 | 60.2 | 65.9 |
| 477 | 2:46 | 3:02 | 54.7 | 70.9 | 47.7 | 50.9 | 53.2 | 54.6 | 56.0 | 56.3 | 61.7 |

COMMENTS:

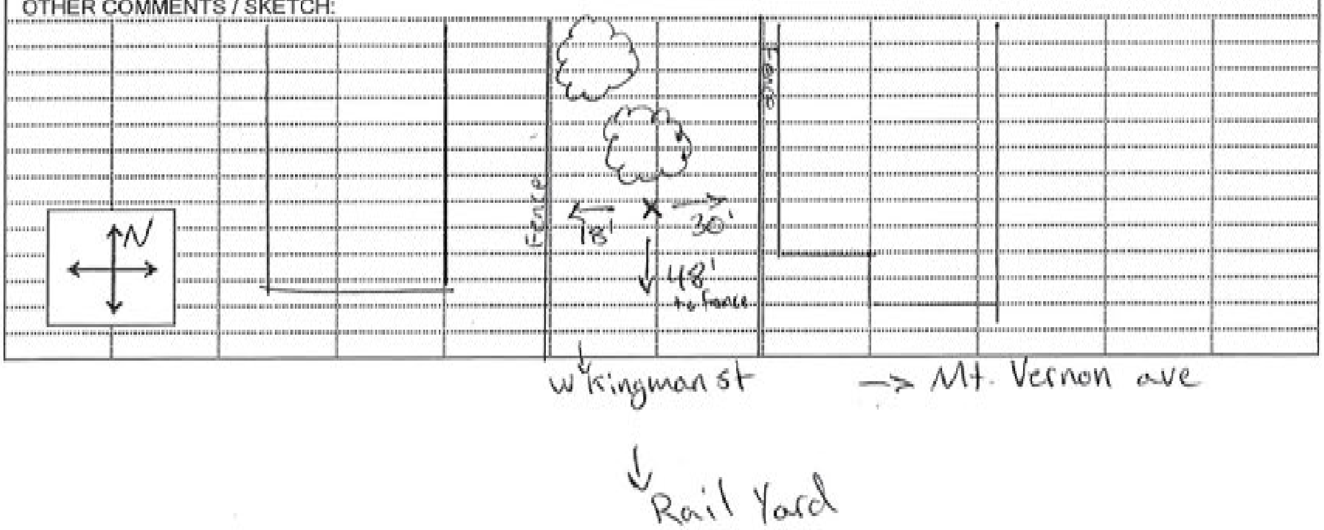
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
→ maybe
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN SPEED #2 COUNT SPEED

| | NB / EB | SB / WB | NB / EB | SB / WB | NB / EB | SB / WB | NB / EB | SB / WB |
|---|---|---|---|---|---|---|---|---|
| AUTOS: | | | | | | | | |
| MED. TRUCKS: | | | | | | | | |
| HVY TRUCKS: | | | | | | | | |
| BUSES: | | | | | | | | |
| MOTORCYCLES: | | | | | | | | |

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Garbage Truck came by last 2 minutes of run 1. Could not pause during that time. Distant rail activity.

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



# FIELD NOISE MEASUREMENT DATA

PROJECT: Mt. Vernon Bridge PROJ. # 365.17

**SITE IDENTIFICATION:** ST-10 OBSERVER(S): JLH
ADDRESS: Empty lot next to hotel
START DATE / TIME: 6/28/17 2:26 PM END DATE / TIME: 6/28/17 3:02 PM

**METEROLOGICAL CONDITIONS:**
TEMP: 100 °F HUMIDITY: 11 %R.H. WIND: **CALM LIGHT MODERATE VARIABLE**
WINDSPEED: 2-7 MPH DIR: **N NE E SE S SW W NW** **STEADY GUSTY**
SKY: **SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN** **OTHER:**

