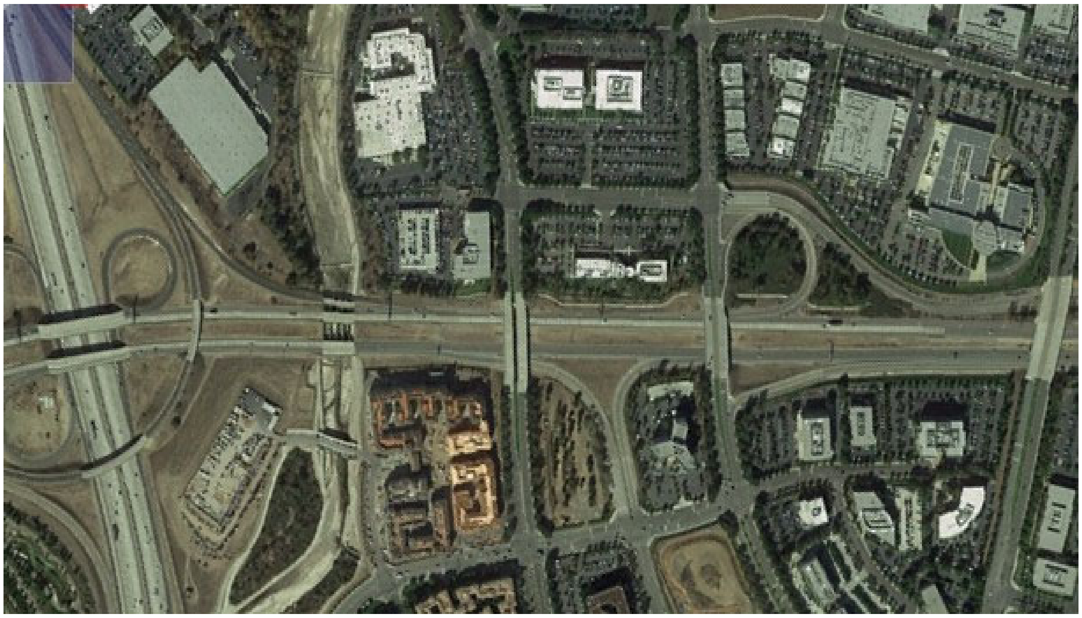

Noise Study Report

State Route 133 Southbound Auxiliary Lane Improvement Project

In the City of Irvine, California

12-ORA-133 PM 8.3/M9.3

EA 0N890/Project No. 1214000130

September 2019

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September 19, 2019

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Summary

This operational improvement project is on State Route 133 (SR-133) from the southbound (SB) Interstate 5 (I-5)/SB SR-133 connector (SB I-5 connector) to the SB SR-133/northbound (NB) Interstate 405 (I-405) connector (NB I-405 connector). The proposed project is in located in the City of Irvine in south Orange County. This project proposes to construct a new auxiliary lane on SB SR-133 from the SB I-5 connector (PM M9.3) to the NB I-405 connector (PM 8.3). This auxiliary lane will become the second lane on the NB I-405 connector. This project also proposes to extend the number three lane on SB SR 133 approximately 300 feet south of the San Diego Creek to match the existing roadway pavement. This project is a non-capacity increasing project. There are two alternatives, No Build and Build.

The purpose of this project is to improve traffic flow on SB SR-133 by reducing congestion and operational deficiencies between the SB I-5 connector and the NB I-405 connector. In addition, this project will provide additional vehicular storage, shorten the queue length of vehicles, enhance operations, and improve safety for the drivers traveling on the SB I-5 connector and SB SR-133 mainline during peak periods.

This Noise Study Report (NSR) evaluates potential traffic noise impacts that may result from the proposed project. This NSR has been prepared to comply with Title 23 Part 772 of the Code of Federal Regulations (23CFR772), "Procedures for Abatement of Highway Traffic Noise and Construction Noise", as described in Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) and Section 216 of the California Street and Highways Code.

Two alternatives, the No-Build Alternative and one Build Alternative, have been considered for the Project:

- <u>No-Build (Alternative 1)</u> would be where no construction or improvements would be made to the existing SB SR-133 between the SB I-5 connector and NB I-405 connector.

- <u>Build (Alternative 2)</u> proposes to operations and safety of this facility by constructing a new auxiliary lane on SB SR-133 from the SB I-5 connector to the NB I-405 connector. This proposed lane will become the second lane on the NB I-405 connector. This alternative also proposes to extend the number three lane on SB SR-133 approximately 300 feet south of San Diego Creek to match the existing roadway pavement.

Under 23CFR772.7, projects are categorized as Type I, Type II, or Type III projects. Federal Highway Administration (FHWA) defines a Type I project as a proposed Federal or Federal-Aid highway project for the construction of a highway on a new location, the physical alteration of existing highway where there is either a substantial horizontal or substantial vertical alteration, or other activities discussed in Chapter 4 of this NSR. Based on the proposed changes to the existing freeway facility, this project is defined as a Type I project because of the addition of the auxiliary lane and therefore noise abatement must be considered for the project and evaluated for feasibility and reasonableness.

Existing land uses within the project limits consist of offices, hotel, and apartments. The terrain in the project area varies in elevation between the mainline and land use. In the northbound side of SR-133, the land uses vary in elevation from the existing freeway by a range of 2 feet above to 4 feet below. In the southbound side of SR-133, the land uses vary in elevation from the freeway by a range of 5 feet above and 8 feet below at the area between Alton Parkway and Barranca Parkway; and 25 feet below at the south end of the project along the I-405 connector.

The results of the noise study showed that the noisiest-hour traffic noise levels were found to range from 55.2 to 76.5 dBA, L_{eq}[h] (A-weighted decibels at hourly equivalent sound level). Existing and Future No-Build noisiest-hour traffic noise levels were found to range from 55.2 to 75.5 dBA while the Future Build noisiest-hour traffic noise levels were found to range from 55.2 to 76.5 dBA.

The list below breaks down the above noise level ranges based on activity category land use type in each condition for more information:

	Activity Category Land Use (Noise Abatement Criteria - dBA)	Noise Level Range
<u>Existing</u>	B (67) – Residential (Apartments)	60.4 to 75.3 dBA L_{eq}[h]
	E (72) – Offices, Hotel	55.2 to 75.5 dBA L_{eq}[h]
<u>No-Build</u>	*(Same as Existing above)*	
<u>Build</u>	B (67) – Residential (Apartments)	60.9 to 75.6 dBA L_{eq}[h]
	E (72) – Offices, Hotel	55.2 to 76.5 dBA L_{eq}[h]

Based on the noise analysis results, a total of 38 receivers (representing 59 dwelling units or frequent human-use areas) were modeled and evaluated for potential traffic noise impacts. A total of 23 receivers (representing 42 dwelling units/frequent human-use areas) from the 38 evaluated, varying in all activity category land use types within the project limits, are impacted by traffic noise currently from the freeway in the existing and no build conditions and will also be impacted by the future build project condition. Table B-1 in the Appendix B summarizes the results.

Noise abatement in the form of soundwalls were evaluated and considered for the project. Three soundwalls - Noise barrier numbers (NB Nos.) S9066, S9067, and S9075 - were placed at locations within the project limits to determine its feasibility and reasonableness to shield traffic noise impacts. Noise abatement is considered feasible from an acoustical perspective if it predicts to provide at least a 5 dB of noise reduction at an impacted receptor and is considered reasonable if it predicts to provide at least a 7 dB of noise reduction at one or more benefited receptors.

A range of 1 to 9 receptors will benefit from the proposed walls. All three of the evaluated soundwalls were determined to be feasible and preliminarily reasonable for the project, which is based on meeting the 7 dB noise reduction goal.

Besides predicted traffic noise impacts from the proposed project, temporary construction noise is anticipated during construction activities. Construction noise will be regulated by Caltrans 2018 Standard Specification Section 14-8.02, "Noise Control".

A Noise Abatement Decision Report (NADR) will be prepared for this project. The NADR is a design responsibility and is prepared to compile information from the NSR, from other relevant environmental studies, and design considerations into a single, comprehensive document before public review of the project. The NADR is prepared by the project engineer after completion of the noise study report prior to publication of the draft environmental document. The NADR includes noise abatement construction cost estimates that have been prepared or reviewed, approved, and signed by the project engineer based on site-specific conditions. Construction cost estimates are compared to reasonableness allowances in the NADR to identify which noise barrier configurations are reasonable from a cost perspective. The reasonableness determination of the feasible noise barriers shown in Tables 7-1, 7-2, and 7-3 in Chapter 7 of this NSR will be reported in the NADR for the proposed project.

Conclusion

Based on the studies so far accomplished, Caltrans intends to consider noise abatement measures in the form of barrier(s) at locations, with respective lengths and heights as shown in the NSR. If during the final design phase, project conditions have substantially changed, or the noise barriers become not feasible and reasonable, or design standards and safety requirements restrict the construction of noise barriers, noise barriers might not be provided. The final decision regarding the construction of noise barriers will be made after completion of the public involvement during the final project design process.

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List of Abbreviated Terms

CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	Decibels
FHWA	Federal Highway Administration
Hz	Hertz
kHz	Kilohertz
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
$L_{eq(h)}$	Equivalent Sound Level over one hour
L_{max}	Maximum Sound Level
LOS	Level of Service
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
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
SPL	sound pressure level
TeNS	Caltrans' Technical Noise Supplement
TNM 2.5	FHWA Traffic Noise Model Version 2.5

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Chapter 1. Introduction

1.1 Purpose of the Noise Study Report

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

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

1.2 Project, Need, and Purpose

Project

This operational improvement project is on State Route 133 (SR-133) from the southbound (SB) Interstate 5 (I-5)/SB SR-133 connector (SB I-5 connector) to the SB SR-133/northbound (NB) Interstate 405 (I-405) connector (NB I-405 connector). The proposed project is in located in the City of Irvine in south Orange County. This project proposes to construct a new auxiliary lane on SB SR-133 from the SB I-5 connector (PM M9.3) to the NB I-405 connector (PM 8.3). This auxiliary lane will become the second lane on the NB I-405 connector. This project also proposes to extend the number three lane on SB SR 133 approximately 300 feet south of the San Diego Creek to match the existing roadway pavement. This project is a non-capacity increasing project. There are 2 alternatives, Build and No Build.

Need

This segment of SB SR-133 is operating under severe congestion during morning peak hours. The number three lane of SB SR-133 experiences long traffic queues which back up all the way to the SB I-5 connector and the SB SR-133 mainline (north of the SB I-5 connector). This segment of SB SR-133 has accident rates higher than the average rates for similar facilities statewide.

Purpose

The purpose of this project is to improve traffic flow on SB Rte 133 by reducing congestion and operational deficiencies between the SB I-5 connector and the NB I-405 connector. In addition, this project will provide additional vehicular storage, shorten the queue length of vehicles, enhance operations, and improve safety for the drivers traveling on the SB I-5 connector and SB Rte 133 mainline during peak periods.

Chapter 2. Project Description

This operational improvement project is on State Route 133 (SR-133) from the southbound (SB) Interstate 5 (I-5)/SB SR-133 connector (SB I-5 connector) to the SB SR-133/northbound (NB) Interstate 405 (I-405) connector (NB I-405 connector). The proposed project is in located in the City of Irvine in south Orange County. This project proposes to construct a new auxiliary lane on SB SR-133 from the SB I-5 connector (PM M9.3) to the NB I-405 connector (PM 8.3). This auxiliary lane will become the second lane on the NB I-405 connector. This project also proposes to extend the number three lane on SB SR 133 approximately 300 feet south of the San Diego Creek to match the existing roadway pavement. This project is a non-capacity increasing project.

Two alternatives, Build and No Build, will be analyzed as part of the draft environmental document. The project alternatives are described below (see Figures 2-1 for the Build Alternative).

2.1 Alternative 1 – No Build

No-Build Alternative would be where no construction or improvements are made to the existing SB SR-133 between the SB I-5 connector and NB I-405 connector.

2.2 Alternative 2 – Build

The Build Alternative proposes to improve operations and safety of this facility by constructing a new auxiliary lane on SB SR-133 from the SB I-5 connector to the NB I-405 connector. This proposed lane will become the second lane on the NB I-405 connector. This alternative also proposes to extend the number three lane on SB SR-133 approximately 300 feet south of San Diego Creek to match the existing roadway pavement. See Figure 2-1 (Sheets 1 to 3).

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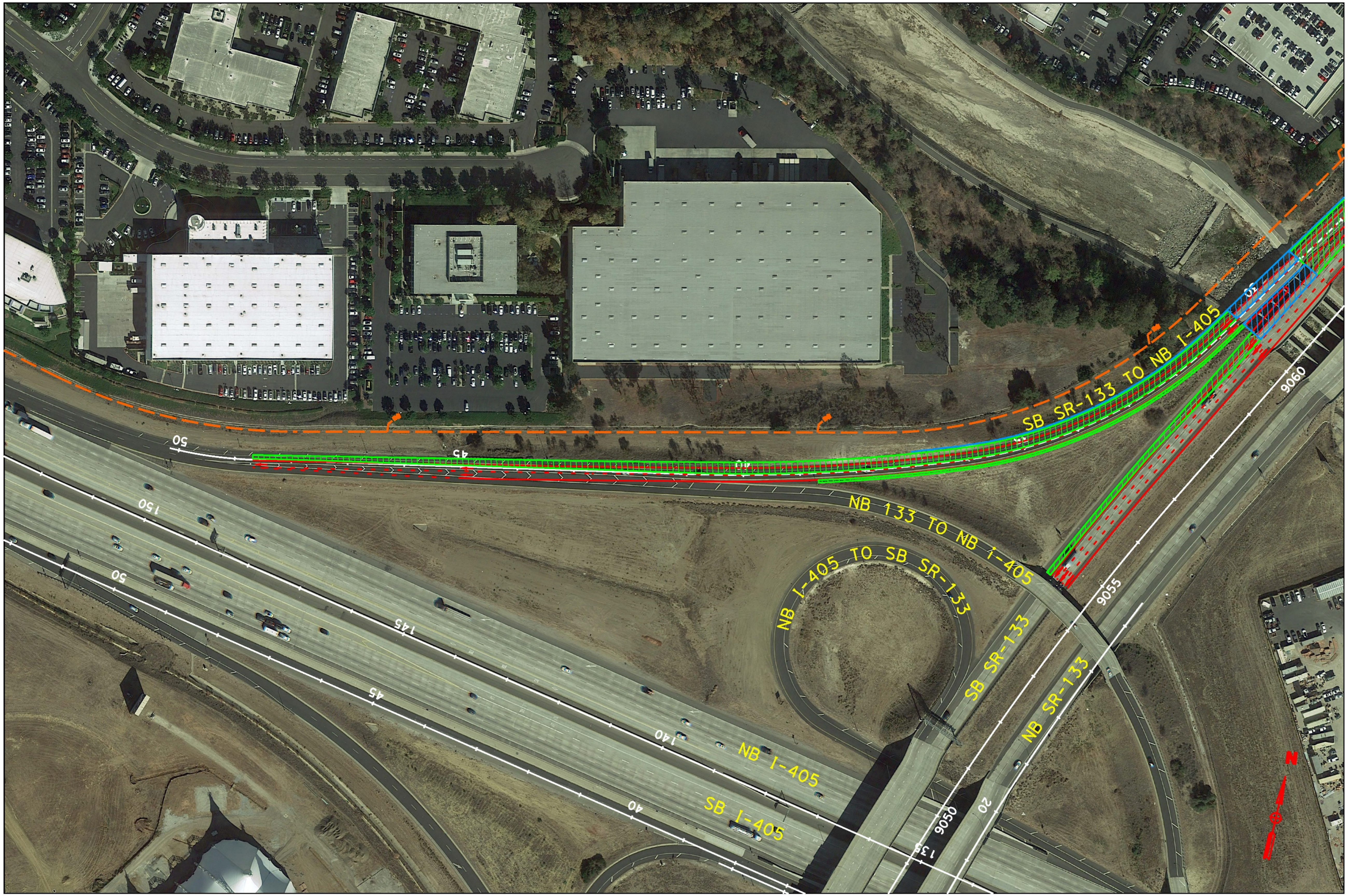


LEGEND

- Proposed Roadway Improvement
- Proposed Structure Improvement
- Proposed Pavement Delineation (Striping)

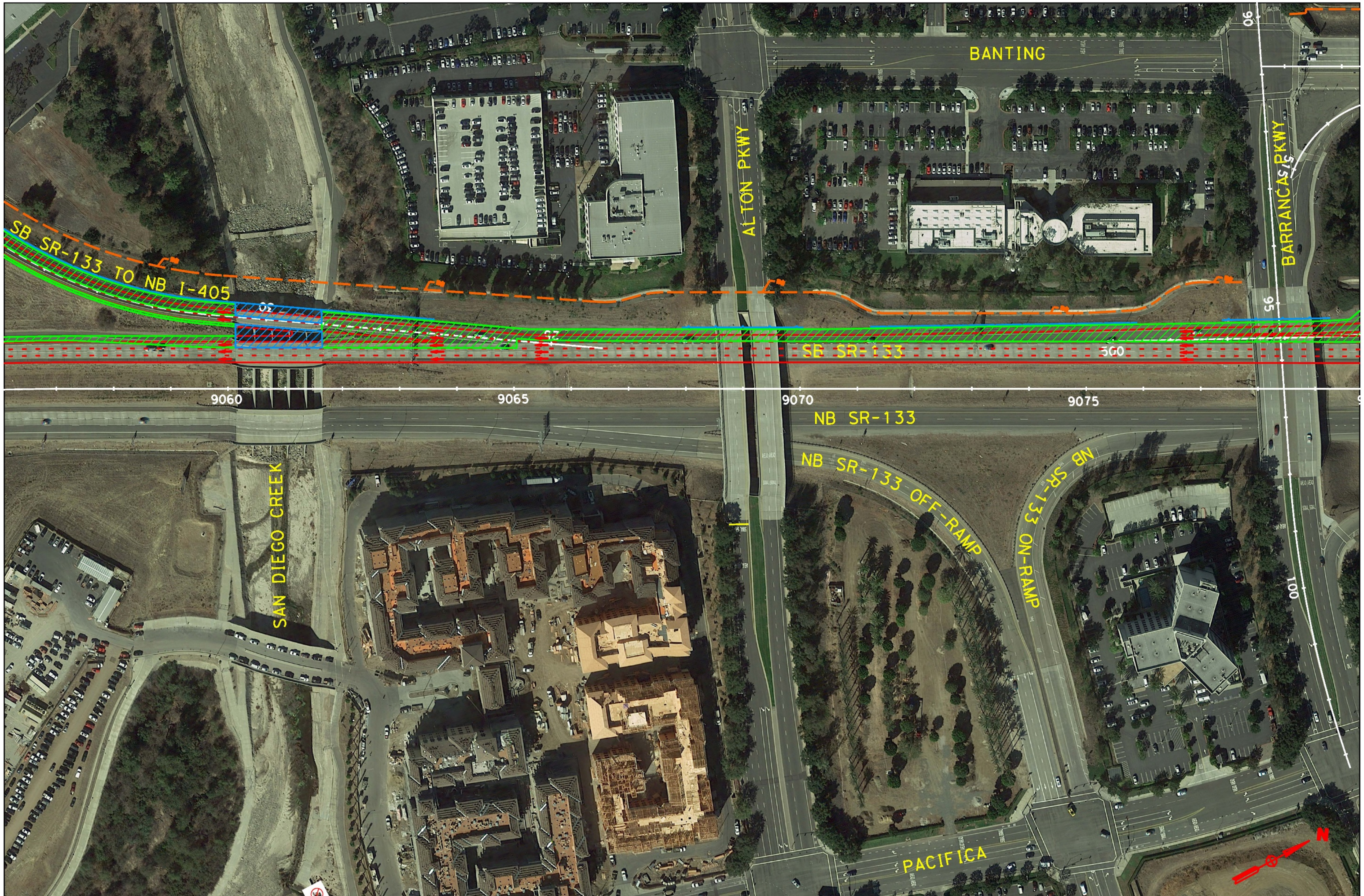
FIGURE 2-1

Sheet 1 of 3

Scale: 1" = 180'