**ACOUSTIC MEASUREMENTS:**
INSTRUMENT: LD LxT1 TYPE: 1 2 SERIAL #: 4005
CALIBRATOR: LD CAL200 SERIAL #: 2916
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 113.9 dBA SPL WINDSCREEN ✓

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

| REC # | START | END | $L_{eq}$ | $L_{max}$ | $L_{min}$ | $L_{90}$ | $L_{50}$ | $L_{25}$ | $L_{10}$ | $L_{8.33}$ | $L_{1.67}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 178 | 2:26pm | 2:42pm | 63.4 | 78.0 | 53.6 | 56.1 | 61.8 | 64.6 | 67.0 | 67.4 | 70.8 |
| 179 | 2:46pm | 3:02pm | 64.9 | 76.1 | 55.2 | 58.0 | 62.7 | 66.0 | 68.4 | 68.8 | 71.5 |

COMMENTS:

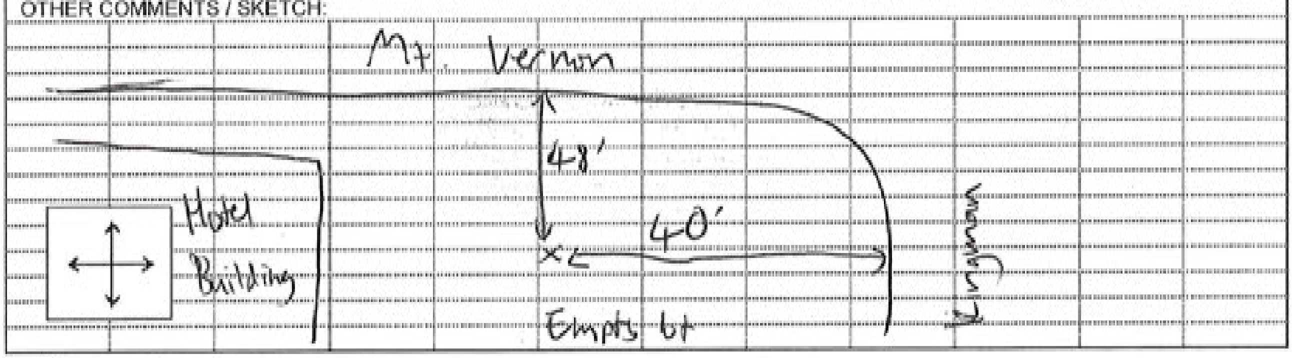
**SOURCE INFO AND TRAFFIC COUNTS:**
PRIMARY NOISE SOURCE: **TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:**
ROADWAY TYPE: Local, Mt Vernon
TRAFFIC COUNT DURATION: ____-MIN

| | NB / EB | SB / WB | SPEED NB / EB | SPEED SB / WB | #2 COUNT NB / EB | #2 COUNT SB / WB | SPEED NB / EB | SPEED SB / WB |
|---|---|---|---|---|---|---|---|---|
| AUTOS: | III | III | | | II | IIII | | |
| MED. TRUCKS: | | I | | | | | | |
| HVY TRUCKS: | | | | | | | | |
| BUSES: | | | | | | | | |
| MOTORCYCLES: | | | | | | | | |