BUILD ALTERNATIVE 2

SR-133 SB AUXILIARY LANE PROJECT



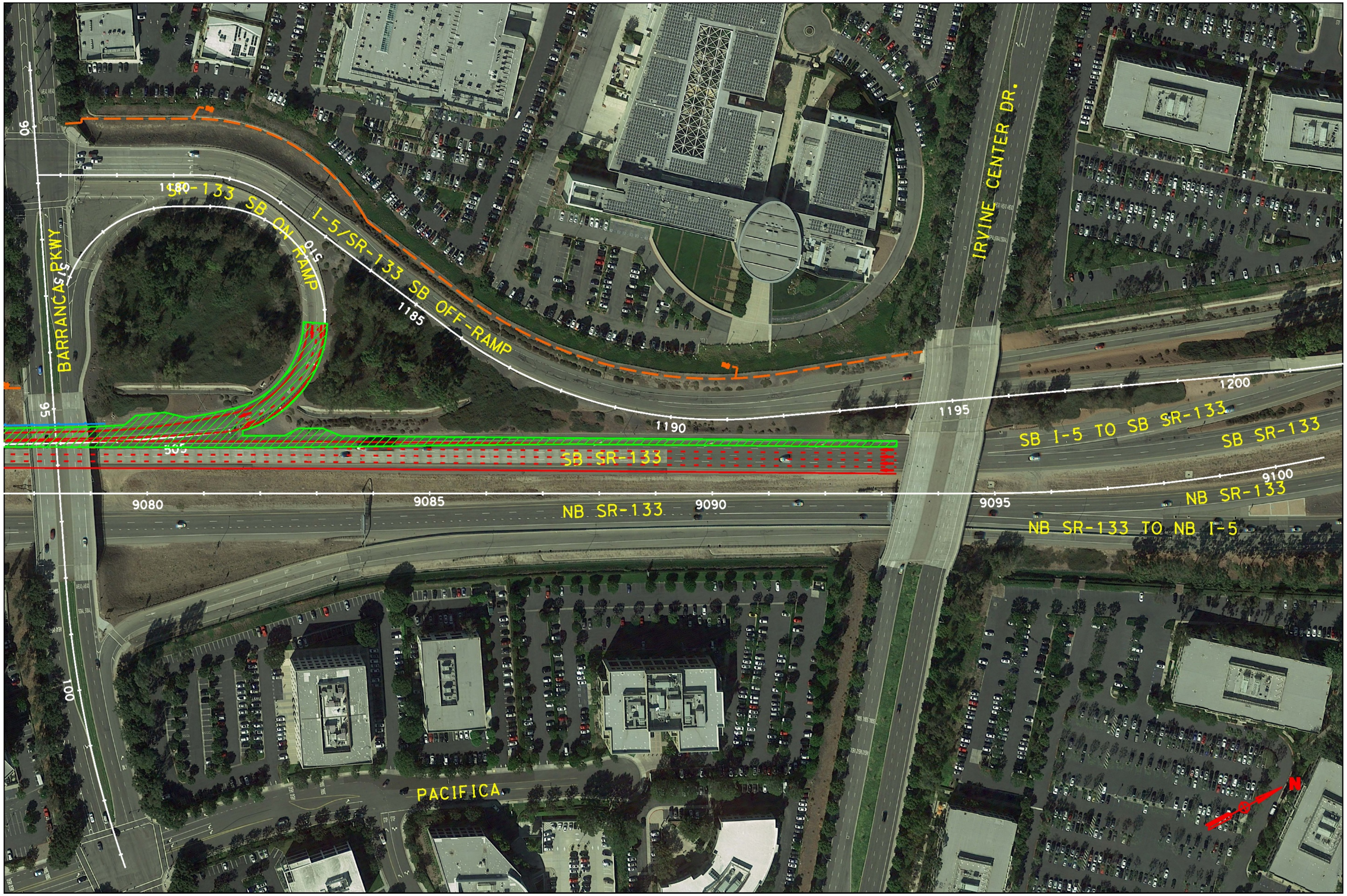
LEGEND

- Proposed Roadway Improvement
- Proposed Structure Improvement
- Proposed Pavement Delineation (Striping)

FIGURE 2-1
Sheet 2 of 3
Scale: 1" = 180'

BUILD ALTERNATIVE 2

SR-133 SB AUXILIARY LANE PROJECT



LEGEND

- Proposed Roadway Improvement
- Proposed Structure Improvement
- Proposed Pavement Delineation (Striping)

FIGURE 2-1
Sheet 3 of 3
Scale: 1" = 180'

BUILD ALTERNATIVE 2
SR-133 SB AUXILIARY LANE PROJECT

Chapter 3. Fundamentals of Traffic Noise

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

3.1 Sound, Noise, and Acoustics

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

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

3.2 Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

3.3 Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in 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 lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	**— 70 —**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**— 60 —**	
		Large business office
Quiet urban daytime	**— 50 —**	Dishwasher next room
Quiet urban nighttime	**— 40 —**	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	**— 0 —**	Lowest threshold of human hearing

Source: Caltrans 2013.

3.6 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 hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 decibels for each doubling of distance from a line source.

3.8.2 Ground Absorption

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

3.8.3 Atmospheric Effects

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

3.8.4 Shielding by Natural or Human-Made Features

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

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Chapter 4. Federal Regulations and State Policies

4.1 Federal Regulations

4.1.1 23 CFR 772

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

- FHWA defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment of the highway. The following projects are also considered to be Type I projects:
- The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a high-occupancy vehicle (HOV) lane, high-occupancy toll (HOT) lane, bus lane, or truck climbing lane,
- The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane,
- The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange,
- Restriping existing pavement for the purpose of adding a through traffic lane or an auxiliary lane,
- The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza.

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

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

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

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

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

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

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

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

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

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

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

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

4.2 State Regulations and Policies

4.2.1 California Environmental Quality Act (CEQA)

Noise analysis under the California Environmental Quality Act (CEQA) may be required regardless of whether or not the project is a Type I project. The CEQA noise analysis is completely independent of the 23 CFR 772 analysis done for NEPA. Under CEQA, the baseline noise level is compared to the build noise level. The assessment entails looking at the setting of the noise impact and then how large or perceptible any noise increase would be in the given area. Key considerations include: the uniqueness of the setting, the sensitive nature of the noise receptors, the magnitude of the noise increase, the number of residences affected, and the absolute noise level. The significance of noise impacts under CEQA are addressed in the environmental document rather than the NSR. Even though the NSR (or noise technical memorandum) does not specifically evaluate the significance of noise impacts under CEQA, it must contain the technical information that is needed to make that determination in the environmental document.

4.2.2 Section 216 of the California Streets and Highways Code

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

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

Chapter 5. Study Methods and Procedures

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

Initial gathering of information was first completed to identify existing and future activities on all land uses that may be affected by noise from the highway. Information such as preliminary project plans, aerial topo maps, and online geographical data were some resources used to locate and identify potential noise sensitive areas within the project area. Field investigations were then conducted to further confirm the identity of each land use and activity that could be subject to traffic and construction noise impacts from the proposed project. Existing land uses in the project area were categorized by the type of land use and its Activity Category as defined in Table 4-1, and the extent of frequent human use. As stated in the Protocol, noise abatement is only considered where frequent human use occurs and where a lowered noise level would be of benefit. Although all land uses were evaluated in this analysis, the focus is on locations of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential front and backyards, common use areas at multi-family residences (i.e. balconies and patios), and outside sitting/eating areas at restaurants, offices, and businesses. In this project, several modeled receptors and receivers were selected at each or common exterior human frequent use areas at all developed lands and undeveloped lands which have been permitted that needs to be analyzed for future noise impacts or benefits from noise abatement consideration.

Short-term noise measurement sites were carefully selected within the project area to determine existing ambient noise levels and validate/calibrate the noise prediction model which will be used to calculate the existing and future noise levels with and without the project. These noise measurement locations were selected by acoustical equivalence, site geometry, and in areas of human frequent use that will be exposed to the highest noise levels generated by the highway after the completion of the project.

Seven short-term noise measurement locations were selected to represent land uses within the project area. No long-term measurement sites were recorded during the week of short-term measurements. All short-term measurement locations were selected to serve as representative modeling locations. A total of 38 receiver locations were modeled to represent land uses in the project area. These modeled and noise measurement sites are shown in Figure 5-1 (Sheet 1 to 3).

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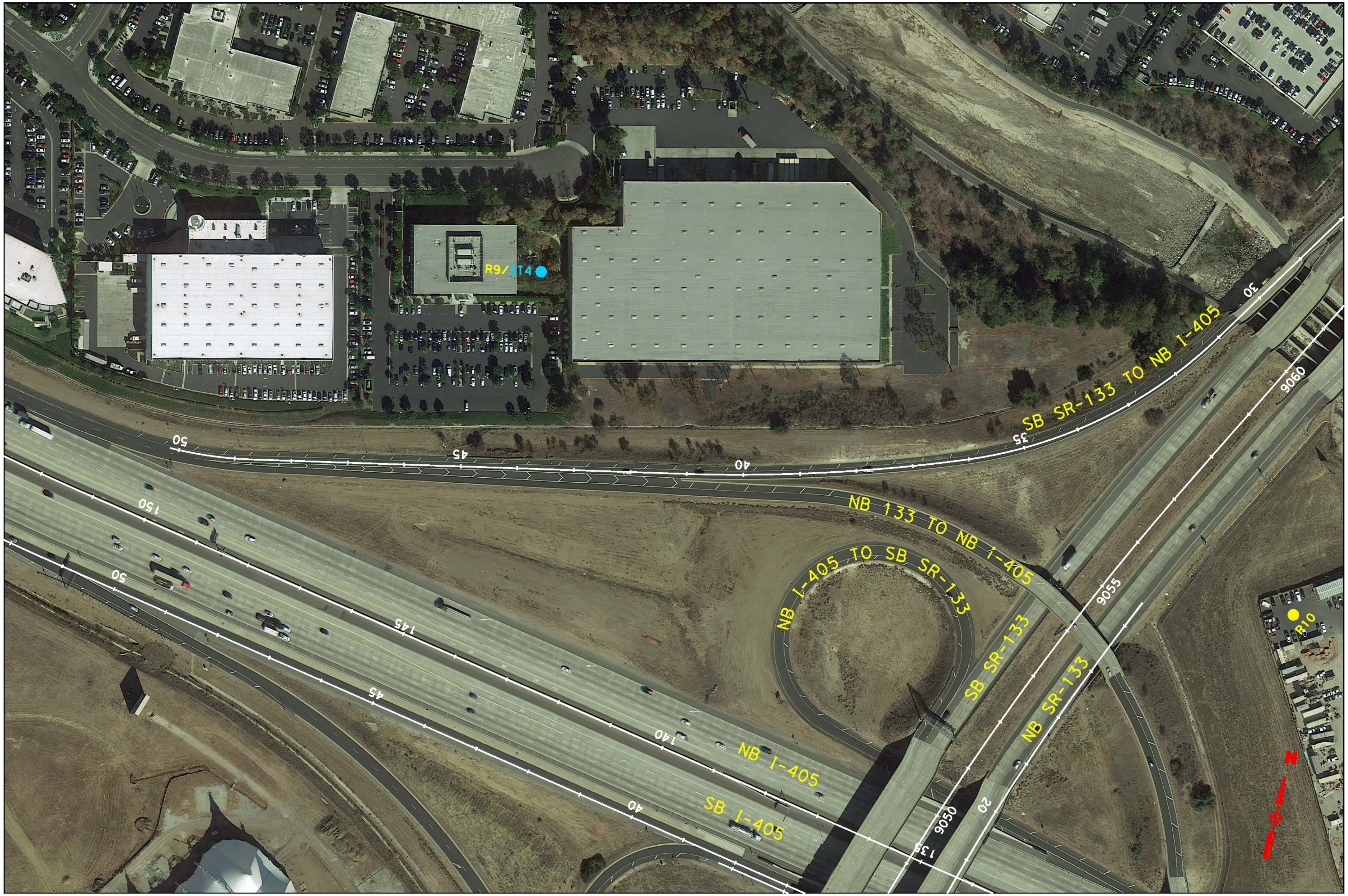


LEGEND

- Short-Term Noise Measurement Locations (ST#)
- Modeled Receptor Locations (R# or R#.#)

.#/# Receptor Floor Levels (i.e., R203.2/3/4/5 are Receptors at 2nd, 3rd, 4th, and 5th Floor area)

FIGURE 5-1

SHEET 1 OF 3

1" =180'

NOISE MEASUREMENT AND MODELED RECEPTOR LOCATIONS

SR-133 SB Auxiliary Lane Project

LEGEND

- Short-Term Noise Measurement Locations (ST#)
- Modeled Receptor Locations (R# or R#.#)

.#/# Receptor Floor Levels (i.e., R203.2/3/4/5 are Receptors at 1st, 2nd, 3rd, 4th, and 5th Floor area)

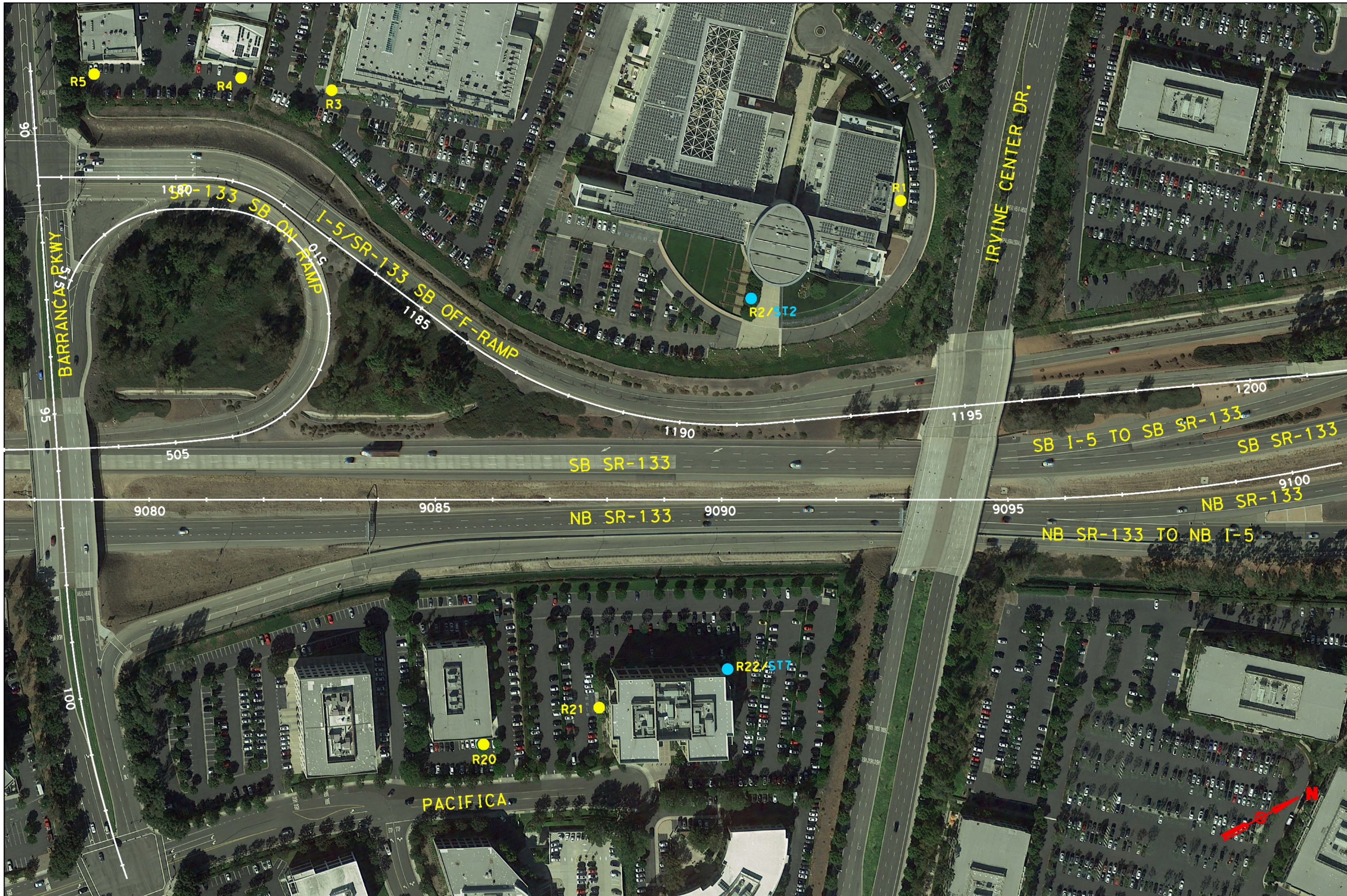
FIGURE 5-1

SHEET 2 OF 3

1" =180'

NOISE MEASUREMENT AND MODELED RECEPTOR LOCATIONS

SR-133 SB AUXILIARY LANE PROJECT



LEGEND

- Short-Term Noise Measurement Locations (ST#)
- Modeled Receptor Locations (R# or R#.#)

.#/# Receptor Floor Levels (i.e., R203.2/3/4/5 are Receptors at 2nd, 3rd, 4th, and 5th Floor area)

FIGURE 5-1

SHEET 3 OF 3

1" =180'

NOISE MEASUREMENT AND MODELED RECEPTOR LOCATIONS

SR-133 SB AUXILIARY LANE PROJECT

5.2 Field Measurement Procedures

A field noise study was conducted in accordance with recommended procedures in the Caltrans TeNS (September 2013). The following is a summary of the procedures used to collect short-term sound level data.

5.2.1 Short-Term Noise Measurements

Short-term (ST) monitoring was conducted at seven locations on Tuesday, February 26, 2019 using a Larson Davis Model 812 Type 1 (Precision) sound level meter (Serial No. A0523). The calibration of the meter was checked before and after each measurement using a Larson Davis Acoustic Calibrator model CAL200 (Serial No. 1192). Measurements were taken over a 15-minute period at each monitoring site. Short-term monitoring was conducted at receptor locations classified as Activity Categories B, E, during off peak traffic hours when traffic was free flowing. Field measurements were taken at these locations to measure and document existing ambient noise levels and validate/calibrate the traffic noise prediction model.

During the short-term measurements, environmental engineer staffs were present to monitor the meter. The sound level values (L_{eq}, L_{max}, and L_{min}) collected during each measurement period were automatically recorded with the digital integrating sound-level meter and subsequently logged manually on field data sheets (see Appendix C) for each measurement location. Any noise contamination, such as barking dogs, lawn mowers, aircraft passing overhead, birds chirping, etc. were also noted in the field data sheets, which includes information on the start time and duration of contaminating event. The relevant traffic data (vehicle count, classification and average speed) on SR-133 during short-term measurements ST1 and ST5 were obtain by recording the traffic volume on SR-133 mainline using a video camera and were expanded to hourly volumes (multiplied by four to normalize the results to hourly values) and entered in the FHWA Traffic Noise Model (TNM) 2.5. Supplemental traffic data sources obtain from Caltrans Performance Measurement System (PeMS) and traffic census websites (i.e. 2018 Traffic Volumes AADT, 2016 Truck Traffic AADT, and 2017 Ramp Volumes) were also used for all other short-term measurements (ST2, ST3, ST4, ST6 and ST7) to estimate the traffic data of the facilities when no actual manual counts were taken on the ramps or local streets during the noise measurement period (See Appendix A – Table A-1 Noise Model Calibration Traffic Data).

Temperature, wind speed, and humidity were also recorded during the short-term monitoring session using a Kestrel 3000 hand-held weather meter/digital hygrometer. Wind speeds during the measurement periods ranged from 0 to 2.5 miles per hour (mph). Temperatures ranged from 61.5 to 73°F with relative humidity typically 41 to 70 %.

5.2.2 Long-Term Noise Measurement

No long-term noise level measurement data was collected within the project area during the week of which the short-term noise level measurements were conducted. PeMS data was used to determine when the noisiest hour for traffic on SR-133 within the project limits would occur. Based on the data, 7:30 AM and 11:30 AM showed the most free-flowing traffic volume with the highest speed during the week and a few short-term measurements were taken during or within those time periods.

5.3 Traffic Noise Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model Version 2.5 (TNM 2.5). TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). Key inputs to the traffic noise model were the locations of roadways, traffic mix and speed, shielding features (e.g., topography and buildings), noise barriers, ground type, and receptors. Three-dimensional representation of these inputs were developed using CAD drawings, aerials, and topographic contours.

Traffic noise was evaluated under existing condition, future no-build condition, and future project build condition. Noisiest-hour traffic volumes, vehicle classification percentages, and traffic speeds under existing, future no-build, and future build conditions were based on Caltrans District 12 Noisiest-Hour Traffic Assumptions as shown below for SR-133 at the project vicinity:

Noisiest-Hour Traffic Assumptions

Mainline Lane Volume	1000 vphpl (vehicles per hour per lane)
Mainline Lane Volume (I-405)	1950 vphpl
HOV Lane Volume (I-405)	1500 vphpl (no heavy or medium trucks)
Auxiliary Lane Volume	1000 vphpl
Ramp Volume	1000 vphpl
Mainline Truck Percentage	6% (4% Medium Trucks, 2% Heavy Trucks)
Ramp Truck Percentage	4% (3% Medium Trucks, 1% Heavy Trucks)
Mainline Lane Speed	65 mph
Ramp Speed	10 to 55 mph

The worst-case noise impacts occur when the traffic is operating at free-flowing conditions or at a Level of Service C. The following traffic assumptions above is expected to produce the noisiest hour and will be used for the TNM analysis. However as stated elsewhere in the report, actual measured volume and speeds will be used for verification and calibration of the TNM. Tables A-1 in Appendix A summarize the traffic volumes, average speeds, and assumptions used for model validation and calibration, and modeling existing condition, future no-build condition, and future build condition for all alternatives. The predicted future noise levels were compared to the predicted existing noise levels (for substantial increases in noise levels) and to the NAC to determine potential noise impacts. Feasible noise abatement measures were considered to reduce projected noise impacts.

5.4 Methods for Identifying Traffic Noise Impacts and Consideration of Abatement

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

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dB at impacted receptor locations is predicted with implementation of the abatement measures. Other factors that affect feasibility include topography, access requirements for driveways and ramps, presence of local cross streets, utility conflicts, other noise sources in the area, and safety considerations.

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

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

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

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

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

Chapter 6. Existing Noise Environment

6.1 Existing Land Uses

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. The following land uses were identified in the project area:

- Multi-family residences: Activity Category B
- Offices, Hotel: Activity Category E
- Undeveloped Lands: Activity Category G

Although all developed land uses are evaluated in this analysis, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential balconies and common use areas at multi-family residences, offices, and hotel.

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

- **Area A, SR-133 Southbound:** Area A is located on the west side of southbound SR-133 between Irvine Center Drive and I-405. The land uses in this area is composed of offices. The terrain in this area varies approximately in elevation ranging from 5 feet above to 25 feet below the freeway. Office buildings in the Activity Category E land use areas have frequent human use receptors such as benches and sitting areas that are adjacent or near the freeway. No existing soundwalls are present to shield the receptors from traffic noise.