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

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

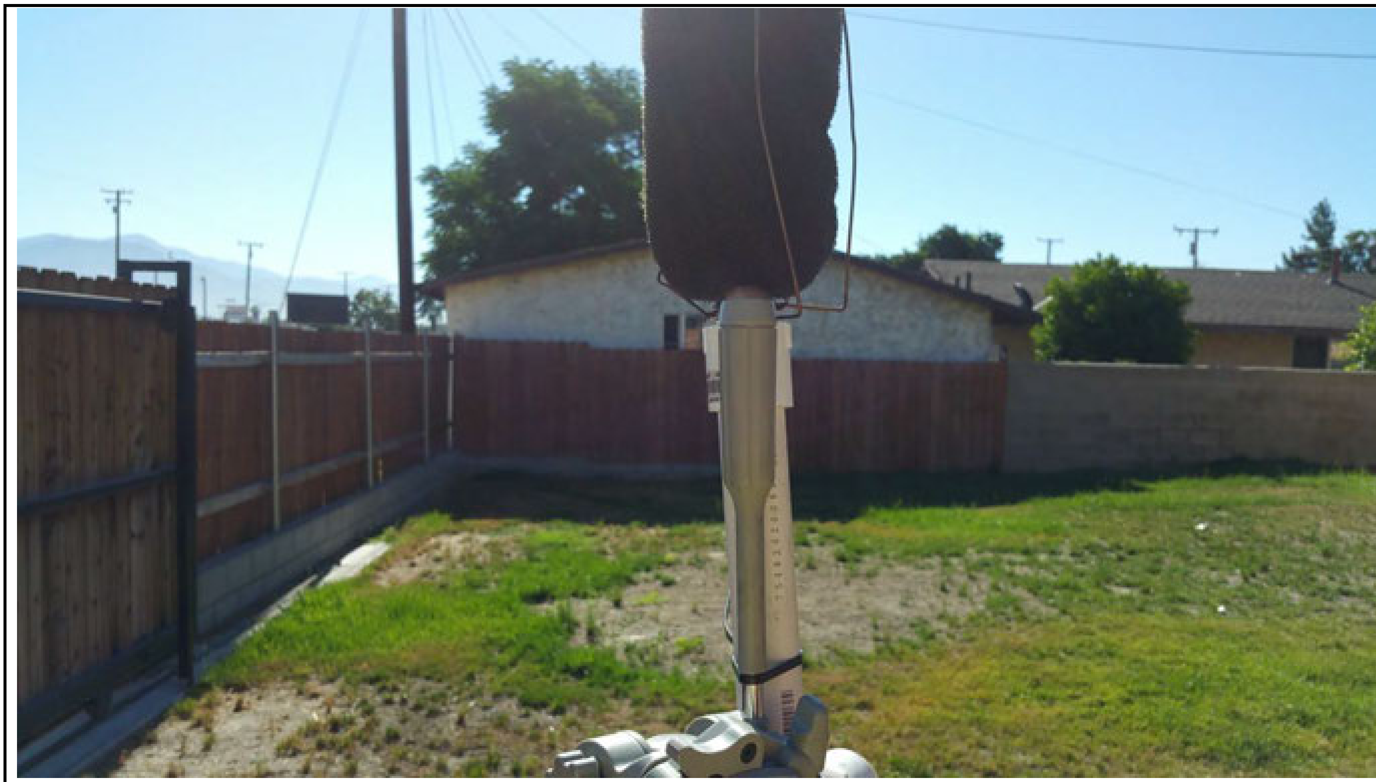
**DESCRIPTION / SKETCH:**
TERRAIN: **HARD SOFT MIXED FLAT OTHER:**
PHOTOS:
OTHER COMMENTS / SKETCH:



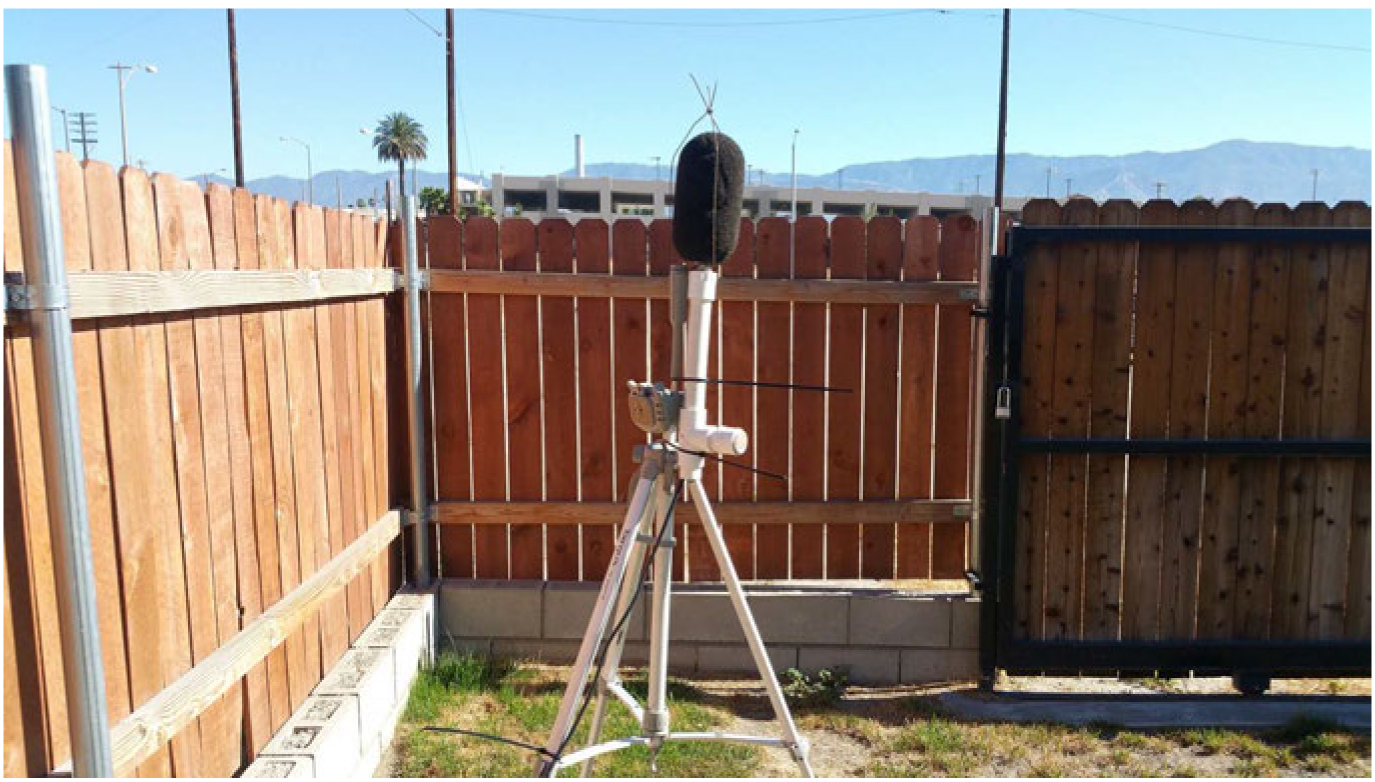

Hotel El Patio

Appendix C-3

# Field Photos

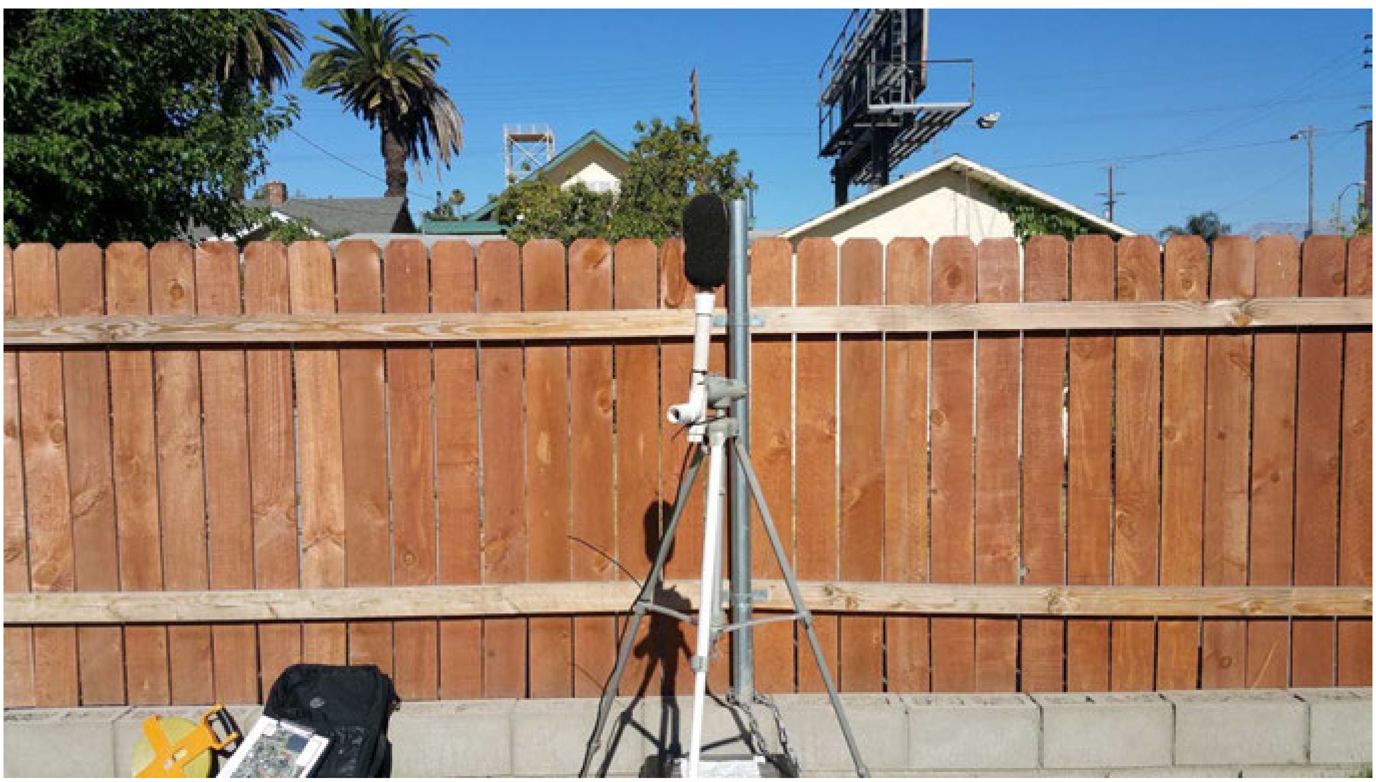


**Photograph 1:** LT-1 (ST-6) Looking East



**Photograph 2:** LT-1 (ST-6) Looking North

**Photograph 3:** LT-1 (ST-6) Looking South



**Photograph 4:** LT-1 (ST-6) Looking West

**Photograph 5:** LT-2 (ST-8) Looking East

**Photograph 6:** LT-2 (ST-8) Looking North

**Photograph 7:** LT-2 (ST-8) Looking South

**Photograph 8:** LT-2 (ST-8) Looking West

**Photograph 9:** ST-1 Looking East

**Photograph 10:** ST-1 Looking North

**Photograph 11:** ST-1 Looking South

**Photograph 12:** ST-1 Looking West

**Photograph 13:** ST-2 Looking East

**Photograph 14:** ST-2 Looking North

**Photograph 15:** ST-2 Looking South

**Photograph 16:** ST-2 Looking West

**Photograph 17:** ST-3 Looking East

**Photograph 18:** ST-3 Looking North

**Photograph 19:** ST-3 Looking South

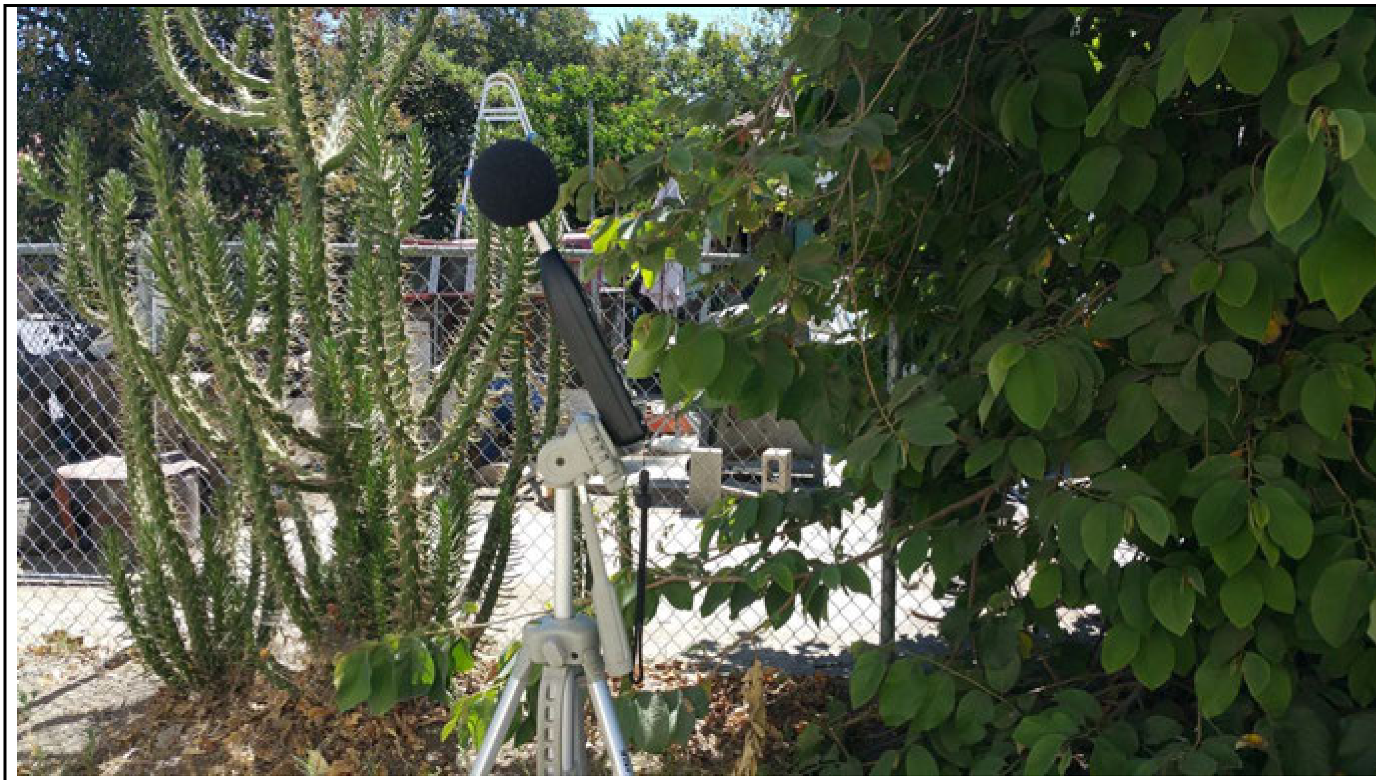