- **Area B, SR-133 Northbound:** Area B is located on the east side of northbound between I-405 and Irvine Center Drive. The land uses in this area is composed of apartments, a hotel, and offices. The terrain in this area varies approximately in elevation ranging from 2 feet above to 4 below the freeway. Receivers at certain locations of the apartments (Westview in Irvine Spectrum) were placed and modeled because of balconies that show human frequent use. In addition, the apartment had a couple of common outdoor exercise activity areas that also required evaluation.

6.2 Noise Measurement Results

The existing noise environment in the project area is characterized below based on short-term noise level measurements.

6.2.1 Short-Term Measurements

Table 6-1 summarizes the results of the 7 short-term (ST) noise level measurements conducted in the project area.

Table 6-1. Summary of Short-Term Noise Level Measurements

Measurement No.	Date	Start Time	Duration (Mins)	Measured Noise Level (dBA L_{eq})	Location and Description	Noise Source	Comments
ST1	02/26/2019	07:25	15	69.0	2 Banting, Irvine CA 92618 – Office (Toyota LA Regional Office)	Traffic on SR-133.	Sitting area receptor at back of building facing freeway.
ST2	02/26/2019	08:44	15	63.6	52 Discovery, Irvine CA 92618 – Office (Masimo Biotechnology Company)	Traffic on SR-133.	Sitting bench receptor at front of building facing freeway.
ST3	02/26/2019	09:37	15	69.9	15750 Alton Parkway, Irvine CA 92618 – Office (Wells Fargo Dealer Service)	Traffic on SR-133.	Sitting area receptor at back of building facing freeway.
ST4	02/26/2019	10:21	15	60.2	9 Pasteur – Suite 100, Irvine CA 92618 – Office (Razer USA)	Traffic on SR-133, SB SR-133 connector to NB I-405, and I-405	Sitting area receptor at left side of building facing freeway connector.
ST5	02/26/2019	11:30	15	70.3	21100 Spectrum, Irvine CA 92618 – Apartments (Westview a Irvine Spectrum)	Traffic on SR-133 and Alton Parkway.	Balcony and common exercise area receivers at the rear of building facing freeway.
ST6	02/26/2019	13:28	15	59.8	90 Pacifica Irvine, CA 92618 – Hotel (DoubleTree by Hilton Hotel Irvine – Spectrum)	Traffic on SR-133 and Pacifica/Gateway on-ramp to NB SR-133	Hotel Pool receptor. Shielded by 6' high property wall and a parking structure between freeway and hotel.
ST7	02/26/2019	13:40	15	60.9	108 Pacifica, Irvine CA 92618 – Office Building	Traffic on I-5 and Avenida De La Carlota	Sitting area receptor at back of building facing the freeway.

6.2.2 Noise Model Calibration

A total of two separate model runs were conducted using the traffic counts and calculated average vehicle speeds collected during the ambient noise monitoring. The results of these model runs were compared to the measured ambient noise levels to ensure TNM 2.5's accuracy. Correction factors known as K-factors were applied to each of the modeled receiver locations, so the monitored and modeled noise levels were similar. Table 6-2 shows the measured ambient noise level, the modeled noise levels using traffic counts and calculated average speeds during the noise monitoring, and the K-factor at each of the seven monitored locations.

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

Measurement Position	Measured Noise Level (dBA)	Predicted Noise Level from Model (dBA)	Measured minus Predicted (dB)
ST1	69.9	71.0	-1.1
ST2	63.6	67.3	-3.7
ST3	69.9	70.3	-0.4
ST4	60.2	57.8	2.4
ST5	70.3	72.6	-2.3
ST6	59.8	61.4	-1.6
ST7	60.9	59.1	1.1

The predicted sound levels from the model runs were within ± 4 dB of the measured sound levels. A review of the modeled parameters was re-checked and adjusted to ensure that it accurately represents the actual existing site conditions. Re-run of the prediction model resulted with the same difference between the predicted sound levels and the measured sound levels. Based on the difference results, calibration constant K-factors were applied to each of the modeled receptor locations so that the monitored and modeled noise levels were the same.

6.3 Existing Noise Levels

Existing noisiest-hour noise levels were predicted using Caltrans District 12 Noisiest-Hour Traffic Assumptions for SR-133 at the project vicinity discussed in section 5.3 and coded into the validated TNM model of the existing conditions. The calculated noise level results for each modeled receiver were then calibrated based on the K-factor. The results of the existing traffic noise model after applying the k-factor are shown in Table 6-4. Currently, of the 38 modeled receiver locations, 22 receivers (representing 40 receptors with areas of human frequent use) approach or exceed the NAC. Figure 5-1 (Sheets 1 to 3) shows the location of the modeled receivers.

Table 6-3 – Existing Traffic Noise Levels

Receptor No.	General Location or Address	Type of Land Use	No. of Units Represented	Noise Abatement Category and Criterion	Existing Levels (dBA, L_{eq}[h])
R1	52 Discovery, Irvine CA	Office	1	E (72)	55.2
R2	52 Discovery, Irvine CA	Office	1	E (72)	68.7
R3	58 Discovery, Irvine CA	Office	1	E (72)	57.2
R4	84 Discovery, Irvine CA	Office	1	E (72)	57
R5	90 Discovery, Irvine CA	Office	1	E (72)	54.1
R6	2 Banting, Irvine CA	Office	1	E (72)	**73.5**
R7	2 Banting, Irvine CA	Office	1	E (72)	**75.2**
R8	15750 Alton Parkway, Irvine CA	Office	1	E (72)	**75.5**
R9	9 Pasteur, Irvine CA	Office	1	E (72)	66
R10	Irvine Spectrum Center, Irvine CA	Vacant Land	1	G	65.2
R11.1	21100 Spectrum, Irvine CA	Residential	2	B (67)	**67.1**
R11.2	21100 Spectrum, Irvine CA	Residential	2	B (67)	**68.2**
R11.3	21100 Spectrum, Irvine CA	Residential	2	B (67)	**68.6**
R11.4	21100 Spectrum, Irvine CA	Residential	2	B (67)	**68.8**
R11.5	21100 Spectrum, Irvine CA	Residential	2	B (67)	**68.9**
R12.1	21100 Spectrum, Irvine CA	Residential	2	B (67)	**69.9**
R12.2	21100 Spectrum, Irvine CA	Residential	2	B (67)	**70.9**
R12.3	21100 Spectrum, Irvine CA	Residential	2	B (67)	**71.2**
R12.4	21100 Spectrum, Irvine CA	Residential	2	B (67)	**71.3**
R12.5	21100 Spectrum, Irvine CA	Residential	2	B (67)	**71.3**
R13	21100 Spectrum, Irvine CA	Residential	1	B (67)	**75**
R14	21100 Spectrum, Irvine CA	Residential	2	B (67)	**75.3**
R15.1	21100 Spectrum, Irvine CA	Residential	2	B (67)	**69.3**
R15.2	21100 Spectrum, Irvine CA	Residential	2	B (67)	**70.3**
R15.3	21100 Spectrum, Irvine CA	Residential	2	B (67)	**70.7**
R15.4	21100 Spectrum, Irvine CA	Residential	2	B (67)	**71.3**
R15.5	21100 Spectrum, Irvine CA	Residential	2	B (67)	**71.4**
R16.1	21100 Spectrum, Irvine CA	Residential	2	B (67)	60.4
R16.2	21100 Spectrum, Irvine CA	Residential	2	B (67)	63.5
R16.3	21100 Spectrum, Irvine CA	Residential	2	B (67)	65.4
R16.4	21100 Spectrum, Irvine CA	Residential	2	B (67)	**66.5**
R16.5	21100 Spectrum, Irvine CA	Residential	2	B (67)	**67.2**
R17	Irvine Spectrum Center, Irvine CA	Vacant Land	1	G	63.9
R18	90 Pacifica, Irvine CA	Hotel	1	B (67)	65.7
R19	90 Pacifica, Irvine CA	Hotel	1	B (67)	55.6
R20	108 Pacifica, Irvine CA	Office	1	B (67)	55.3
R21	114 Pacifica, Irvine CA	Office	1	B (67)	67.3
R22	114 Pacifica, Irvine CA	Office	1	B (67)	67.1

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

7.1 Future Noise Environment and Impacts

The noise study was conducted to determine the future traffic noise impacts at the same modeled receivers within the project area. Potential long-term noise impacts associated with project operations are solely from traffic noise. Traffic noise was evaluated for the worst-case traffic conditions after the project is built.

Future traffic noise levels at all 38 receiver locations were again predicted using Caltrans District 12 Noisiest-Hour Traffic Assumptions for SR-133 at the project vicinity but coded into the validated TNM model of the future build project condition (Alternative 2). Similarly, the calculated noise level results at each modeled receiver were then calibrated based on the K-factor. The results of the future traffic noise model after applying the k-factor are shown in Table B-1 in Appendix B-1.

Tables B-1 summarizes the traffic noise modeling results for existing condition, future no-build condition (without project), and proposed future build condition with the project of Alternative 2. The predicted future build traffic noise levels with the project are compared to existing condition and to future no-build condition. The comparison to existing condition is included in the analysis to identify traffic noise impacts as defined under 23 CFR 772. The comparison to future build condition indicates the direct effect of the project.

Of the 38 modeled receiver locations, 23 receivers (representing 42 receptors with areas of human frequent use) approach or exceed the NAC. The same receivers currently impacted by traffic noise in the existing condition will experience traffic noise impacts in the future condition with the project and an additional receiver, R16.3, begin to experience traffic noise impacts. When traffic noise impacts occur, noise abatement measures must be considered.

Below discusses the predicted traffic noise levels and traffic noise impacts based on the modeling results. The approximate lengths and locations of all evaluated noise barriers considered as noise abatement measures for the project is shown in Figures 7-1 (Sheets 1 to 3).

Area A

The traffic noise modeling results in Table B-1 indicate traffic noise levels at receptors in Area A are predicted to be in the range of 55.2 to 76.5 dBA L_{eq}(h) in the future build condition. The results also indicate that the increase in noise between existing condition and the future build conditions is predicted to be in the range of 0.0 to 1.0 dB. The traffic noise levels in the future build condition at a few receivers (offices) are predicted to approach and/or exceed the noise abatement criterion (72 dBA L_{eq}[h]) but do not substantially exceed the existing noise levels by 12 dBA or more. Therefore, noise abatement must be evaluated and considered in this area. The impacted receptors are as follows:

- **Receptors R6, R7, and R8.**

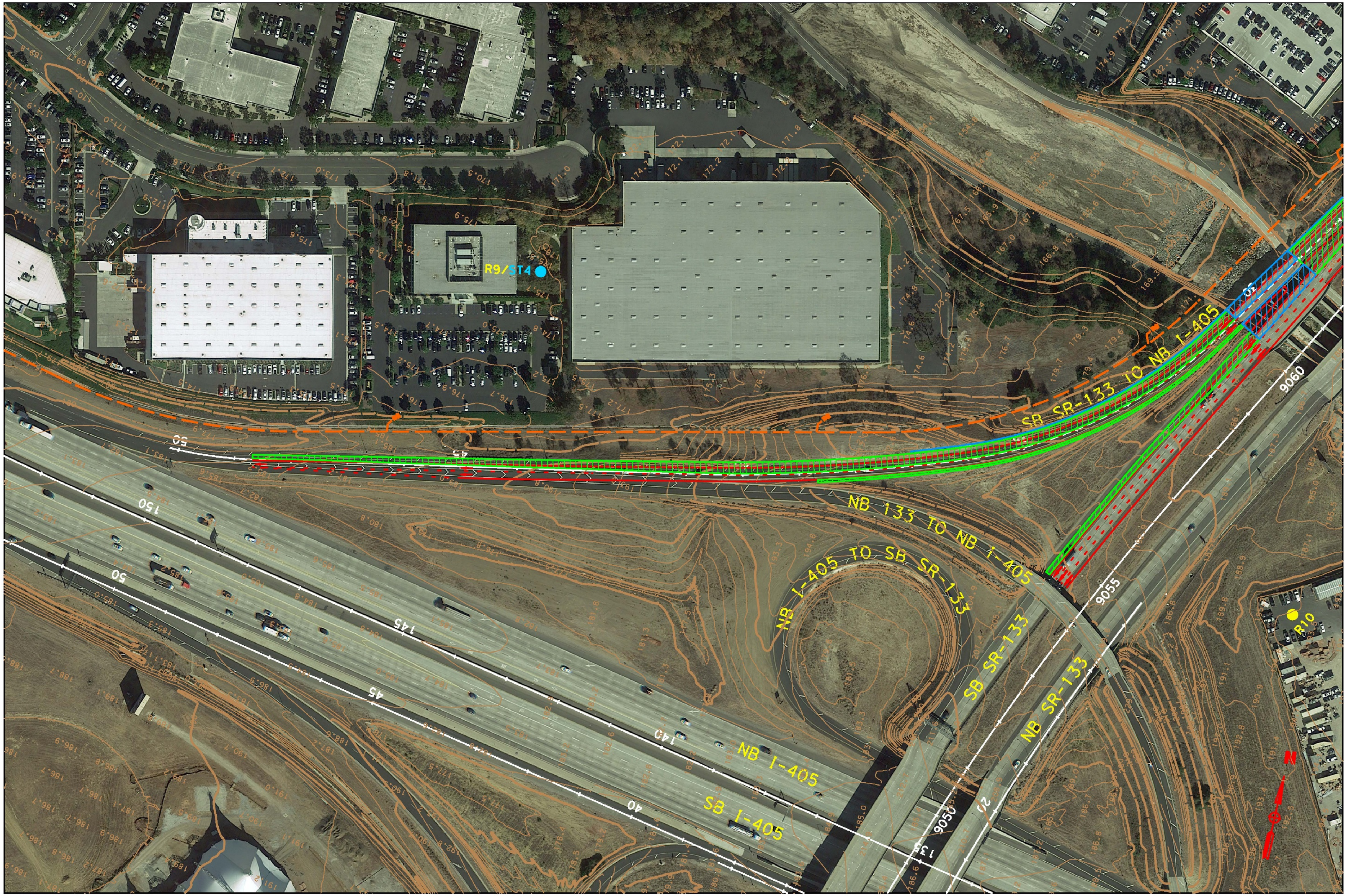
These receivers are in Area A along SB SR-133 and represent outside sitting areas of office buildings. Currently there are no existing sound wall that shields SR-133 traffic noise. Noise barriers (NB No. S9075 and S9067) were modeled ranging from 6 feet to 22 feet high at 2 feet intervals with approximate lengths of 432 feet and 735 feet respectively at Caltrans Right-of-way to shield these impacted receivers from future predicted traffic noise levels.

Area B

The traffic noise modeling results in Table B-1 indicate traffic noise levels at receivers in Area B are predicted to be in the range of 55.5 to 75.6 dBA L_{eq}(h) in the future build condition. The results also indicate that the increase in noise between existing condition and the future build conditions is predicted to be in the range of -0.1 to 0.6 dB. The traffic noise levels in the future build condition at receivers (apartments and offices) are predicted to approach and/or exceed the noise abatement criterion (67 and 72 dBA L_{eq}[h]) but do not substantially exceed the existing noise levels by 12 dBA or more. Therefore, noise abatement must be evaluated and considered in this area. The impacted receptors are as follows:

- **Receptors R11.1 through R11.5, R12.1 through R12.5, R13, R14, R15.1 through R15.5, and R16.3 through R16.5.**

These receptors represent a majority of the 1st, 2nd, 3rd, 4th, and 5th floor balconies of the Westview Apartment Homes which is in Area B along the NB side of SR-133 between the San Diego Creek and Alton Parkway. Receivers R13 and R14 represents outside



LEGEND

- Short-Term Noise Measurement Locations (ST#)
- Modeled Noise Barrier Locations
- Modeled Receptor Locations (R# or R#.#)
- S#### Modeled Noise Barrier Number
- .#/# Receptor Floor Levels (i.e., R203.2/3/4/5 are Receptors at 2nd, 3rd, 4th, and 5th Floor area)
- Proposed Roadway Improvement
- Proposed Structure Improvement
- Proposed Pavement Delineation (Striping)

FIGURE 7-1

SHEET 1 OF 3

1″ =180′

MODELED NOISE BARRIER AND RECEPTOR LOCATIONS

SR-133 SB AUXILIARY LANE PROJECT

LEGEND

- Short-Term Noise Measurement Locations (ST#)
- Modeled Noise Barrier Locations
- Modeled Receptor Locations (R# or R#.#)
- S#### Modeled Noise Barrier Number
- .#/# Receptor Floor Levels (i.e., R203.2/3/4/5 are Receptors at 2nd, 3rd, 4th, and 5th Floor area)
- Proposed Roadway Improvement
- Proposed Structure Improvement
- Proposed Pavement Delineation (Striping)

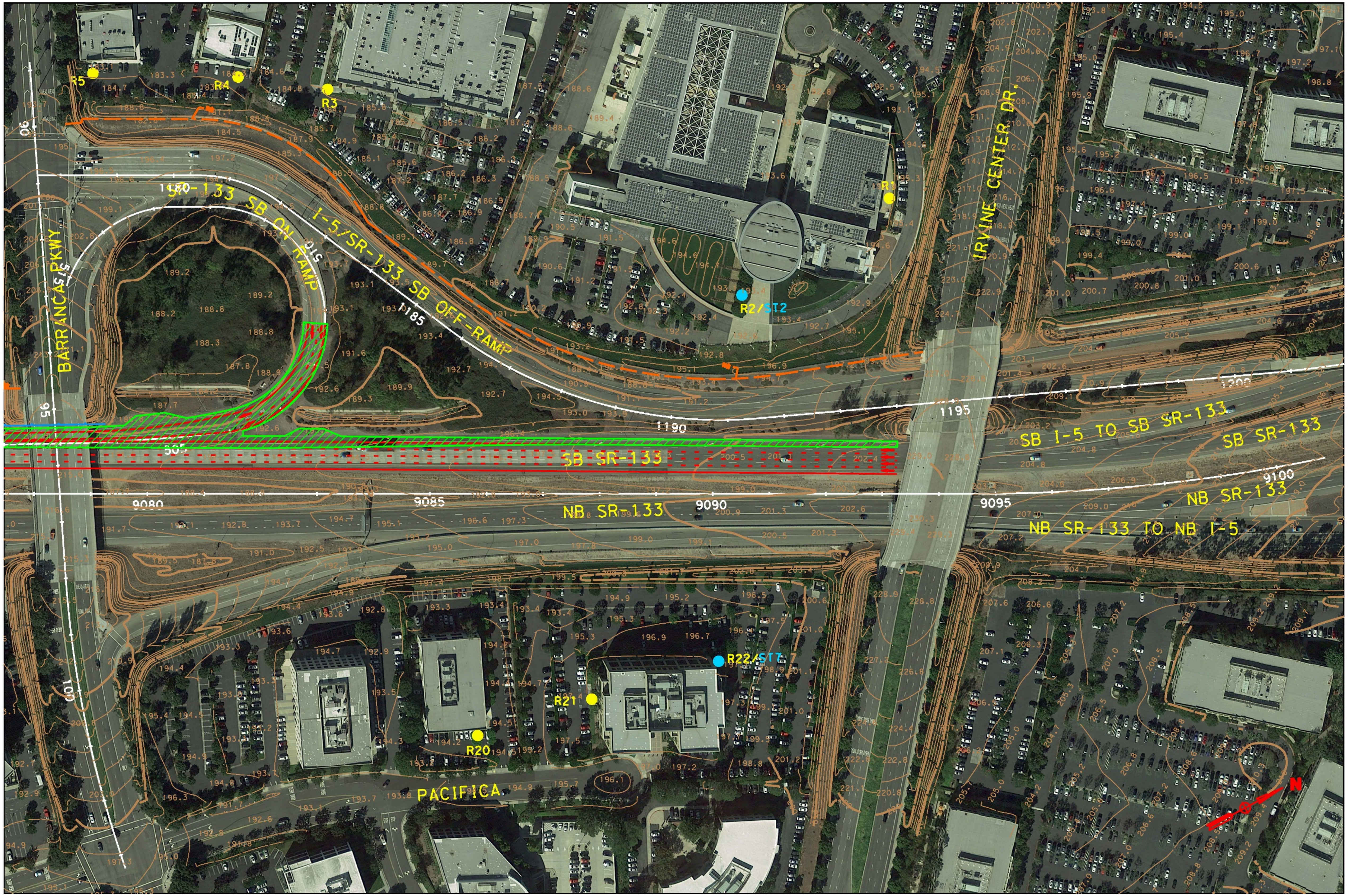
FIGURE 7-1

SHEET 2 OF 3

1″ =180′

MODELED NOISE BARRIER AND RECEPTOR LOCATIONS

SR-133 SB AUXILIARY LANE PROJECT



LEGEND

- Short-Term Noise Measurement Locations (ST#)
- Modeled Receptor Locations (R# or R#.#)
- S#### Modeled Noise Barrier Number
- .#/# Receptor Floor Levels (i.e., R203.2/3/4/5 are Receptors at 2nd, 3rd, 4th, and 5th Floor area)
- Modeled Noise Barrier Locations
- Proposed Roadway Improvement
- Proposed Structure Improvement
- Proposed Pavement Delineation (Striping)

FIGURE 7-1

SHEET 3 OF 3

1″ =180′

MODELED NOISE BARRIER AND RECEPTOR LOCATIONS

SR-133 SB AUXILIARY LANE PROJECT

exercise areas of the apartment and faces the freeway. Currently there is no existing sound wall that shield these receivers from freeway traffic noise. A noise barrier (NB No. S9066) ranging from 6 feet to 22 feet high at two feet intervals with an approximate length of 700 feet was modeled at the State's right-of-way to shield these impacted receivers.

7.2 Preliminary Noise Abatement Analysis

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

- Construction of noise barriers, including acquisition of property rights, either within or outside the highway right-of-way.
- Traffic management measures including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.
- Alteration of horizontal and vertical alignments.
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise.
- Noise insulation of Activity Category D land use facilities listed in Table 4-1. Post-installation maintenance and operational costs for noise insulation are not eligible for Federal-aid funding.

All the above noise abatement options have been considered. However, because of the configuration and location of the project and its alternative, noise barriers in the form of a soundwall is the only form of noise abatement considered to be feasible for this project. Each noise barrier evaluated has been evaluated for feasibility based on achievable noise reduction. For each noise barrier found to be acoustically feasible, reasonable cost allowances were calculated by multiplying the number of benefited receptors by $107,000. Table B-1 in Appendix B summarizes results at receiver locations for three noise barriers (NB Nos. S9066, S9067, and S9075) that has been evaluated in detail for the Build Alternative.

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

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

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

7.2.1 Area A

Traffic noise impacts from the proposed Project are predicted at outdoor sitting areas of office building in this area. and therefore noise abatement must be considered.

Impacted receivers R6, R7 and R8 represents a total of 3 receivers that was modeled at outdoor sitting areas of offices in Area A. Detailed modeling analysis was conducted for proposed noise barriers located along the SB side of SR-133 at the State’s right-of-way between Alton Parkway and Barranca Parkway for R6 and R7; and between the San Diego Creek and Alton Parkway. Noise Barrier No. S9075 was evaluated for R6 and R7 and has an approximate length of 735 feet [SR-133 Station (Sta) 9070+15 to 9077+30]. Noise Barrier No. S9067 was evaluated for R8 and has an approximate length of 432 feet

(SR-133 Sta 9063+54 to 9067+83). Barrier heights in the range of 6 to 22 feet were evaluated in 2-foot increments for both walls and Table B-1 in Appendix B summarizes the results of the barrier analysis for all three receivers in the area. Based on the results, both barriers at heights 12 feet to 22 feet reduced the predicted noise levels by 5 dB or more at all three receivers and therefore are considered feasible from an acoustical perspective. See Figure 7 Sheet 2 for proposed barrier locations.

Table 7-1 and 7-2 summarizes the calculated noise reductions and reasonable allowances for each barrier height for both walls in the Build Alternative. Caltrans' acoustical design goal of 7 dB was also met and is shown in their appropriate tables.

Table 7-1. Summary of Reasonableness Allowances – NB No. S9075

Noise Barrier I.D.: S9075 in Area A									
Critical Receptor: R7									
Predicted Future Noise Level, dBA L_{eq}(h): 75.5									
Future Build Noise Level Minus Existing Noise Level: 1.2									
Future Build with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier [1]**	**16-Foot Barrier**	**18-Foot Barrier**	**20-Foot Barrier**	**22-Foot Barrier**
Barrier Noise Reduction, dB	0.0	0.0	2.7	5.9	8.0	10.7	12.3	13.6	14.8
Number of Benefited Receptors	0	0	0	1	2	2	2	2	2
Reasonable Allowance Per Benefited Receptor	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$0	$0	$107,000	$214,400	$214,000	$214,000	$214,000	$214,000

1. Minimum height needed to achieve Caltrans' 7 dB noise reduction design goal.

Table 7-2. Summary of Reasonableness Allowances – NB No. S9067

Noise Barrier I.D.: S9067 in Area A									
Critical Receptor: R8									
Predicted Future Noise Level, dBA L_{eq}(h): 74.9									
Future Build Noise Level Minus Existing Noise Level: 1.0									
Future Build with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier [1]**	**14-Foot Barrier**	**16-Foot Barrier**	**18-Foot Barrier**	**20-Foot Barrier**	**22-Foot Barrier**
Barrier Noise Reduction, dB	0.0	0.3	3.7	7.0	9.5	11.0	12.2	13.1	14.5
Number of Benefited Receptors	0	0	0	1	1	1	1	1	1
Reasonable Allowance Per Benefited Receptor	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$0	$0	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000

1. Minimum height needed to achieve Caltrans' 7 dB noise reduction design goal

7.2.2 Area B

Traffic noise impacts from proposed Project are predicted at multi-family residential balconies and outdoor exercise areas of apartment homes (Westview at Irvine Spectrum) in this area, and therefore noise abatement must be considered.

Impacted receivers R11.1 through R11.5, R12.1 through R12.5, R13, R14, R15.1 through R15.5, and R16.3 through R16.5 represent a total of 42 human-frequent use areas of multi-family residences and common exercise areas, that was modeled in Area B. Detailed modeling analysis was conducted for a proposed noise barrier located along NB side of SR-133 at the State's right-of-way at an approximate length of 700 feet (SR-133 Sta 9061+81 to 9068+59). The barrier evaluated is identified as NB No. S9066 in Figure 7-1. Barrier heights in the range of 6 to 22 feet were evaluated in 2-foot increments. Tables B-1in Appendix B summarizes the results of the barrier analysis for each receiver location. Based on the results, the barrier at heights ranging from 8 to 22 feet reduced the predicted noise levels by 5 dB at most of the impacted receptors and therefore considered feasible from an acoustical perspective. See Figure 7 Sheet 2 for proposed barrier location.

Table 7-3 summarizes the calculated noise reductions and reasonable allowances for each barrier height in the Build Alternative. Caltrans' acoustical design goal of 7 dB was also met and is shown in the table.

Table 7-3. Summary of Reasonableness Allowances – NB No. S9066

Noise Barrier I.D.: S9066 in Area B									
Critical Receptor: R14									
Predicted Future Noise Level, dBA L_{eq}(h): 75.9									
Future Build Noise Level Minus Existing Noise Level: 2.4									
Future Build with Barrier	**6-Foot Barrier**	**8-Foot Barrier [1]**	**10-Foot Barrier**	**12-Foot Barrier**	**14-Foot Barrier**	**16-Foot Barrier**	**18-Foot Barrier**	**20-Foot Barrier**	**22-Foot Barrier**
Barrier Noise Reduction, dB	4.1	8.0	10.4	12.1	13.6	14.6	15.8	16.7	17.5
Number of Benefited Receptors	0	3	5	5	5	7	7	7	9
Reasonable Allowance Per Benefited Receptor	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$321,000	$535,000	$535,000	$535,000	$749,000	$749,000	$749,000	$963,000

1. Minimum height needed to achieve Caltrans' 7 dB noise reduction design goal.

7.3 Noise Reflection

The reflection of noise from barriers can be a source of concern for residences near a barrier or barriers. A barrier that reduces noise at receptors on one side of the highway could potentially alter the noise at receptors on the other side of the freeway or highway. In certain configurations, noise reflecting off these barriers or structures (i.e. retaining walls, bridge soffits, or other noise-reflective materials used within the project) degrades the evaluated noise barrier's performance or may cause noise increases in areas not protected by the barriers.

The Protocol has a section discussing how to avoid reflective noise effects by proposing acoustically absorptive surface or materials with a noise reduction of 0.80 or greater on walls under either of the following conditions:

- The ratio of the spacing between new parallel barriers or retaining walls and the average height of the barriers or walls is 15:1 or less and,

- Receptors on one side of the highway have a direct line of sight from an area of frequent human use that would be benefit from a lowered noise level to a new barrier or new retaining wall on the opposite side of the highway.

For this Project, both conditions will not occur. The ratio of the space between proposed parallel walls, NB Nos. S9066 and S9067, and their feasible average heights comes to about 17:1 which is more than 15:1. Also, receivers on Westview apartment homes does not have a direct line of sight of the noise barrier on the opposite side of the freeway.

7.4 Conclusion

Based on this noise study, Caltrans intends to consider noise abatement measures in the form of barrier(s), i.e. sound walls for the Project. The feasible noise barriers considered consists of 3 walls: S9066, S9067, and S9075. Tables 7-1 to Tables 7-3 summarizes the reasonableness allowances for each barrier and at their height ranges for the Build Alternative. The number of benefited receptors with the evaluated barriers and varying heights resulted with a range of 1 to 9 and a total Reasonable Allowance from $107,000 to $963,000.

The evaluation of noise barriers presented in this report is preliminary and has been conducted at a level appropriate for environmental review and not for final design of the proposed Project. If pertinent parameters change substantially during the final project design, preliminary noise barrier location and heights may be modified or eliminated from the final project. A final decision on the recommendation to construct the noise abatement measure will be made upon completion of the public involvement process and the final project design process.

A Noise Abatement Decision Report (NADR) will be prepared for the Project. The NADR is a design responsibility and is prepared to compile information from the NSR, from other relevant environmental studies, and from design considerations into a single comprehensive document before public review of the project. The NADR is prepared after the completion of the NSR and usually prior to publication of the draft environmental document. The NADR includes noise abatement construction cost estimates that have been approved and signed by the project engineer based on site-specific conditions. Construction cost estimates of the noise abatement are compared to reasonable allowances in the NADR to identify which barrier or soundwall configurations are reasonable from a cost perspective. The reasonableness determination of the feasible noise barriers shown in Tables 7-1 to 7-3 will be reported in the NADR for the proposed Project.

7.5 NEPA and CEQA Considerations

Caltrans' Traffic Noise Analysis Protocol dated May 2011, Section 7, explains in detail how Caltrans' policies and procedures apply the 23CFR772. It also explains how traffic noise impacts are evaluated under CEQA and NEPA. Based on Section 7 of the Protocol, this noise study contains existing noise levels, and future predicted noise levels for both the No-Build and Build conditions. All data, analysis, and information needed to satisfy the requirements of the NEPA and/or CEQA have already been provided in this noise study report. This allows the produced data to be appropriately used if any of these two Acts or laws apply during the environmental phase of the Project.

Chapter 8. Construction Noise

During construction of the Project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Noise associated with construction is controlled by 2018 Caltrans Standard Specification Section 14-8.02, "Noise Control," which states the following:

- Control and monitor noise resulting from work activities.
- Do not exceed 86 dBA Lmax at 50 feet from the job site activities from 9 p.m. to 6 a.m.

Table 8-1 summarizes noise levels produced by construction equipment that is commonly used on roadway construction projects. Construction equipment is expected to generate noise levels ranging from 70 to 90 dB at a distance of 50 feet, and noise produced by construction equipment would be reduced over distance at a rate of about 6 dB per doubling of distance.

Table 8-1. Construction Equipment Noise

Equipment	Maximum Noise Level (dBA at 50 feet)
Scrapers	89
Bulldozers	85
Heavy Trucks	88
Backhoe	80
Pneumatic Tools	85
Concrete Pump	82

Source: Federal Transit Administration, 2006. See also:
http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

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

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Chapter 9. References

This chapter contains references cited in the NSR. The format for cited references is provided below. References citied in the boiler plate and example text are also provided below.

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Appendix A Traffic Data

This appendix contains tables presenting the traffic data for calibration, modeled existing condition, modeled future no-build condition, and build conditions for the project alternative.

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Table A-1 Noise Model Calibration Traffic Data								
Description of Traffic Lane	15-Minute Traffic Volume Count Per Vehicle Type			1-Hour Traffic Volume Count Per Vehicle Type			Vehicle Travel Speeds Per Vehicle Type	
	Autos	Medium Trucks	Heavy Trucks	Autos	Medium Trucks	Heavy Trucks	Autos (mph)	Trucks (mph)
ST1 (2/26/2019 Start 07:25 AM End 07:46 AM)								
SR-133 NORTHBOUND								
Mainline Lane 1 Mainline Lane 2	534	7	9	2136	28	36	66	66
SR-133 SOUTHBOUND								
Mainline Lane 1 Mainline Lane 2 Mainline Lane 3 (Merging Traffic from Loop On-ramp)	658	4	8	2632	16	32	55	55
RAMPS								
SR-133 NB On-ramp From Pacifica/Gateway				220	7	3	45	45
SR-133 NB Off-ramp to Pacifica/Gateway				208	7	2	45	45
ST2 (2/26/2019 Start 08:44 AM End 08:59 AM)								
SR-133 NORTHBOUND								
Mainline Lane 1 Mainline Lane 2				2456	64	32	58	58
SR-133 SOUTHBOUND								
Mainline Lane 1 Mainline Lane 2 Mainline Lane 3				2179	45	23	64	64
RAMPS								
SR-133 NB On-ramp From Barranca Parkway				322	13	7	55	55
I-5 SB Off-ramp to Barranca Parkway				817	26	9	45	45
SR-133 SB Off-ramp to Barranca Parkway				817	26	9	45	45
ST3 (2/26/2019 Start 09:37 AM End 09:52 PM)								
SR-133 NORTHBOUND								
Mainline Lane 1 Mainline Lane 2				1540	32	16	59	59

Table A-1 Noise Model Calibration Traffic Data								
Description of Traffic Lane	15-Minute Traffic Volume Count Per Vehicle Type			1-Hour Traffic Volume Count Per Vehicle Type			Vehicle Travel Speeds Per Vehicle Type	
	Autos	Medium Trucks	Heavy Trucks	Autos	Medium Trucks	Heavy Trucks	Autos (mph)	Trucks (mph)
SR-133 SOUTHBOUND								
Mainline Lane 1				1844	40	20	66	66
Mainline Lane 2								
Mainline Lane 3								
RAMPS								
SR-133 NB Off-ramp to Pacifica				208	7	2	45	45
SR-133 NB On-ramp From Pacifica				220	7	3	45	45
SR-133 SB On-ramp From Barranca Parkway				148	6	2	45	45
ST4 (2/26/2019 Start 10:21 AM End 10:36 AM)								
I-405 NORTHBOUND								
Mainline Lane 1				6584	57	27	65	65
Mainline Lane 2								
Mainline Lane 3								
Mainline Lane 4								
Mainline Lane 5 (Merging)								
I-405 SOUTHBOUND								
Mainline Lane 1				6132	48	24	66	66
Mainline Lane 2								
Mainline Lane 3								
Mainline Lane 4								
CONNECTORS AND RAMPS								
SR-133 SB to I-405 NB				572	3	7	55	55
SR-133 NB to I-405 NB				244	10	5	55	55
I-405 NB to SR-133 SB				125	5	3	40	40

Table A-1 Noise Model Calibration Traffic Data

Description of Traffic Lane	15-Minute Traffic Volume Count Per Vehicle Type			1-Hour Traffic Volume Count Per Vehicle Type			Vehicle Travel Speeds Per Vehicle Type	
	Autos	Medium Trucks	Heavy Trucks	Autos	Medium Trucks	Heavy Trucks	Autos (mph)	Trucks (mph)
ST5 (2/26/2019 Start 11:30 AM End 11:45 AM)								
SR-133 NORTHBOUND								
Mainline Lane 1	341	10	9	1364	40	36	66	66
Mainline Lane 2								
SR-133 SOUTHBOUND								
Mainline Lane 1	454	4	8	1816	16	32	65	65
Mainline Lane 2								
RAMPS								
SR-133 NB Off-ramp to Pacifica/Gateway				208	7	2	55	55
ST6 (2/26/2019 Start 13:28 PM End 13:43 PM)								
SR-133 NORTHBOUND								
Mainline Lane 1				1300	35	17	66	66
Mainline Lane 2								
SR-133 SOUTHBOUND								
Mainline Lane 1				1268	27	13	66	66
Mainline Lane 2								
Mainline Lane 3 (Merging Traffic from Loop On-ramp)								
RAMPS								
SR-133 NB On-ramp From Pacifica/Gateway				220	7	3	45	45
SR-133 NB Off-ramp to Pacifica/Gateway				208	7	2	45	45
SR-133 SB On-ramp From Barranca Parkway				341	11	4	45	45
ST7 (2/26/2019 Start 14:03 PM End 14:18 PM)								
SR-133 NORTHBOUND								
Mainline Lane 1				1079	46	23	67	67
Mainline Lane 2								
Mainline Lane 3								
SR-133 SOUTHBOUND								

Table A-1 Noise Model Calibration Traffic Data								
Description of Traffic Lane	15-Minute Traffic Volume Count Per Vehicle Type			1-Hour Traffic Volume Count Per Vehicle Type			Vehicle Travel Speeds Per Vehicle Type	
	Autos	Medium Trucks	Heavy Trucks	Autos	Medium Trucks	Heavy Trucks	Autos (mph)	Trucks (mph)
Mainline Lane 1				1272	29	15	67	67
Mainline Lane 2								
Mainline Lane 3								
RAMPS								
SR-133 NB On-ramp From Barranca Parkway				322	13	7	55	55
I-5 SB Off-ramp to Barranca Parkway				192	6	2	45	45
SR-133 SB Off-ramp to Barranca Parkway				192	6	2	45	45

Note: Traffic volumes and speed used in the calibration of ST1 and ST5 were obtain from field count, PeMS, and traffic census data. Traffic volumes and speed used in the calibration of ST2, ST3, ST4, ST6, and ST7 were obtain directly from PeMS and traffic census data. Adjacent local roadway traffic volumes and speeds were not taken during the noise measurements and ambient noise from this noise source are accounted for during the validation and calibration of the TNM.

Table A-2 Modeled Existing and No Build Condition Traffic Data

Roadway Description	Segment	Number of Lanes	Noisiest-Hour Traffic Volume (vphpl)	Total Traffic Volume Per Segment	Autos		Medium Trucks		Heavy Trucks		Average Speed (mph)
					%	Volume	%	Volume	%	Volume	
SR-133											
Northbound	From I-405 to Alton Pkwy										
Mainline Lane 1		1	1950	5850	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65
Southbound											
Mainline Lane 1		1	1950	5850	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65
Connectors											
SR-133 SB to I-405 NB		1	1950	1950	94	1833	4	78	2	39	65
Ramps											
NB Off-ramp to Pacifica/Gateway		2	1000	2000	96	1920	3	60	1	20	45
Northbound	From Alton Pkwy to Barranca Pkwy										
Mainline Lane 1		1	1950	3900	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Southbound											
Mainline Lane 1		1	1950	5850	94	1833	4	78	4	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65
Ramps											
NB Off-ramp to Pacifica/Gateway		2	1000	2000	94	1920	3	60	1	20	45
NB On-ramp from Pacifica/Gateway		1	1000	1000		960		30		10	45
SB On-ramp from Banting/Barranca Pkwy		1	1000	1000		960		30		10	45
Northbound	From Barranca Pkwy to Irvine Center Dr.										
Mainline Lane 1		1	1950	5850	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65

Table A-2 Modeled Existing and No Build Condition Traffic Data

Roadway Description	Segment	Number of Lanes	Noisiest-Hour Traffic Volume (vphpl)	Total Traffic Volume Per Segment	Autos		Medium Trucks		Heavy Trucks		Average Speed (mph)
					%	Volume	%	Volume	%	Volume	
Southbound											
Mainline Lane 1		1	1950			1833		78		39	65
Mainline Lane 2		1	1950	5850	94	1833	4	78	2	39	65
Mainline Lane 3		1	1950			1833		78		39	65
Connectors											
SR-133 NB to I-5 NB	From Barranca Pkwy to Irvine Center Dr.	2	3900	3900	94	3666	4	156	2	78	65
I-5 SB to SR-133 SB		2	3900	3900	94	3666	4	156	2	78	65
Ramps											
NB On-ramp from Barranca Pkwy		1	1000	1000	96	960	3	30	1	10	45
SB Off-ramp to Barranca Pkwy		1	1000	1000	96	960	3	30	1	10	45
I-5 SB Off-ramp to Barranca Pkwy		1	1000	1000	96	960	3	30	1	10	45
I-405											
Northbound											
Mainline Lane 1		1	1950			1833		78		39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950	9750	94	1833	4	78	2	39	65
Mainline Lane 4		1	1950			1833		78		39	65
Mainline Lane 5		1	1950			1833		78		39	65
HOV Lane 1	From PM 1.8 to 2.1	1	1500	1500	100	1500	0	0	0	0	65
Southbound											
Mainline Lane 1		1	1950			1833		78		39	65
Mainline Lane 2		1	1950	7800	94	1833	4	78	2	39	65
Mainline Lane 3		1	1950			1833		78		39	65
Mainline Lane 4		1	1950			1833		78		39	65
HOV Lane 1		1	1500	1500	100	1500	0	0	0	0	65
HOV Lane 2		1	1500	1500	100	1500	0	0	0	0	65

Table A-3 Modeled Future Build Condition Traffic Data											
Roadway Description	Segment	Number of Lanes	Noisiest-Hour Traffic Volume (vphpl)	Total Traffic Volume Per Segment	Autos		Medium Trucks		Heavy Trucks		Average Speed (mph)
					%	Volume	%	Volume	%	Volume	
SR-133											
Northbound	From I-405 to Alton Pkwy										
Mainline Lane 1		1	1950	5850	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65
Southbound											
Mainline Lane 1		1	1950	5850	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65
Connectors											
SR-133 SB to I-405 NB		2	3900	3900	94	3666	4	156	2	78	65
Ramps											
NB Off-ramp to Pacifica/Gateway		2	1000	2000	96	1920	3	60	1	20	45
Northbound	From Alton Pkwy to Barranca Pkwy										
Mainline Lane 1		1	1950	3900	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Southbound											
Mainline Lane 1		1	1950	5850	94	1833	4	78	4	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65
Auxiliary Lane 1		1	1000	1000		940		40		20	65
Ramps											
NB Off-ramp to Pacifica/Gateway		2	1000	2000	94	1920	3	60	1	20	45
NB On-ramp from Pacifica/Gateway		1	1000	1000		960		30		10	45
SB On-ramp from Banting/Barranca Pkwy		1	1000	1000		960		30		10	45
Northbound	From Barranca Pkwy to Irvine Center Dr.										
Mainline Lane 1		1	1950	5850	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65

Table A-3 Modeled Future Build Condition Traffic Data												
Roadway Description	Segment	Number of Lanes	Noisiest-Hour Traffic Volume (vphpl)	Total Traffic Volume Per Segment	Autos		Medium Trucks		Heavy Trucks		Average Speed (mph)
					%	Volume	%	Volume	%	Volume	
Mainline Lane 3	From Barranca Pkwy to Irvine Center Dr.	1	1950		94	1833	4	78	2	39	65
Southbound											
Mainline Lane 1		1	1950	7800	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65
Mainline Lane 4		1	1950			1833		78		39	65
Connectors											
SR-133 NB to I-5 NB		2	3900	3900	94	3666	4	156	2	78	65
I-5 SB to SR-133 SB		2	3900	3900	94	3666	4	156	2	78	65
Ramps											
NB On-ramp from Barranca Pkwy		1	1000	1000	96	960	3	30	1	10	45
SB Off-ramp to Barranca Pkwy		1	1000	1000	96	960	3	30	1	10	45
I-5 SB Off-ramp to Barranca Pkwy		1	1000	1000	96	960	3	30	1	10	45
I-405											
Northbound	From PM 1.8 to 2.1										
Mainline Lane 1		1	1950	9750	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65
Mainline Lane 4		1	1950			1833		78		39	65
Mainline Lane 5		1	1950			1833		78		39	65
HOV Lane 1		1	1500	1500	100	1500	0	0	0	0	65
Southbound											
Mainline Lane 1		1	1950	7800	94	1833	4	78	2	39	65
Mainline Lane 2		1	1950			1833		78		39	65
Mainline Lane 3		1	1950			1833		78		39	65
Mainline Lane 4		1	1950			1833		78		39	65
HOV Lane 1		1	1500	1500	100	1500	0	0	0	0	65
HOV Lane 2		1	1500	1500	100	1500	0	0	0	0	65

Appendix B Predicted Future Noise Levels and Noise Barrier Analysis

This appendix contains tables that summarizes the traffic noise modeling results for existing, and future-build conditions with and without the project for Alternative 2 This table also compares the predicted noise reductions by barrier height for each noise barrier analyzed.