**Photograph 20:** ST-3 Looking West

**Photograph 21:** ST-4 Looking East

**Photograph 22:** ST-4 Looking North

**Photograph 23:** ST-4 Looking South

**Photograph 24:** ST-4 Looking West



**Photograph 25:** ST-5 Looking East

**Photograph 26:** ST-5 Looking North

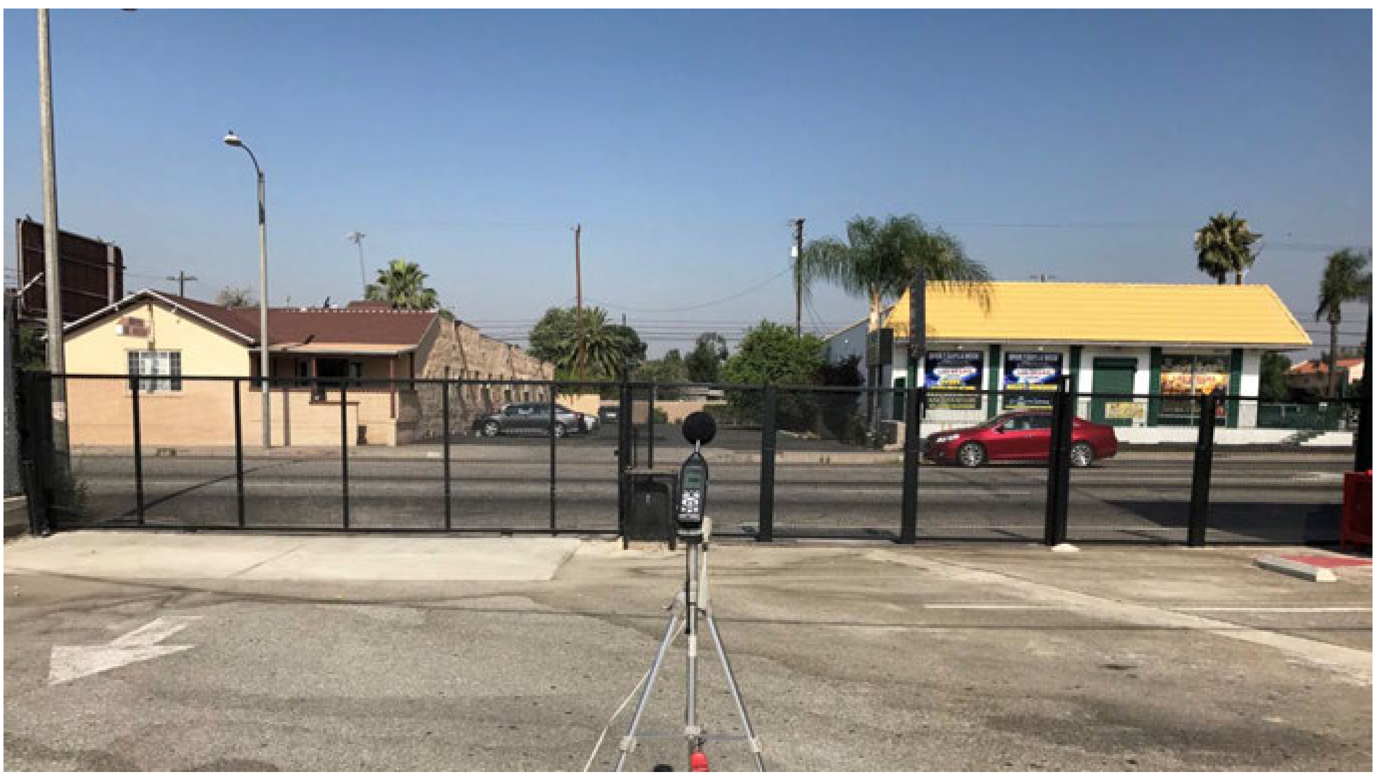
**Photograph 27:** ST-5 Looking South

**Photograph 28:** ST-5 Looking West

**Photograph 29:** ST-7 Looking East

**Photograph 30:** ST-7 Looking North

**Photograph 31:** ST-7 Looking South



**Photograph 32:** ST-7 Looking West

**Photograph 33:** ST-9 Looking East

**Photograph 34:** ST-9 Looking North

**Photograph 35:** ST-9 Looking South

**Photograph 36:** ST-9 Looking West

Photograph 37: ST-10 Looking East


**Photograph 38:** ST-10 Looking North


**Photograph 39:** ST-10 Looking South

**Photograph 40:** ST-10 Looking West

Appendix C-4

# TNM® Input/Output Files

See included CD

# Appendix D Traffic Data Sources

(Included on CD only.)