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TABLE B-1 Predicted Future Noise and Barrier Analysis

SR-133 Future Noisiest Hour Noise Levels - $L_{eq}(h)$

Noise Level Prediction with Barrier [$L_{eq}(h)$], Insertion Loss (I.L.), and Number of Benefited Receptors (NBR)

Receiver No.	Area	Noise Barrier No.	Existing Wall In Front of Receiver (Height, FT) [10]	Land Use [6]	Number of Dwelling Units	Address or General Location	Existing Noise Level $L_{eq}(h)$, dBA	Future No Build $L_{eq}(h)$, dBA	Future Build $L_{eq}(h)$, dBA	Future No-Build minus Existing Condition $L_{eq}(h)$, dBA	Future Build minus Existing Condition $L_{eq}(h)$, dBA	Activity Category (NAC) [5]	Impact Type (A/E - Approach or Exceed the NAC)	6 Feet $L_{eq}(h)$	6 Feet I.L.	6 Feet NBR	8 Feet $L_{eq}(h)$	8 Feet I.L.	8 Feet NBR	10 Feet $L_{eq}(h)$	10 Feet I.L.	10 Feet NBR	12 Feet $L_{eq}(h)$	12 Feet I.L.	12 Feet NBR	14 Feet $L_{eq}(h)$	14 Feet I.L.	14 Feet NBR	16 Feet $L_{eq}(h)$	16 Feet I.L.	16 Feet NBR	18 Feet $L_{eq}(h)$	18 Feet I.L.	18 Feet NBR	20 Feet $L_{eq}(h)$	20 Feet I.L.	20 Feet NBR	22 Feet $L_{eq}(h)$	22 Feet I.L.	22 Feet NBR
R1	A			OFC	1	Discovery, Irvine	55.2	55.2	55.2	0.0	0.0	E(72)	NO	~[1]	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R2/ST2	A			OFC	1	Discovery, Irvine	68.7	68.7	69	0.0	0.3	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R3	A			OFC	1	Discovery, Irvine	57.2	57.2	57.4	0.0	0.2	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R4	A			OFC	1	Discovery, Irvine	57	57	57.2	0.0	0.2	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R5	A			OFC	1	Discovery, Irvine	54.1	54.1	54.3	0.0	0.2	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R6	A	S9075		OFC	1	Banting, Irvine	**73.5**	**73.5**	**74.5**	0.0	1.0	E(72)	**A/E**	74.9	-0.4	0	74.8	-0.3	0	73.5	1.0	0	71	3.5	0	67.8	6.7	1	65.2	**9.3**	1	63.4	**11.1**	1	62	**12.5**	1	60.7	**13.8**	1
R7/ST1	A			OFC	1	Banting, Irvine	**75.2**	**75.2**	**76.2**	0.0	1.0	E(72)	**A/E**	76.4	-0.2	0	76.4	-0.2	0	73.5	2.7	0	70.3	5.9[3]	1	68.2	**8**	1	65.5	**10.7**	1	63.9	**12.3**	1	62.6	**13.6**	1	61.4	**14.8**	1
R8/ST3	A	S9067		OFC	1	Alton Pkwy, Irvine	**75.5**	**75.5**	**76.5**	0.0	1.0	E(72)	**A/E**	76.5	0.0	0	76.2	0.3	0	72.8	3.7	0	69.5	**7**[4]	1	67	**9.5**	1	65.5	**11.0**	1	64.3	**12.2**	1	63.4	**13.1**	1	62	**14.5**	1
R9/ST4	A			OFC	1	Pasteur, Irvine	66	66	66.8	0.0	0.8	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R10	B			VL	1	Spectrum, Irvine	65.2	65.2	65.5	0.0	0.3	G	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R11.1	B	S9066		RES	2	Spectrum, Irvine	**67.1**	**67.1**	**67.3**	0.0	0.2	B (67)	**A/E**	67.2	0.1	0	67.2	0.1	0	67.1	0.2	0	67.1	0.2	0	67.1	0.2	0	67.1	0.2	0	67.1	0.2	0	67.1	0.2	0	67.1	0.2	0
R11.2	B			RES	2	Spectrum, Irvine	**68.2**	**68.2**	**68.6**	0.0	0.4	B (67)	**A/E**	68.4	0.2	0	68.2	0.4	0	68.2	0.4	0	68.2	0.4	0	68.1	0.5	0	68.1	0.5	0	68.1	0.5	0	68.1	0.5	0	68.1	0.5	0
R11.3	B			RES	2	Spectrum, Irvine	**68.6**	**68.6**	**68.9**	0.0	0.3	B (67)	**A/E**	68.8	0.1	0	68.8	0.1	0	68.7	0.2	0	68.6	0.3	0	68.5	0.4	0	68.5	0.4	0	68.5	0.4	0	68.5	0.4	0	68.5	0.4	0
R11.4	B			RES	2	Spectrum, Irvine	**68.8**	**68.8**	**69.1**	0.0	0.3	B (67)	**A/E**	69.2	-0.1	0	69	0.1	0	69	0.1	0	68.9	0.2	0	68.9	0.2	0	68.8	0.3	0	68.7	0.4	0	68.7	0.4	0	68.7	0.4	0
R11.5	B			RES	2	Spectrum, Irvine	**68.9**	**68.9**	**69.2**	0.0	0.3	B (67)	**A/E**	69.2	0.0	0	69.1	0.1	0	69.1	0.1	0	69	0.2	0	69	0.2	0	69	0.2	0	69	0.2	0	68.9	0.3	0	68.8	0.4	0
R12.1	B			RES	2	Spectrum, Irvine	**69.9**	**69.9**	**70.1**	0.0	0.2	B (67)	**A/E**	69.4	0.7	0	69.3	0.8	0	69.2	0.9	0	69.2	0.9	0	69.1	1	0	69.1	1.0	0	69.1	1	0	69.1	1	0	69.1	1	0
R12.2	B			RES	2	Spectrum, Irvine	**70.9**	**70.9**	**71.2**	0.0	0.3	B (67)	**A/E**	70.8	0.4	0	70.5	0.7	0	70.3	0.9	0	70.2	1.0	0	70.1	1.1	0	70.1	1.1	0	70	1.2	0	70	1.2	0	70	1.2	0
R12.3	B			RES	2	Spectrum, Irvine	**71.2**	**71.2**	**71.5**	0.0	0.3	B (67)	**A/E**	71.4	0.1	0	71.1	0.4	0	71	0.5	0	71	0.5	0	70.6	0.9	0	70.4	1.1	0	70.4	1.1	0	70.3	1.2	0	70.3	1.2	0
R12.4	B			RES	2	Spectrum, Irvine	**71.3**	**71.3**	**71.6**	0.0	0.3	B (67)	**A/E**	71.6	0.0	0	71.4	0.2	0	71.3	0.3	0	71.1	0.5	0	71.1	0.5	0	71.1	0.5	0	70.8	0.8	0	70.6	1	0	70.5	1.1	0
R12.5	B			RES	2	Spectrum, Irvine	**71.3**	**71.3**	**71.6**	0.0	0.3	B (67)	**A/E**	71.6	0.0	0	71.6	0.0	0	71.3	0.3	0	71.3	0.3	0	71.1	0.5	0	71.1	0.5	0	71.1	0.5	0	71.1	0.5	0	71.1	0.5	0
R13	B			RES	1	Spectrum, Irvine	**75**	**75**	75.2	0.0	0.2	B (67)	**A/E**	71.4	3.8	0	68.9	6.3	1	67.2	**8.0**	1	66.4	**8.8**	1	65.8	**9.4**	1	65.4	**9.8**	1	65.1	**10.1**	1	64.9	**10.3**	1	64.7	**10.5**	1
R14/ST5	B			RES	2	Spectrum, Irvine	**75.3**	**75.3**	**75.6**	0.0	0.3	B (67)	**A/E**	71.5	4.1	0	67.6	**8.0**	2	65.2	**10.4**	2	63.5	**12.1**	2	62	**13.6**	2	61	**14.6**	2	59.8	**15.8**	2	58.9	**16.7**	2	58.1	**17.5**	2
R15.1	B			RES	2	Spectrum, Irvine	**69.3**	**69.3**	**69.7**	0.0	0.4	B (67)	**A/E**	66.6	3.1	0	65.1	4.6	0	64.1	5.6	2	63.2	6.5	2	62.7	**7**	2	62.4	**7.3**	2	62.2	**7.5**	2	62	**7.7**	2	61.9	**7.8**	2
R15.2	B			RES	2	Spectrum, Irvine	**70.3**	**70.3**	**70.8**	0.0	0.5	B (67)	**A/E**	70.6	0.2	0	70.5	0.3	0	69.3	1.5	0	67.9	2.9	0	66	4.8	0	65.2	5.6	2	64.6	6.2	2	64.3	6.5	2	64.1	6.7	2
R15.3	B			RES	2	Spectrum, Irvine	**70.7**	**70.7**	**71.3**	0.0	0.6	B (67)	**A/E**	71.3	0.0	0	71.2	0.1	0	71.1	0.2	0	71	0.3	0	70	1.3	0	69.5	1.8	0	69	2.3	0	66.8	4.5	0	65.9	5.4	2
R15.4	B			RES	2	Spectrum, Irvine	**71.3**	**71.3**	**71.9**	0.0	0.6	B (67)	**A/E**	71.9	0.0	0	71.9	0.0	0	71.9	0.0	0	71.7	0.2	0	71.7	0.2	0	71.7	0.2	0	70.9	1	0	70.5	1.4	0	70.2	1.7	0
R15.5	B			RES	2	Spectrum, Irvine	**71.4**	**71.4**	**72**	0.0	0.6	B (67)	**A/E**	72	0.0	0	72	0.0	0	72	0.0	0	72	0.0	0	71.9	0.1	0	71.9	0.1	0	71.8	0.2	0	71.8	0.2	0	71.2	0.8	0
R16.1	B			RES	2	Spectrum, Irvine	60.4	60.4	60.9	0.0	0.5	B (67)	NO	59.1	1.8	0	58.4	2.5	0	57.9	3.0	0	57.3	3.6	0	56.9	4	0	56.7	4.2	0	56.5	4.4	0	56.3	4.6	0	56.2	4.7	0
R16.2	B			RES	2	Spectrum, Irvine	63.5	63.5	64.1	0.0	0.6	B (67)	NO	63.7	0.4	0	63.1	1.0	0	61.6	2.5	0	61.1	3.0	0	60.6	3.5	0	60.3	3.8	0	60.1	4	0	60	4.1	0	59.9	4.2	0
R16.3	B			RES	2	Spectrum, Irvine	65.4	65.4	**66**	0.0	0.6	B (67)	**A/E**	65.9	0.1	0	65.8	0.2	0	65.3	0.7	0	65.2	0.8	0	64.6	1.4	0	64.1	1.9	0	63.9	2.1	0	63.8	2.2	0	63.7	2.3	0
R16.4	B			RES	2	Spectrum, Irvine	**66.5**	**66.5**	**67.1**	0.0	0.6	B (67)	**A/E**	67.1	0.0	0	67.1	0.0	0	67.1	0.0	0	66.7	0.4	0	66.6	0.5	0	66.5	0.6	0	66.3	0.8	0	65.8	1.3	0	65.6	1.5	0

TABLE B-1 Predicted Future Noise and Barrier Analysis

SR-133 Future Noisiest Hour Noise Levels - $L_{eq}(h)$

Noise Level Prediction with Barrier [$L_{eq}(h)$], Insertion Loss (I.L.), and Number of Benefited Receptors (NBR)

Receiver No.	Area	Noise Barrier No.	Existing Wall In Front of Receiver (Height, FT) [10]	Land Use [6]	Number of Dwelling Units	Address or General Location	Existing Noise Level $L_{eq}(h)$, dBA	Future No Build $L_{eq}(h)$, dBA	Future Build $L_{eq}(h)$, dBA	Future No-Build minus Existing Condition $L_{eq}(h)$, dBA	Future Build minus Existing Condition $L_{eq}(h)$, dBA	Activity Category (NAC) [5]	Impact Type (A/E - Approach or Exceed the NAC)	6 Feet $L_{eq}(h)$	6 Feet I.L.	6 Feet NBR	8 Feet $L_{eq}(h)$	8 Feet I.L.	8 Feet NBR	10 Feet $L_{eq}(h)$	10 Feet I.L.	10 Feet NBR	12 Feet $L_{eq}(h)$	12 Feet I.L.	12 Feet NBR	14 Feet $L_{eq}(h)$	14 Feet I.L.	14 Feet NBR	16 Feet $L_{eq}(h)$	16 Feet I.L.	16 Feet NBR	18 Feet $L_{eq}(h)$	18 Feet I.L.	18 Feet NBR	20 Feet $L_{eq}(h)$	20 Feet I.L.	20 Feet NBR	22 Feet $L_{eq}(h)$	22 Feet I.L.	22 Feet NBR
R16.5	B	S9066		RES	2	Spectrum, Irvine	**67.2**	**67.2**	**67.8**	0.0	0.6	B (67)	**A/E**	67.8	0.0	0	67.8	0.0	0	67.8	0.0	0	67.8	0.0	0	67.4	0.4	0	67.4	0.4	0	67.2	0.6	0	67.2	0.6	0	67.1	0.7	0
R17	B			VL	1	Spectrum, Irvine	63.9	63.9	64.3	0.0	0.4	G	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R18/ST6	B			HTL	1	Pacifica, Irvine	65.7	65.7	66.2	0.0	0.5	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R19	B			HTL	1	Pacifica, Irvine	55.6	55.6	55.5	0.0	-0.1	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R20	B			OFC	1	Pacifica, Irvine	55.3	55.3	55.5	0.0	0.2	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R21	B			OFC	1	Pacifica, Irvine	67.3	67.3	67.7	0.0	0.4	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~
R22	B			OFC	1	Pacifica, Irvine	67.1	67.1	67.2	0.0	0.1	E(72)	NO	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~

1 This symbol (~) represents noise barriers that were not analyzed in this location and height because the predicted noise level at the modeled receptor did not approach or exceed the NAC.
2 Numbers in bold represent noise levels that approach or exceed the NAC.
3 Underlined numbers represent noise level reductions that achieve at least 5 dB at the modeled receptor after the insertion of the noise barrier and its evaluated height. This noise barrier is considered feasible from an acoustical perspective.
4 Underlined and bold numbers represent noise level reductions that achieve at least 7 dB at one or more benefited receptor after the insertion of the noise barrier and its evaluated height. The 7-dB Noise Reduction Design Goal is one factor that must be met for it to be considered reasonable.
5 All Noise Abatement Criteria (NAC) are exterior unless noted otherwise.
6 Abbreviations for the Land Use consists of: RES-Multi-family residential apartments, OFC-Office, HTL-Hotel, VL-Vacant Land.

Appendix C Supplemental Data

Supplemental data such as field notes, photographs, certification of calibration of sound level meter equipment, Modeled Noise Barrier's top and bottom elevations, and other data from the field investigation.

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COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
12-0N8900	*1214000130*	*RC/RB*	*02/26/2019*

LOCATION	POSITION ID
Toyota LA Regional Office Building	*ST1*

STREET NAME	BETWEEN	AND
2 Banting, Irvine CA 92618	*Alton Parkway*	*Barranca Parkway*

☐ LDL 700	☒ LDL 812	SERIAL No.
		A0523

START TIME: AM PM	STOP TIME: AM PM	DURATION
0725	*0740*	*15 Min*

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
51°F	*1.5 mph*	*S*	*70 %*

REMARKS

- *Partly cloudy*
- *Birds chirping*

COMMENTS:

- *Positioned 35' away from Building and sound level meter facing freeway.*

VERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
69.0	*74.3*	*62.2*					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
12-0N8900	*1214000130*	*RC/RB*	*02/26/2019*

LOCATION	POSITION ID
Masimo Office Building	*ST2*

STREET NAME	BETWEEN	AND
52 Discovery, Irvine CA 92618	*Barranca Parkway*	*Irvine Center Drive*

☐ LDL 700	☒ LDL 812	SERIAL No.
		A0523

START TIME: AM PM	STOP TIME: AM PM	DURATION
0844	*0859*	*15 Min*

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
61°F	*0.9 mph*	*S*	*65 %*

REMARKS

- *Partly cloudy*

COMMENTS:

- *2 persons walked and talked adjacent to meter – 0849*
- *A person walked and talked adjacent to meter - 0856*
- *A personnel of the building conversed adjacent to meter - 0859*

- *The sound level meter positioned 67 feet away from the building and facing the freeway (east direction).*

AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
63.6	*67.8*	*59.6*					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
12-0N8900	*1214000130*	*RC/RB*	*02/26/2019*

LOCATION	POSITION ID
Wells Fargo Office Building	*ST3*

STREET NAME	BETWEEN	AND
15750 Alton Parkway, Irvine CA 92618	*San Diego Creek*	*Alton Parkway*

☐ LDL 700	☒ LDL 812	SERIAL No.
		A0523

START TIME: AM PM	STOP TIME: AM PM	DURATION
0937	*0952*	*15 Min*

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
60°F	*1.2 mph*	*S*	*59 %*

REMARKS

- *Partly cloudy*

COMMENTS:

- *0948 – Man walked by the meter with keys dangling from side of body.*
- *0949 – Large truck backing up. Deliver man walked by again with keys dangling from side of body.*

- *The sound level meter is positioned 21 feet away from the building and facing the freeway.*

AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
69.9	*79.3*	*60.1*					

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
12-0N8900	*1214000130*	*RC/RB*	*02/26/2019*

LOCATION	POSITION ID
Razer Corporate Office Building	*ST4*

STREET NAME	BETWEEN	AND
9 Pasteur, Suite 100, Irvine CA 92618	*Laguna Canyon Rd*	*San Diego Creek*

☐ LDL 700	☒ LDL 812	SERIAL No. *A0523*

REMARKS

- *Partly cloudy*

START TIME: AM PM	STOP TIME: AM PM	DURATION
1021	*1036*	*15 Min*

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
62°F	*1.2 mph*	*S*	*57 %*

COMMENTS:

- *1030 – UPS Truck delivering goods in front of meter. 3 people talking about 50 feet away.*
- *10:36 – Truck horn sound in parking lot in front of meter.*

- *The sound level meter is positioned 67 feet away from the building and facing the freeway.*

VERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
60.2	*70.6*	*55.7*					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
12-0N8900	*1214000130*	*RC/RB*	*02/26/2019*

LOCATION	POSITION ID
Westview Apartments – Outside exercise area	*ST5*

STREET NAME	BETWEEN	AND
21100 Spectrum, Irvine CA 92618	*San Diego Creek*	*Alton Parkway*

☐ LDL 700	☒ LDL 812	SERIAL No.
		A0523

START TIME: AM PM	STOP TIME: AM PM	DURATION
1130	*1145*	*15 Min*

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
63°F	*1.3 mph*	*S*	*59 %*

REMARKS

- *Partly cloudy*

COMMENTS:

- *Sound level meter positioned at exercise area facing the freeway. No building walls are near its vicinity.*

AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
70.3	*78.2*	*60.5*					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
12-0N8900	*1214000130*	*RC/RB*	*02/26/2019*

LOCATION	POSITION ID
Double Tree by Hilton – Swimming pool area	*ST6*

STREET NAME	BETWEEN	AND
90 Pacifica, Irvine CA 92618	*Alton Parkway*	*Barranca Parkway*

☐ LDL 700	☒ LDL 812	SERIAL No.
		A0523

START TIME: AM PM	STOP TIME: AM PM	DURATION
1328	*1343*	*15 Min*

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
73°F	*0.5 mph*	*S*	*41 %*

REMARKS

- *Partly cloudy*

COMMENTS:

- Birds chirping intermittently around meter

- *Sound level meter positioned 50 feet from building and 12 feet/18 feet away from property walls.*

AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
59.8	*64.3*	*55.5*					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
12-0N8900	*1214000130*	*RC/RB*	*02/26/2019*

LOCATION	POSITION ID
Office Building – Outdoor sitting area	*ST7*

STREET NAME	BETWEEN	AND
108 Pacifica, Irvine CA 92618	*Barranca Parkway*	*Irvine Center Drive*

☐ LDL 700	☒ LDL 812	SERIAL No.
		A0523

START TIME: AM PM	STOP TIME: AM PM	DURATION
1403	*1418*	*15 Min*

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
66°F	*2.5 mph*	*N*	*53 %*

REMARKS

- *Partly cloudy*

COMMENTS:

- *1417 – Two men talking around meter.*

- *Sound level meter positioned 17 feet and 20 feet from corner of building.*

AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
60.9	*65.8*	*54.8*					

Modeled Noise Barrier's Top and Bottom Elevations											
Barrier No.	SR-133 Station*	Bottom of Wall Elevations	Top of Wall Elevations at Wall Heights:								
			6 feet	8 feet	10 feet	12 feet	14 feet	16 feet	18 feet	20 feet	22 feet
S9066	9061+81	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
	9062+72	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
	9063+09	182.00	188.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00
	9064+00	184.30	190.30	192.30	194.30	196.30	198.30	200.30	202.30	204.30	206.30
	9065+00	185.90	191.90	193.90	195.90	197.90	199.90	201.90	203.90	205.90	207.90
	9066+00	186.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00	208.00
	9066+29	186.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00	208.00
	9067+00	186.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00	208.00
	9068+00	186.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00	208.00
	9068+59	188.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00	208.00	210.00
S9067	9063+54	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
	9064+00	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
	9065+00	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
	9066+25	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
	9066+74	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
	9067+26	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
	9067+52	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
	9067+83	184.00	190.00	192.00	194.00	196.00	198.00	200.00	202.00	204.00	206.00
S9075	9070+15	185.50	191.50	193.50	195.50	197.50	199.50	201.50	203.50	205.50	207.50
	9071+00	185.50	191.50	193.50	195.50	197.50	199.50	201.50	203.50	205.50	207.50
	9072+00	185.50	191.50	193.50	195.50	197.50	199.50	201.50	203.50	205.50	207.50
	9073+00	185.50	191.50	193.50	195.50	197.50	199.50	201.50	203.50	205.50	207.50
	9074+00	185.50	191.50	193.50	195.50	197.50	199.50	201.50	203.50	205.50	207.50
	9075+00	185.50	191.50	193.50	195.50	197.50	199.50	201.50	203.50	205.50	207.50
	9076+00	185.50	191.50	193.50	195.50	197.50	199.50	201.50	203.50	205.50	207.50
	9077+00	185.50	191.50	193.50	195.50	197.50	199.50	201.50	203.50	205.50	207.50
	9077+30	185.50	191.50	193.50	195.50	197.50	199.50	201.50	203.50	205.50	207.50

* SR-133 stations are approximate values. Elevations are based on surface information and preliminary design plans and profiles. Location of noise barriers are at Caltrans or State's right-of-way.

CERTIFICATE OF CALIBRATION
22352-1
FOR LARSON DAVIS
PRECISION INTEGRATING AND LOGGING SOUND LEVEL METER

Model **812** Serial No. **A0523**
ID No. **N/A**

With Microphone Model **2560** Serial No. **2878**
With Preamplifier Model **PRM828** Serial No. **1541**

Customer: **State of California - Caltrans District 12**
Irvine, CA 92612 P.O. No. **CCSA-3042-0018**

was tested and met Larson Davis specifications at the points tested and as outlined in ANSI S1.4-1983 Type 1; IEC 651-1979 Type 1

on **06 MAY 2016** BY **HAROLD LYNCH**
Service Manager

As received condition: Within Specification.
Re-calibration due on: **06 MAY 2017**

Certified References*

Mfg.	Type	Serial No.	Cal Date	Due Date
B&K	1049	1314996	12 JUN 2015	12 JUN 2016
B&K	2636	1423390	04 JAN 2016	04 JAN 2017
B&K	4226	2141942	02 DEC 2015	02 DEC 2016
B&K	4231	1770857	16 SEP 2015	16 SEP 2016
HP	34401A	MY45023668	12 FEB 2016	12 FEB 2017
HP	3458A	2823A07179	23 JUL 2015	31 JUL 2016

Performed in Compliance with ANSI, NCSL Z-540-1, 1994
and ISO 17025, ISO 9001:2008 Certification NQA No. 11252
*References are traceable to NIST (National Institute of Standards and Technology).

Note: For calibration data see enclosed pages.
The data represent both "as found" and "as left" condition.

Reference Test Procedure: **ACCT Procedure 812-820 Version 3.5.1.**

Temperature	Relative Humidity	Barometric Pressure
23°C	**39** %	**984.64** hPa

Signed: Harold Lynch

ODIN METROLOGY, INC.
CALIBRATION OF SOUND & VIBRATION INSTRUMENTATION
3533 OLD CONEJO ROAD, SUITE 125 THOUSAND OAKS CA 91320
PHONE: (805) 375-0830 FAX: (805) 375-0405

Odin Metrology, Inc.

3533 Old Conejo Road, Suite 125
Thousand Oaks, CA 91320
Phone: (805) 375-0830, Fax: (805) 375-0405
www.OdinMetrology.com

Calibration data for

Larson Davis Precision Integrating and Logging Sound Level Meter
Type 812# A0523, ID# 04308

With Microphone 2560# 2878 and Preamplifier PRM828# 1541

Performed on May 6, 2016

for

State of CA, Caltrans District 12

PO#: Credit Card
Certificate#: 22352-1
Calibration performed by: HL

Environmental Conditions
Relative humidity: 39%
Ambient temperature: 23°C
Ambient pressure: 984.64 hPa

The following calibration was performed per ACCT Procedure 812-820 version 3.5.1.
The data represent both the **"As Found"** and the **"As Left"** conditions.

Page No.	Test	Standard Section (Type 1) ANSI S1.4	IEC 651	Result
3	Internal Clock	Reference Only		**See Data**
3	Sensitivity Verification with Acoustic Calibrator	Reference Only		**See Data**
3	Acoustic Frequency Response with Microphone	5.1, 5.2	6.1, 6.2	**Pass**
3	Self-Generated Noise	5.6	6.6	**Pass**
4	Output Impedance	9.2	10.2	**Pass**
4	AC Full Scale Output Voltage	Reference Only		**See Data**
4	DC Full Scale Output Voltage	Reference Only		**See Data**
4	DC Linearity	Reference Only		**See Data**
5	Overload Indication	8.3.1	9.3.1	**Pass**
5	Peak Characteristic	6.5	7.5	**Pass**
5	Decay Time Constants	6.2, 6.3	7.2, 7.3	**Pass**
6	Steady-State Response	6.4	7.4	**Pass**
	Frequency Response	5.1, 5.2	6.1, 6.2	
6	A-Weighted			**Pass**
7	C-Weighted			**Pass**
	Toneburst Response			
8	Fast time weighting	6.2	7.2	**Pass**
8	Slow time weighting	6.2	7.2	**Pass**
8	Impulse time weighting (single)	6.3	7.3	**Pass**
8	Impulse time weighting (continuous)	6.3	7.3	**Pass**
	Differential Level Linearity	6.9, 6.10	7.9, 7.10	
9	A-Weighted			**Pass**
9	C-Weighted			**Pass**

Internal Clock

Date and time are transferred from SLM, then the SLM date and time are set according to Odin Metrology's clock and the date and time are transferred from the SLM a second time. Time zones (with minor simplifications) and DST are obeyed.

Local Date/Time: Date and time according to Odin Metrology's clock (Pacific Daylight Time) at the time of the clock setting
Location: US state or other location for which the SLM clock is set (some time zone simplifications are made)
UTC Offset: UTC offset for the given location
Daylight Saving Time: whether DST is currently observed for the given location
SLM Clock Before Set: readouts of the SLM's system date and time before any changes are made
SLM Clock After Set: readouts of the SLM's system date and time after setting

Local Date/Time	Location	UTC Offset (Hr:Min)	Daylight Saving Time	SLM Clock Before Set	SLM Clock After Set
Fri 06May2016 08:43:17	California	-7:00	Yes	Fri 06May2016 08:43:09	Fri 06May2016 08:43:20

Sensitivity Verification with Acoustic Calibrator

A sound level calibrator is mounted on the sound level meter and the internal calibration is started. The SLM indication is recorded before and after calibration.

Calibrator Freq.: the frequency of the signal generated by the sound level calibrator
Calibrator SPL: the SPL of the signal generated by the sound level calibrator
SLM SPL Before: SLM indication before internal calibration sequence
SLM SPL After: SLM indication after internal calibration sequence
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)

Performed with microphone 2560# 2878, preamplifier PRM828# 1541, and calibrator 4231# 1770857.

Calibrator Freq. (Hz)	Calibrator SPL (dB)	SLM SPL Before (dB)	SLM SPL After (dB)	Uncertainty (dB)
1,000.0	114.0	113.85	114.00	0.40

Acoustic Frequency Response with Microphone (S1.4 § 5.1, 5.2, 651 § 6.1, 6.2)

The acoustic frequency response is tested using a multifunction acoustical calibrator type 4226 in C frequency weighting. If a windscreen is used, these data are to be corrected.

Frequency: the frequency of the signal to the sound level meter (frequency of 4226 multifunction acoustic calibrator)
Data Found: the value the sound level meter actually indicates (this is a pressure measurement)
RI Corr.: random incidence correction for microphone to be added to displayed SLM (pressure) value
Corrected Resp.: SLM's reading plus the correction indicated
Nominal Value: what the sound level meter should indicate according to ANSI S1.4 and IEC 651
Tolerance: the acceptable range, including the stated uncertainty, for what the sound level meter should indicate according to ANSI S1.4 and IEC 651
Uncertainty: maximum expanded uncertainty of measurement according to IEC with approximately 95% confidence level (coverage factor k=2)
Deviation: the difference between the nominal value and the data found

Performed with microphone 2560# 2878, preamplifier PRM828# 1541, and calibrator 4226# 2141942.

Frequency (Hz)	Data Found (dB)	RI Corr. (dB)	Corrected Resp. (dB)	Nominal Value (dB)	Tolerance (dB) Minimum	Tolerance (dB) Maximum	Uncertainty (dB)	Deviation (dB)	Pass/Fail
31.5	110.75	0.00	110.75	110.99	109.49	112.49	0.15	-0.24	Pass
63.0	113.02	0.00	113.02	113.18	112.18	114.18		-0.17	Pass
125.0	113.76	0.00	113.76	113.83	112.83	114.83		-0.07	Pass
250.0	113.97	0.00	113.97	114.00	113.00	115.00		-0.03	Pass
500.0	114.01	0.00	114.01	114.03	113.03	115.03		-0.02	Pass
1,000.0	Reference								
2,000.0	113.64	0.01	113.65	113.83	112.83	114.83	0.15	-0.18	Pass
4,000.0	112.96	0.16	113.12	113.18	112.18	114.18		-0.06	Pass
8,000.0	110.14	0.10	110.24	110.99	107.99	112.49	0.25	-0.75	Pass
12,500.0	103.26	0.22	103.48	107.76	101.76	110.76	0.50	-4.28	Pass

Self-Generated Noise (S1.4 § 5.6, 651 § 6.6)

To measure inherent noise, the input to the SLM is terminated with a shorted dummy microphone of equal capacitance.

Frequency Weighting: the frequency weighting setting on the sound level meter
Tolerance: the acceptable range, including the stated uncertainty, for what the sound level meter should indicate according to ANSI S1.4 and IEC 651
Data Found: the 30-second L_{eq} value the sound level meter indicates
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)

Frequency Weighting	Tolerance (< dB)	Data Found (dB)	Uncertainty (dB)	Pass/Fail
A	30.00	20.46	0.003	Pass
C		25.35		Pass

Output Impedance (S1.4 § 9.2, 651 § 10.2)

A reference signal is applied to the sound level meter and the output is shorted. The indicated level may not be affected by more than the specified tolerance.

Frequency: the frequency of the signal to the sound level meter
Input Level: the level (amplitude) of the signal to the sound level meter
Nominal Value: the value the sound level meter should indicate
Tolerance: the acceptable difference from nominal, including the stated uncertainty, for what the sound level meter should indicate according to ANSI S1.4 and IEC 651
Data Found: the value the sound level meter actually indicates
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)
Deviation: the difference between the nominal value and the data found

Frequency (kHz)	Input Level (dB)	Nominal Value (dB)	Tolerance (± dB)	Data Found (dB)	Uncertainty (dB)	Deviation (dB)	Pass/Fail
1.0	114.0	114.0	0.20	113.99	0.10	-0.01	**Pass**

AC Full Scale Output Voltage

The sound level meter is set up to indicate full-scale on the display and the AC output is measured. Input frequency is 1,000 Hz.
SPL Rdg.: the input to the sound level meter is adjusted so that it indicates this full-scale value
Data Found: the value the sound level meter actually indicates
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)

SPL Rdg. (dB)	Data Found (mV)	Uncertainty (mV)
129.86	2167.41	0.10

DC Full Scale Output Voltage

The sound level meter is set up to indicate full-scale on the display and the DC output is measured. Input frequency is 1,000 Hz.
SPL Rdg.: the input to the sound level meter is adjusted so that it indicates this full-scale value
Data Found: the value the sound level meter actually indicates
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)

SPL Rdg. (dB)	Data Found (mV)	Uncertainty (mV)
129.74	2415.94	0.10

DC Linearity

The sound level meter is set up to indicate full-scale on the display and the DC-output voltage is recorded in decreasing 10-dB steps.
Rel. Input Level: the level (amplitude) of the signal to the sound level meter, relative to the reference of full-scale
Data Found: the measured DC-output from the SLM
Sensitivity: the calculated sensitivity based on the DC-outputs at the levels of FSD and FSD-80 dB.

Rel. Input Level (dB)	Data Found (mV)	Uncertainty (mV)	Sensitivity (mV/dB)
0.0	2420.46		
-10.0	2,214.54		
-20.0	2,012.11		
-30.0	1,812.21	0.40	
-40.0	1,605.42		
-50.0	1,401.68		20.06
-60.0	1,201.66		
-70.0	997.19		
-80.0	788.00	0.05	
-90.0	593.62		
-100.0	414.51		

Overload Indication (S1.4 § 8.3.1, 651 § 9.3.1)

SLM overload is expected when the display value exceeds the tolerance of the inverse A-weighted test (an overload indication when overload is not expected is not a failure condition). This test will not continue past 63.1 Hz as a precautionary measure.

Frequency: the frequency of the signal to the sound level meter
Rel. Input Level: input level to SLM relative to reference level (FSD-5 dB) at 1,000 Hz; equal to the A-weighted frequency curve
Tolerance: tolerance of the A-weighted test at the stated frequency, according to ANSI S1.4 and IEC 651
Data Found: the value the SLM indicates at the stated frequency and input level
Overload Expected: yes or no depending on if the SLM indication has exceed the stated tolerance
Overload Occurred: whether or not the SLM indicated an overload condition

Frequency (Hz)	Rel. Input Level (dB)	Tolerance (dB) Minimum	Tolerance (dB) Maximum	Data Found (dB)	Overload Expected	Overload Occurred	Pass/Fail
1,000.0	Reference						
794.3	0.8	124.0	126.0	125.00	No	No	**N/A**
631.0	1.9	124.0	126.0	125.00	No	No	**N/A**
501.2	3.2	124.0	126.0	125.00	No	No	**N/A**
398.1	4.8	124.0	126.0	125.00	No	Yes	**N/A**
316.2	6.6	124.0	126.0	124.62	No	Yes	**N/A**
251.2	8.6	124.0	126.0	123.62	Yes	Yes	**Pass**
199.5	10.9	124.0	126.0				
158.5	13.4	124.0	126.0				
125.9	16.1	124.0	126.0				
100.0	19.1	124.0	126.0				
79.4	22.5	124.0	126.0				
63.1	26.2	124.0	126.0				
50.1	30.2	124.0	126.0				
39.8	34.6	123.5	126.5				
31.6	39.4	123.5	126.5				
25.1	44.7	123.0	127.0				
20.0	50.5	122.5	127.5				

Peak Characteristic (S1.4 § 6.5, 651 § 7.5)

The rise time of the peak detector must be such that the response of a short duration (100 μs) rectangular pulse is similar to that of a reference pulse of 10 ms.

Polarity: indicates the bursts are the half-period above (positive) or below (negative) the zero level of the rectangular pulse
Input Level: the maximum peak indication on the SLM after a single reference burst is triggered
Tolerance: the acceptable range, including the stated uncertainty, for what the sound level meter should indicate according to ANSI S1.4 and IEC 651
Data Found: the value the sound level meter actually indicates
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)
Deviation: the difference between the nominal value and the data found

Polarity	Input Level (dB)	Tolerance (≥ dB)	Data Found (dB)	Uncertainty (dB)	Pass/Fail
Positive	129.00	127.00	129.73	0.4	**Pass**
	109.00	107.00	109.73		**Pass**
Negative	129.00	127.00	130.04		**Pass**
	109.00	107.00	109.86		**Pass**

Decay Time Constants for Time Weightings Fast and Slow (S1.4 § 6.2, 6.3, 651 § 7.2, 7.3)

The decay rate of the display value on the sound level meter is measured after a steady 4.0 kHz signal is removed.

Time Weighting: the time weighting setting on the sound level meter
Nominal Rate: the decay rate the sound level meter should exhibit according to ANSI S1.4 and IEC 651
Tolerance: the acceptable range, including the stated uncertainty, for the decay rate for this time weighting
Measured Rate: the actual decay rate measured on the sound level meter
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)

Time Weighting	Tolerance (dB/s) Minimum	Tolerance (dB/s) Maximum	Measured Rate (dB/s)	Uncertainty (dB/s)	Pass/Fail
Fast	20.0	N/A	34.29	2.00	**Pass**
Slow	3.3	N/A	4.33	0.40	**Pass**
Impulse	2.4	3.4	3.09	N/A	**Pass**

Steady-State Response (S1.4 § 6.4, 651 § 7.4)

With reference to L_{AF} at the SLM reference level indicated, the measurements of the other time weighting parameters may not differ by more than the specified tolerance. Test frequency is 1.0 kHz.

Time Weighting: time weighting setting on the SLM
Frequency Weighting: frequency weighting setting on the SLM
Input Level: the level (amplitude) of the signal to the sound level meter
Nominal Value: the value the sound level meter should indicate according to ANSI S1.4 and IEC 651
Tolerance: the acceptable difference from nominal, including the stated uncertainty, for what the sound level meter should indicate according to ANSI S1.4 and IEC 651
Data Found: the value the sound level meter actually indicates
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)
Deviation: the difference between the nominal value and the data found

Time Weighting	Input Level (dB)	Nominal Value (dB)	Tolerance (± dB)	Data Found (dB)	Uncertainty (dB)	Deviation (dB)	Pass/Fail
Fast		Reference				Reference	
Slow	114.0	114.0	0.1	114.00	0.003	0.00	Pass
Impulse				114.00		0.00	Pass

A-Frequency-Weighted Frequency Response (S1.4 § 5.1, 5.2, 651 § 6.1, 6.2)

The sound level meter's frequency response relative to the meter's reference level at 1,000 Hz is recorded by varying the frequency as specified.

Frequency: the frequency of the signal to the sound level meter
Nominal Value: the value the sound level meter should indicate according to ANSI S1.4 and IEC 651 (this is relative to the reference value at 1.0 kHz)
Tolerance: the acceptable range, including the stated uncertainty, for what the sound level meter should indicate according to ANSI S1.4 and IEC 651
Data Found: the value the sound level meter actually indicates
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)
Deviation: the difference between the nominal value and the data found

Frequency (Hz)	Nominal Value (dB)	Tolerance (dB) Minimum	Tolerance (dB) Maximum	Data Found (dB)	Uncertainty (dB)	Deviation (dB)	Pass/Fail
20.0	-50.5	-53.0	-48.0	-50.49		-0.04	Pass
25.1	-44.7	-46.7	-42.7	-44.67		0.04	Pass
31.6	-39.4	-40.9	-37.9	-39.45		-0.01	Pass
39.8	-34.6	-36.1	-33.1	-34.74		-0.11	Pass
50.1	-30.2	-31.2	-29.2	-30.21		0.02	Pass
63.1	-26.2	-27.2	-25.2	-26.24	0.50	-0.05	Pass
79.4	-22.5	-23.5	-21.5	-22.61		-0.11	Pass
100.0	-19.1	-20.1	-18.1	-19.24		-0.10	Pass
125.9	-16.1	-17.1	-15.1	-15.99		0.11	Pass
158.5	-13.4	-14.4	-12.4	-13.24		0.11	Pass
199.5	-10.9	-11.9	-9.9	-10.86		0.01	Pass
251.2	-8.6	-9.6	-7.6	-8.74		-0.11	Pass
316.2	-6.6	-7.6	-5.6	-6.74		-0.13	Pass
398.1	-4.8	-5.8	-3.8	-4.86	0.40	-0.05	Pass
501.2	-3.2	-4.2	-2.2	-3.24		-0.01	Pass
631.0	-1.9	-2.9	-0.9	-1.86		0.04	Pass
794.3	-0.8	-1.8	0.2	-0.74		0.08	Pass
1,000.0	0.0	Reference					
1,258.9	0.6	-0.4	1.6	0.51	0.40	-0.08	Pass
1,584.9	1.0	0.0	2.0	0.89		-0.09	Pass
1,995.3	1.2	0.2	2.2	1.14		-0.06	Pass
2,511.9	1.3	0.3	2.3	1.14		-0.13	Pass
3,162.3	1.2	0.2	2.2	1.14		-0.06	Pass
3,981.1	1.0	0.0	2.0	0.89	0.60	-0.08	Pass
5,011.9	0.5	-1.0	2.0	0.51		-0.04	Pass
6,309.6	-0.1	-2.1	1.4	-0.11		0.01	Pass
7,943.3	-1.1	-4.1	0.4	-1.00		0.11	Pass
10,000.0	-2.5	-6.5	-0.5	-2.39		0.10	Pass
12,589.3	-4.3	-10.3	-1.3	-4.36		-0.04	Pass
15,848.9	-6.6	N/A	-3.6	-6.61	1.00	-0.01	Pass
19,952.6	-9.3	N/A	-6.3	-9.49		-0.17	Pass

C-Frequency-Weighted Frequency Response (S1.4 § 5.1, 5.2, 651 § 6.1, 6.2)

The sound level meter's frequency response relative to the meter's reference level at 1,000 Hz is recorded by varying the frequency as specified.

Frequency: the frequency of the signal to the sound level meter

Nominal Value: the value the sound level meter should indicate according to ANSI S1.4 and IEC 651 (this is relative to the reference value at 1.0 kHz)

Tolerance: the acceptable range, including the stated uncertainty, for what the sound level meter should indicate according to ANSI S1.4 and IEC 651

Data Found: the value the sound level meter actually indicates

Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)

Deviation: the difference between the nominal value and the data found

Frequency (Hz)	Nominal Value (dB)	Tolerance (dB) Minimum	Tolerance (dB) Maximum	Data Found (dB)	Uncertainty (dB)	Deviation (dB)	Pass/Fail
20.0	-6.2	-8.7	-3.7	-6.82		-0.58	Pass
25.1	-4.4	-6.4	-2.4	-4.91		-0.50	Pass
31.6	-3.0	-4.5	-1.5	-3.39		-0.38	Pass
39.8	-2.0	-3.5	-0.5	-2.27		-0.27	Pass
50.1	-1.3	-2.3	-0.3	-1.58		-0.28	Pass
63.1	-0.8	-1.8	0.2	-1.07	0.50	-0.25	Pass
79.4	-0.5	-1.5	0.5	-0.69		-0.19	Pass
100.0	-0.3	-1.3	0.7	-0.44		-0.14	Pass
125.9	-0.2	-1.2	0.8	-0.32		-0.15	Pass
158.5	-0.1	-1.1	0.9	-0.19		-0.10	Pass
199.5	0.0	-1.0	1.0	-0.08		-0.05	Pass
251.2	0.0	-1.0	1.0	-0.07		-0.07	Pass
316.2	0.0	-1.0	1.0	-0.07		-0.09	Pass
398.1	0.0	-1.0	1.0	-0.07	0.40	-0.10	Pass
501.2	0.0	-1.0	1.0	0.03		0.00	Pass
631.0	0.0	-1.0	1.0	-0.07		-0.10	Pass
794.3	0.0	-1.0	1.0	0.06		0.04	Pass
1,000.0	0.0			Reference			
1,258.9	0.0	-1.0	1.0	-0.07	0.40	-0.04	Pass
1,584.9	-0.1	-1.1	0.9	-0.07		0.02	Pass
1,995.3	-0.2	-1.2	0.8	-0.19		-0.02	Pass
2,511.9	-0.3	-1.3	0.7	-0.32		-0.02	Pass
3,162.3	-0.5	-1.5	0.5	-0.44		0.06	Pass
3,981.1	-0.8	-1.8	0.2	-0.82	0.60	0.00	Pass
5,011.9	-1.3	-2.8	0.2	-1.19		0.10	Pass
6,309.6	-2.0	-4.0	-0.5	-1.94		0.06	Pass
7,943.3	-3.0	-6.0	-1.5	-2.82		0.19	Pass
10,000.0	-4.4	-8.4	-2.4	-4.19		0.22	Pass
12,589.3	-6.2	-12.2	-3.2	-6.19		0.05	Pass
15,848.9	-8.5	N/A	-5.5	-8.44	1.00	0.09	Pass
19,952.6	-11.2	N/A	-8.2	-11.32		-0.07	Pass

Toneburst Response (S1.4 § 6.2, 6.3, 651 § 7.2, 7.3)
The sound level meter's A-weighted response to tonebursts at 2.0 kHz is measured.
Burst Dur.: the duration of the toneburst
Burst Rep.: repeat rate of the toneburst (continuous tests only)
Input Level: the level of the steady-state sinusoidal signal as indicated on the SLM display
Nominal Value: the value sound level meter should indicate according to ANSI S1.4 and IEC 651
Tolerance: the acceptable range, including the stated uncertainty, for what the sound level meter should indicate according to ANSI S1.4 and IEC 651
Data Found: the value the sound level meter actually indicates
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)
Deviation: the difference between the nominal value and the data found

Fast time weighting, single toneburst

Burst Dur. (ms)	Input Level (dB)	Nominal Value (dB)	Tolerance (dB) Minimum	Tolerance (dB) Maximum	Data Found (dB)	Uncertainty (dB)	Deviation (dB)	Pass/Fail
200	126.0	125.0	124.0	126.0	124.25	0.2	-0.8	Pass
	116.0	115.0	114.0	116.0	114.13		-0.9	Pass
	106.0	105.0	104.0	106.0	104.25		-0.8	Pass
	96.0	95.0	94.0	96.0	94.25		-0.8	Pass
	86.0	85.0	84.0	86.0	84.25		-0.8	Pass
	56.0	55.0	54.0	56.0	54.50		-0.5	Pass

Slow time weighting, single toneburst

Burst Dur. (ms)	Input Level (dB)	Nominal Value (dB)	Tolerance (dB) Minimum	Tolerance (dB) Maximum	Data Found (dB)	Uncertainty (dB)	Deviation (dB)	Pass/Fail
500	126.0	121.9	120.9	122.9	121.12	0.2	-0.8	Pass
	116.0	111.9	110.9	112.9	111.25		-0.7	Pass
	106.0	101.9	100.9	102.9	101.25		-0.7	Pass
	96.0	91.9	90.9	92.9	91.37		-0.6	Pass
	86.0	81.9	80.9	82.9	81.25		-0.7	Pass
	56.0	51.9	50.9	52.9	51.50		-0.4	Pass

Impulse time weighting, single toneburst

Burst Dur. (ms)	Input Level (dB)	Nominal Value (dB)	Tolerance (dB) Minimum	Tolerance (dB) Maximum	Data Found (dB)	Uncertainty (dB)	Deviation (dB)	Pass/Fail
2	126.0	113.4	111.45	115.4	113.38	0.2	-0.1	Pass
	116.0	103.4	101.45	105.4	103.37		-0.1	Pass
	106.0	93.4	91.45	95.4	93.25		-0.2	Pass
	96.0	83.4	81.45	85.4	83.13		-0.3	Pass
	86.0	73.4	71.45	75.4	73.00		-0.4	Pass
	56.0	43.4	41.45	45.4	43.12		-0.3	Pass
5	126.0	117.2	115.2	119.2	116.75		-0.5	Pass
	116.0	107.2	105.2	109.2	106.69		-0.6	Pass
	106.0	97.2	95.2	99.2	96.75		-0.5	Pass
	96.0	87.2	85.2	89.2	86.74		-0.5	Pass
	86.0	77.2	75.2	79.2	76.75		-0.5	Pass
	56.0	47.2	45.2	49.2	46.75		-0.5	Pass
20	126.0	122.4	120.9	123.9	121.62		-0.8	Pass
	116.0	112.4	110.9	113.9	111.62		-0.8	Pass
	106.0	102.4	100.9	103.9	101.63		-0.8	Pass
	96.0	92.4	90.9	93.9	91.76		-0.6	Pass
	86.0	82.4	80.9	83.9	81.75		-0.6	Pass
	56.0	52.4	50.9	53.9	51.88		-0.5	Pass

Impulse time weighting, continuous tonebursts

Burst Dur. (ms)	Burst Rep. (Hz)	Input Level (dB)	Nominal Value (dB)	Tolerance (dB) Minimum	Tolerance (dB) Maximum	Data Found (dB)	Uncertainty (dB)	Deviation (dB)	Pass/Fail
5	2	126.0	117.2	115.2	119.2	116.44	0.2	-0.8	Pass
		116.0	107.2	105.2	109.2	106.24		-1.0	Pass
		106.0	97.2	95.2	99.2	96.28		-1.0	Pass
		96.0	87.2	85.2	89.2	86.87		-0.4	Pass
		86.0	77.2	75.2	79.2	76.87		-0.4	Pass
		56.0	47.2	45.2	49.2	46.15		-1.1	Pass
	20	126.0	118.4	116.4	120.4	119.56		1.1	Pass
		116.0	108.4	106.4	110.4	109.62		1.2	Pass
		106.0	98.4	96.4	100.4	99.65		1.2	Pass
		96.0	88.4	86.4	90.4	89.50		1.1	Pass
		86.0	78.4	76.4	80.4	79.50		1.1	Pass
		56.0	48.4	46.4	50.4	49.56		1.1	Pass
	100	126.0	123.3	122.3	124.3	123.31		0.0	Pass
		116.0	113.3	112.3	114.3	113.25		0.0	Pass
		106.0	103.3	102.3	104.3	103.25		0.0	Pass
		96.0	93.3	92.3	94.3	93.25		0.0	Pass
		86.0	83.3	82.3	84.3	83.19		-0.1	Pass
		56.0	53.3	52.3	54.3	53.25		0.0	Pass

Differential Level Linearity (S1.4 § 6.9, 6.10, 651 § 7.9, 7.10)
Level linearity is tested at 1.0 kHz. The input level is varied precisely and the indicated level on the display must correspond with the change of input level. Test is performed at A- and C-frequency weighting.

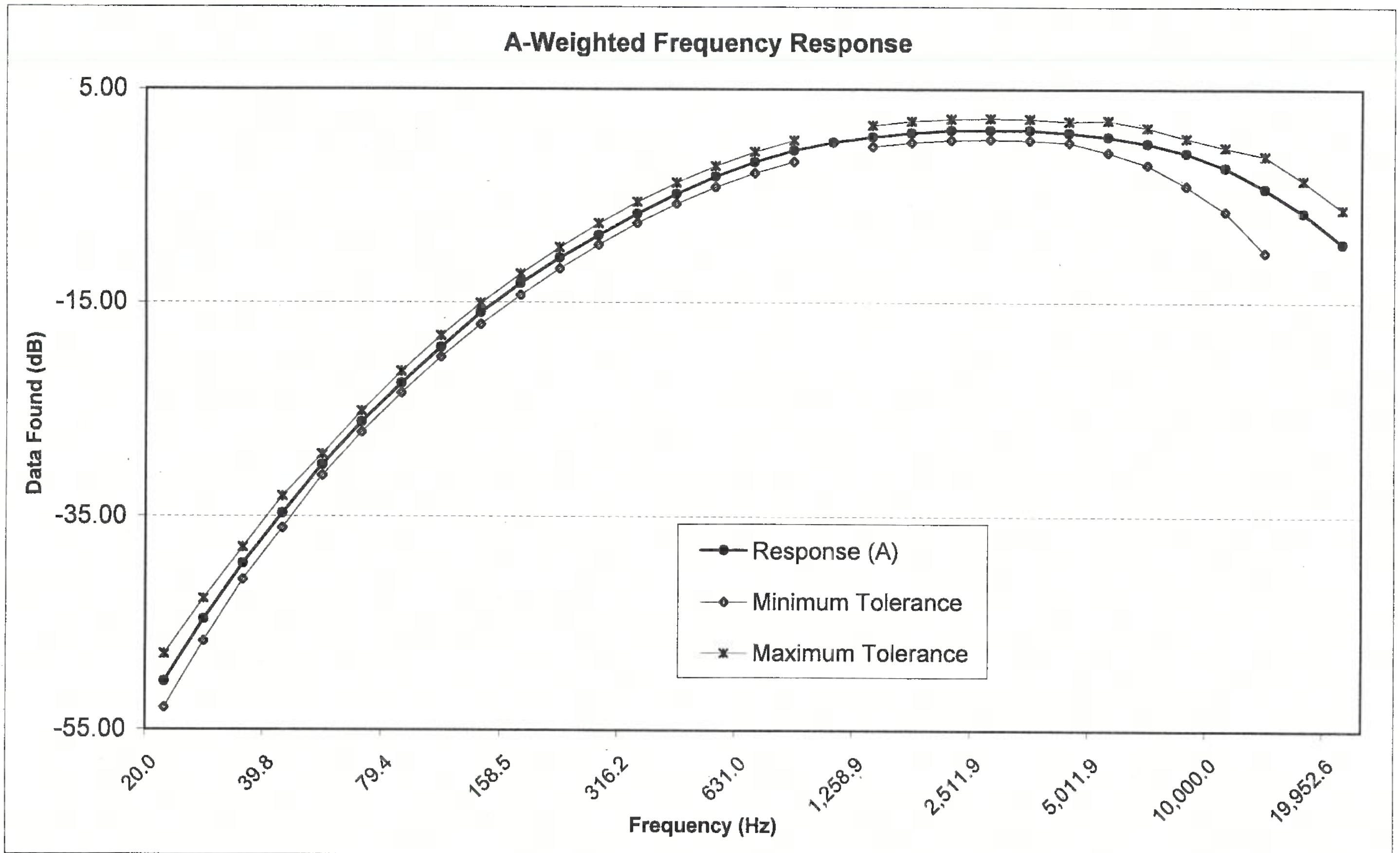
Input Level: the level (amplitude) of the signal to the sound level meter
Nominal Value: the value the sound level meter should indicate according to ANSI S1.4 and IEC 651
Tolerance: the acceptable difference from nominal, including the stated uncertainty, according to ANSI S1.4 and IEC 651
Data Found: the value the sound level meter actually indicates
Uncertainty: maximum expanded uncertainty of measurement with approximately 95% confidence level (coverage factor k=2)
Deviation: difference between the nominal value and the data found; differential: current and previous measurement is not allowed to exceed 0.4 dB according to ANSI S1.4 and IEC 651

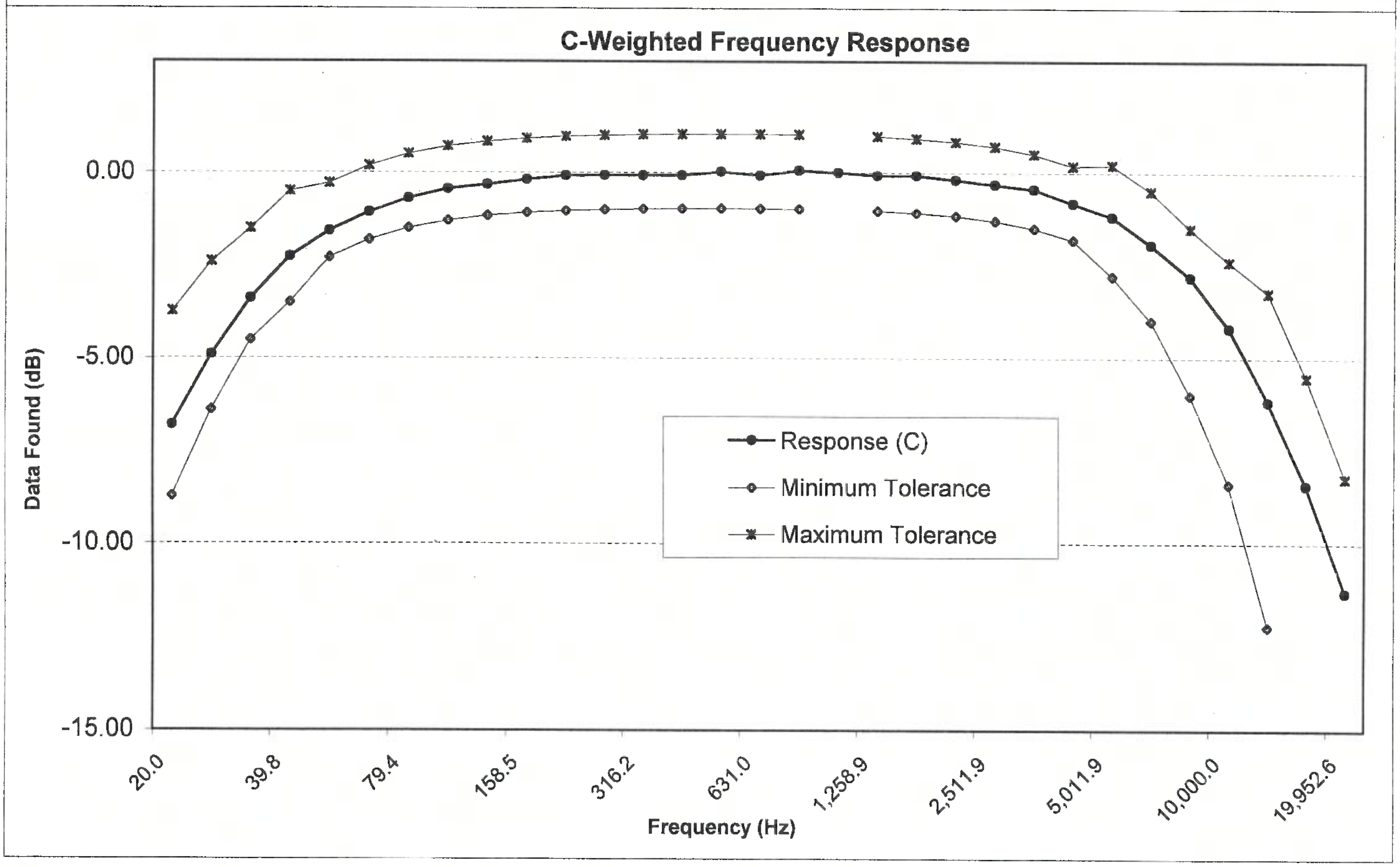
A-weighted

Input Level (dB)	Nominal Value (dB)	Tolerance (± dB)	Data Found (dB)	Uncertainty (dB)	Deviation (dB) Measured	Deviation (dB) Differential	Pass/Fail
114.0	Reference						
120.0	120.0	0.7	119.67	0.2	-0.3	N/A	Pass
125.0	125.0		124.79		-0.2	0.12	Pass
120.0	120.0		119.67		-0.3	-0.12	Pass
115.0	115.0		114.92		-0.1	0.25	Pass
110.0	110.0		109.79		-0.2	-0.13	Pass
105.0	105.0		104.67		-0.3	-0.12	Pass
100.0	100.0		99.92		-0.1	0.25	Pass
95.0	95.0		94.79		-0.2	-0.13	Pass
90.0	90.0		89.79		-0.2	0.00	Pass
85.0	85.0		84.92		-0.1	0.13	Pass
80.0	80.0		79.79		-0.2	-0.13	Pass
75.0	75.0		74.79		-0.2	0.00	Pass
70.0	70.0		69.92		-0.1	0.13	Pass
65.0	65.0		64.67		-0.3	-0.25	Pass
60.0	60.0		59.79		-0.2	0.12	Pass
55.0	55.0		54.92		-0.1	0.13	Pass

C-weighted

Input Level (dB)	Nominal Value (dB)	Tolerance (± dB)	Data Found (dB)	Uncertainty (dB)	Deviation (dB) Measured	Deviation (dB) Differential	Pass/Fail
114.0	Reference						
120.0	120.0	0.7	119.96	0.2	0.0	N/A	Pass
125.0	125.0		125.21		0.2	0.25	Pass
120.0	120.0		119.96		0.0	-0.25	Pass
115.0	115.0		115.08		0.1	0.12	Pass
110.0	110.0		110.21		0.2	0.13	Pass
105.0	105.0		104.96		0.0	-0.25	Pass
100.0	100.0		100.08		0.1	0.12	Pass
95.0	95.0		95.21		0.2	0.13	Pass
90.0	90.0		89.96		0.0	-0.25	Pass
85.0	85.0		85.21		0.2	0.25	Pass
80.0	80.0		80.08		0.1	-0.13	Pass
75.0	75.0		75.08		0.1	0.00	Pass
70.0	70.0		70.21		0.2	0.13	Pass
65.0	65.0		65.02		0.0	-0.19	Pass
60.0	60.0		59.96		0.0	-0.06	Pass
55.0	55.0		55.21		0.2	0.25	Pass


A-Weighted Frequency Response
5.00
-15.00
-35.00
-55.00
Data Found (dB)
20.0
39.8
79.4
158.5
316.2
631.0
1,258.9
2,511.9
5,011.9
10,000.0
19,952.6
Frequency (Hz)
Response (A)
Minimum Tolerance
Maximum Tolerance


C-Weighted Frequency Response
0.00
-5.00
-10.00
-15.00
Data Found (dB)
20.0
39.8
79.4
158.5
316.2
631.0
1,258.9
2,511.9
5,011.9
10,000.0
19,952.6
Frequency (Hz)
Response (C)
Minimum Tolerance
Maximum Tolerance

Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **22352-3**

Certificate of Calibration for
Larson Davis 1/2" Random Incidence Microphone

This calibration is performed by comparison with measurement reference standard microphone:

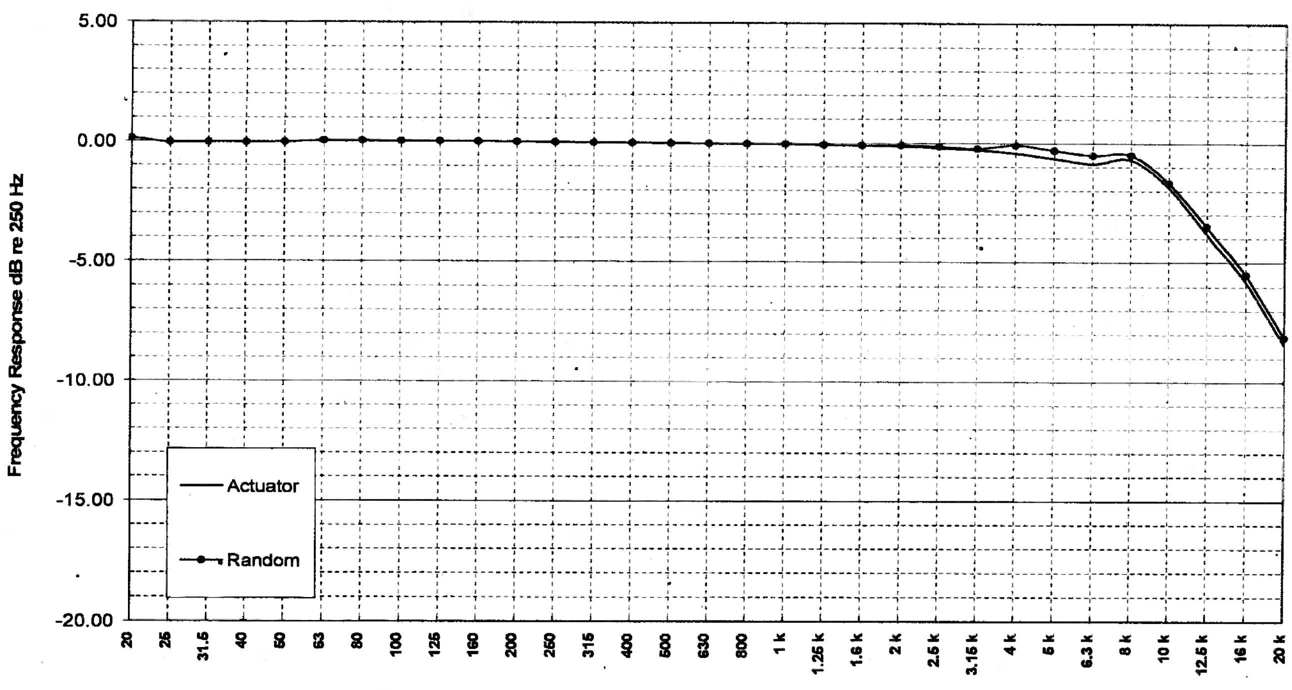
REFERENCE STANDARDS	
Type No.	4134/UA0825
Serial No.	1866524
Calibrated by	DANAK
Cal Date	29 SEP 2015
Due Date	29 SEP 2017

a) Estimated uncertainty of comparison: ± **0.05** dB
b) Estimated uncertainty of reference microphone: ± **0.04** dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± **0.064** dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± **0.13** dB

Type no.	**2560**
Serial no.	**2878**
With preamplifier type no.	**N/A**
Preamplifier Serial no.	**N/A**
Submitted by	**State of California/Caltrans District 12** **Irvine, CA 92612**
Purchase order no.	**Credit Card/CCSA-3042-0018**
Asset no.	**N/A**

PERFORMANCE DATA		
Open circuit sensitivity at 1,013 hPa, 23°C, 50% RH, 251.2 Hz	**-26.35**	dB re 1 V/Pa
	48.12	mV/Pa
System sensitivity (with preamplifier) at 251.2 Hz	**N/A**	dB re 1 V/Pa
	N/A	mV/Pa

Microphone Frequency Response Type 2560
S/N 2878 : Measured 5 May 2016



Calibration performed by *[signature]*

Harold Lynch, Service Manager

CONDITION OF TEST		
Ambient Pressure	**986.05**	hPa
Temperature	**23**	°C
Relative Humidity	**39**	%
Polarization Voltage	**200**	V
Frequency	**251.2**	Hz
Date of Calibration	**05 MAY 2016**	
Re-calibration due on	**05 MAY 2017**	

ODIN METROLOGY, INC.
3533 OLD CONEJO ROAD, SUITE 125
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

The calibration data is both "as found" and "as final." At the time of calibration this microphone was found to be **within** the manufacturer's specifications. Calibration Procedure: **OM-P-1008-Microphone Rev. 1.2 20130618.**

This calibration is traceable to DANAK/DPLA No. **M2.10-1064-2.1** and through inter-laboratory comparisons to NIST Test Number: **TN-683/286992-15** for transfer standard **4160# 512338 24 JUN 2015**. *See page 2 Traceability.

Instrumentation used for calibration of microphones

Instrument Type	Type no.	Serial no.	Cal. Date	Cal. Due	Cal. by
B&K Sine/Random Generator	1049	1464545	16 JUN 15	16 JUN 16	HL
Precision Barometer	141	299/95-10	03 DEC 15	03 DEC 16	CMI
Measuring Amplifier	2636	1324114	01 JUN 15	01 JUN 16	HL
Preamplifier	2639	1595652	22 JUN 15	22 JUN 16	HL
Preamplifier	2669	1936607	05 APR 16	05 APR 17	HL
Preamplifier	26AG	201377	22 SEP 15	22 SEP 16	HL
Multimeter	34401A	MY41029778	16 SEP 15	16 SEP 16	PM
Multimeter	34401A	US36009807	27 AUG 15	27 AUG 16	PM
Microphone	4134/UA0825	1866524	29 SEP 15	29 SEP 17	DANAK
Pistonphone	4220	1404269	17 NOV 15	17 NOV 16	TE
Multitone Calibrator	4226	2141942	02 DEC 15	02 DEC 16	HL
Precision Attenuator	5936	1637820	09 SEP 15	09 SEP 16	HL
Polarization Voltmeter	WB0781	21	17 SEP 15	17 SEP 16	HL

Calibration of reference microphones 4160 serial numbers 991820, 991821, and 1054926, and standard pistonphones 4220 serial numbers 1048473, 1048795, 1510240, 4228 serial number 1048747 with 40 cm^3 volume are calibrated traceable to NIST with NIST test number **TN-683/286992-15.**

The verification/calibration listed on page 1 of this document was performed on a test system which conforms to and operates under the requirements of **ANSI/NCSL Z540-1** which also covers the requirements for **MIL STD 45662A**, **ISO 17025**, and ISO 9001:2008 NQA certification no.: **11252**.

*Traceability to NIST by NIST calibration of Transfer Standard Microphone is used to verify consistency between DANAK/DPLA and NIST calibrations.

This page revised: Rev. 22.2, 20160413

Odin Metrology, Inc.
Calibration of Brüel & Kjær Instruments
3533 Old Conejo Road, Suite 125
Thousand Oaks, CA 91320
Tel: (805) 375-0830, Fax (805) 375-0405

Certificate #. 22352-3 for 2560 serial # 2878

Tabulation for Electrostatic Actuator Response with Free Field Corrections for 2560 Microphone

For: State of CA, Caltrans District 12
Purchase Order# Credit Card Measurements Performed on 05-May-2016
Environmental Conditions: Temp 23 deg C, Relative Humidity: 39%, Ambient Press: 986.05 hPa
Performed by: HL

Indicated Plot Frequency	Frequency Response Actuator	Frequency Response Random	Actual 1/3 Octave Test Frequency
20	0.14	0.14	**19.95**
25	-0.03	-0.03	**25.12**
31.5	-0.03	-0.03	**31.62**
40	-0.03	-0.03	**39.81**
50	-0.02	-0.02	**50.12**
63	0.05	0.05	**63.10**
80	0.04	0.04	**79.43**
100	0.03	0.03	**100.00**
125	0.03	0.03	**125.89**
160	0.01	0.01	**158.49**
200	0.01	0.01	**199.53**
250	0.00	0.00	**251.19**
315	-0.01	-0.01	**316.23**
400	-0.01	-0.01	**398.11**
500	-0.03	-0.03	**501.19**
630	-0.03	-0.03	**630.96**
800	-0.04	-0.04	**794.33**
1 k	-0.06	-0.06	**1000.00**
1.25 k	-0.08	-0.08	**1258.93**
1.6 k	-0.10	-0.10	**1584.89**
2 k	-0.14	-0.09	**1995.26**
2.5 k	-0.20	-0.15	**2511.89**
3.15 k	-0.29	-0.24	**3162.28**
4 k	-0.43	-0.08	**3981.07**
5 k	-0.65	-0.30	**5011.87**
6.3 k	-0.87	-0.52	**6309.57**
8 k	-0.70	-0.50	**7943.28**
10 k	-1.88	-1.68	**10000.00**
12.5 k	-3.80	-3.50	**12589.25**
16 k	-5.81	-5.51	**15848.93**
20 k	-8.42	-8.12	**19952.62**

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
		RC/RB	2/26/2019

LOCATION	POSITION ID
Toyota LA Regional Office	

STREET NAME	BETWEEN	AND
2 BANTING, IRVINE CA 92618		

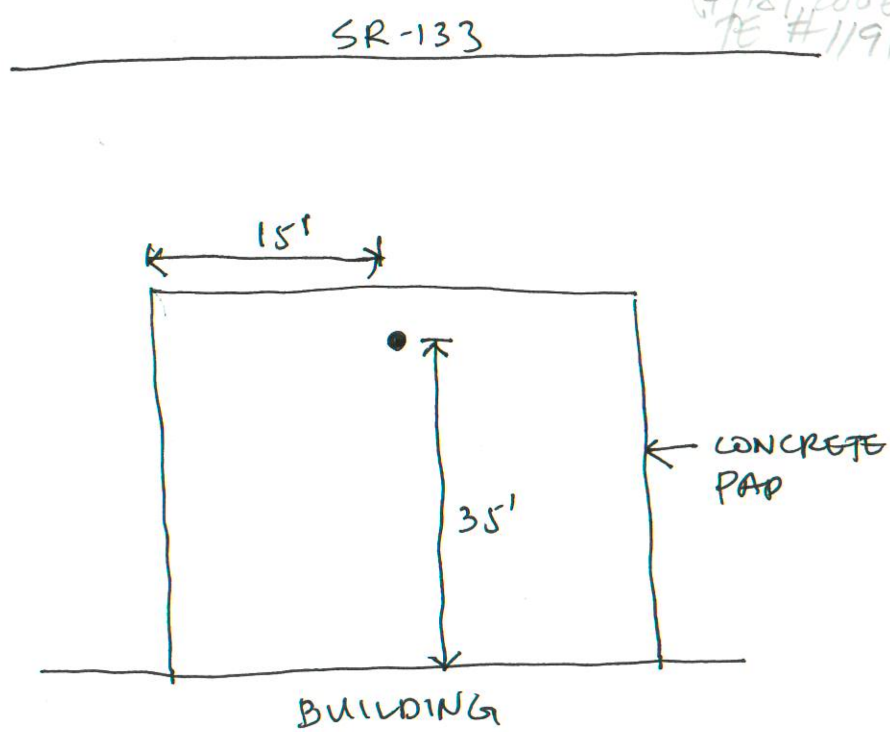
☐ LD 700	☒ LD 812	SERIAL No.	REMARKS
			CAL200 (ACOUSTIC CALIBRATOR) FQ 1000Z SPL 114 ANSI S1.40-1984 IEC 942-1988 CLASS 1L 9V BATT NEDA 1604A IEC 6LR61 (CAL DATE 4/18/2006 TE #1191)

START TIME: (AM) PM	STOP TIME: (AM) PM	DURATION
① 7:25 / ② 7:46	① 7:40 / 8:01	15

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
51°F	1.5 mph	S	70%
	0.6mph	S	

COMMENTS:

7:54 Birds chirping in trees in front of noise meter



AVERAGE METER READING (dBA)

	Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
①	69.0	74.3	62.2					
②	69.9	75.9	59					

COMMUNITY NOISE MONITORING LOG SHEET

2

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE

LOCATION	POSITION ID
MASIMO	

STREET NAME	BETWEEN	AND
52 DISCOVERY, IRVINE CA		

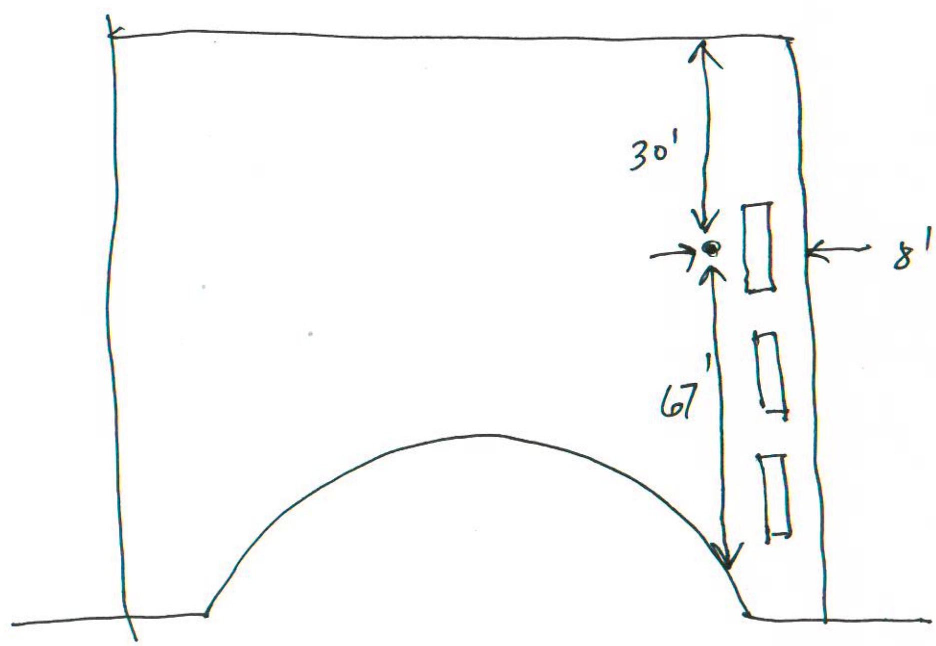
☐ LD 700	☒ LD 812	SERIAL No.	REMARKS

START TIME: AM PM	STOP TIME: AM PM	DURATION
8:44	8:59	15

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
60.7	0.9	S	65%

COMMENTS:

2 person walking & talk – 8:49 am.
1 person 8:54 No talk
8:56 am – 1 person walk & Mobile talk
8:59 am – A person (office) talk



AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
63.6	67.8	59.6					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
0N8900		RC/RB	2/26/2019

LOCATION	POSITION ID
WELLS FARGO	

STREET NAME	BETWEEN	AND

☐ LD 700	☒ LD 812	SERIAL No.	REMARKS
			15750 Alton Pkwy, Irvine CA 92618, Wells Fargo Dealer Services

START TIME: (AM) PM	STOP TIME: (AM) PM	DURATION
9:37	9:52	15

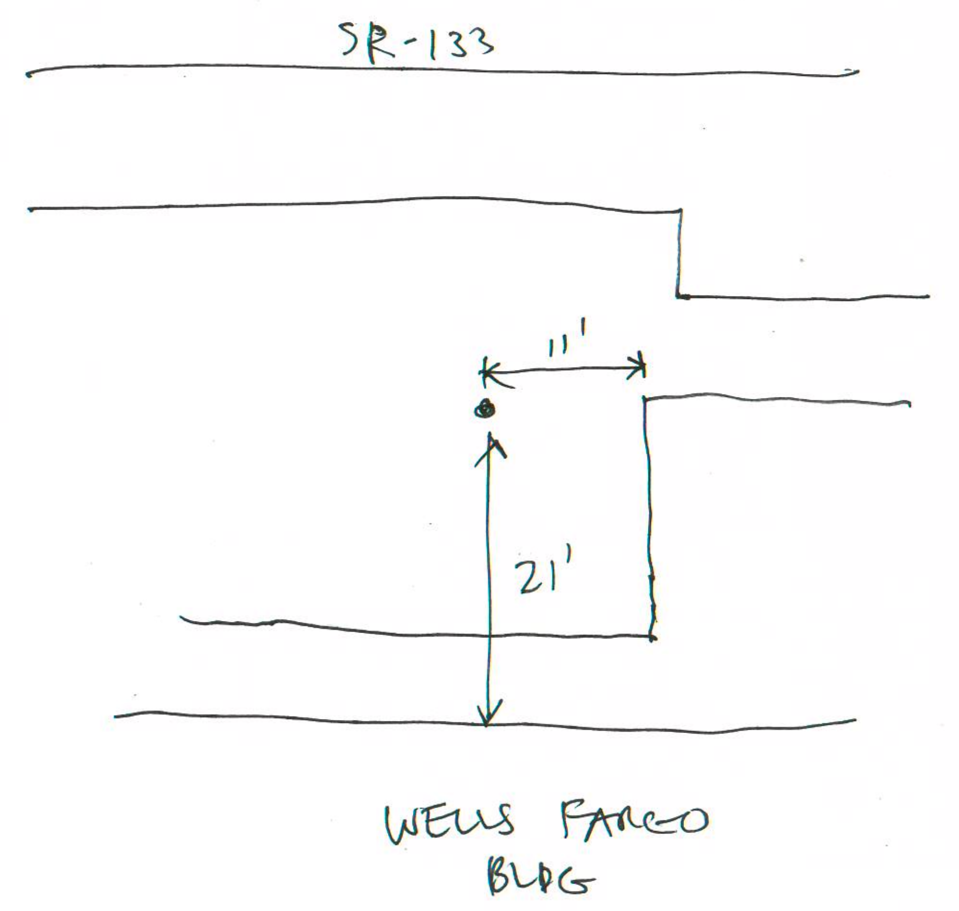
TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
60°F	1.2 mph	S	59%

COMMENTS:

9:48 A MAN WALKING BY W/KEYS DANGLING.

9:49 TRUCK BACK CLOSED & MAN WALK BY W/ KEYS & BOXES.

4s br → sign str. NB SR-133 (speed)



AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
69.9	79.3	60.1					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
ON8900		RC/RB	2/26/2019

LOCATION	POSITION ID

STREET NAME	BETWEEN	AND

☐ LD 700	☐ LD 812	SERIAL No.		REMARKS
				Razer USA (Irvine) 9 Pasteur Ste 100, IRvine CA
START TIME: (AM) PM		STOP TIME: (AM) PM	DURATION	
10:21		10:36	15	
TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY	
62.3°F	1.2 mph	S	57	

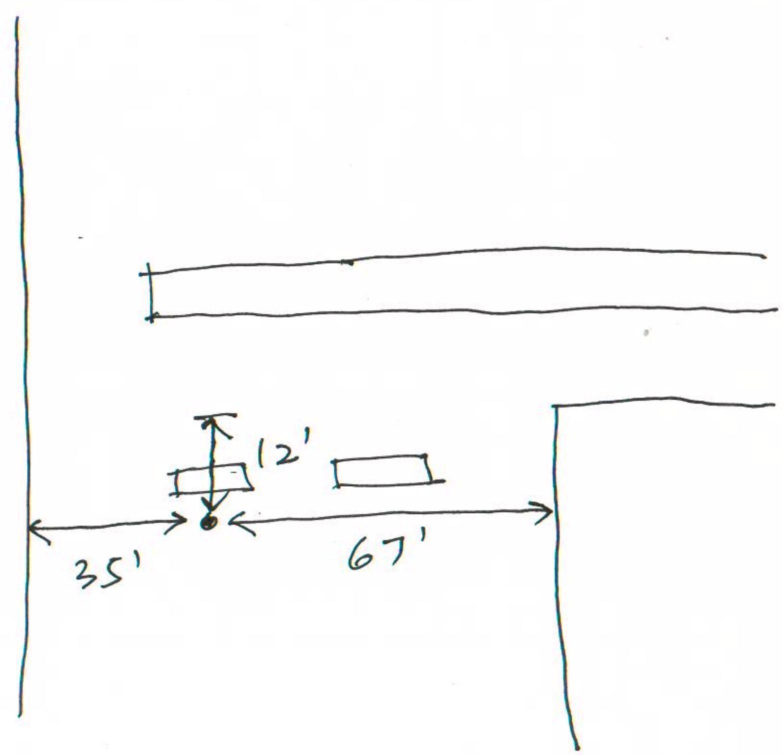
COMMENTS:

10:30 UPS TRUCK

3 PEOPLE TALKING

ABOUT 50' AWAY.

10:36 TRUCK HORN



AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
60.2	70.6	55.7					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE

LOCATION	POSITION ID
APARTMENT – WORK OUT AREA	

STREET NAME	BETWEEN	AND

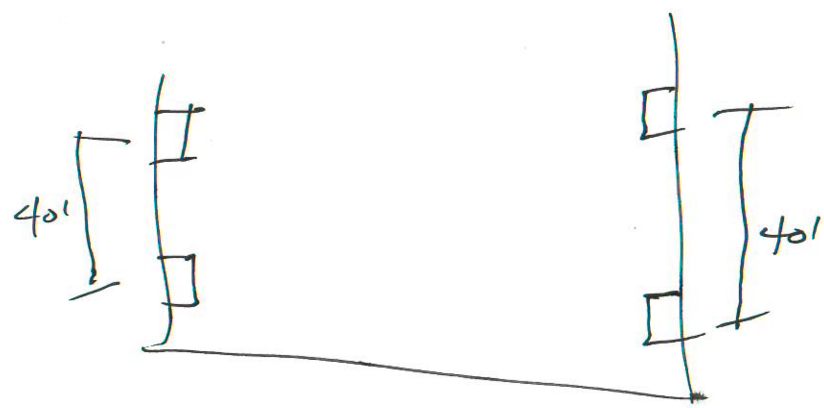
☐ LD 700	☒ LD 812	SERIAL No.	REMARKS
			Westview at Irvine Spectrum 21100 Spectrum, Irvine CA 92618

START TIME: (AM) PM	STOP TIME: (AM) PM	DURATION
11:30	11:45	15

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
63.3°F	1.3 mph	S	59%

COMMENTS:

#5 ST-



3.5 secs SSR → to Br

AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
70.3	78.2	60.5					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE

LOCATION	POSITION ID
#6 HOTEL	

STREET NAME	BETWEEN	AND

☐ LD 700	☒ LD 812	SERIAL No.	REMARKS

START TIME: AM (PM)	STOP TIME: AM (PM)	DURATION
1:28	1:43	15

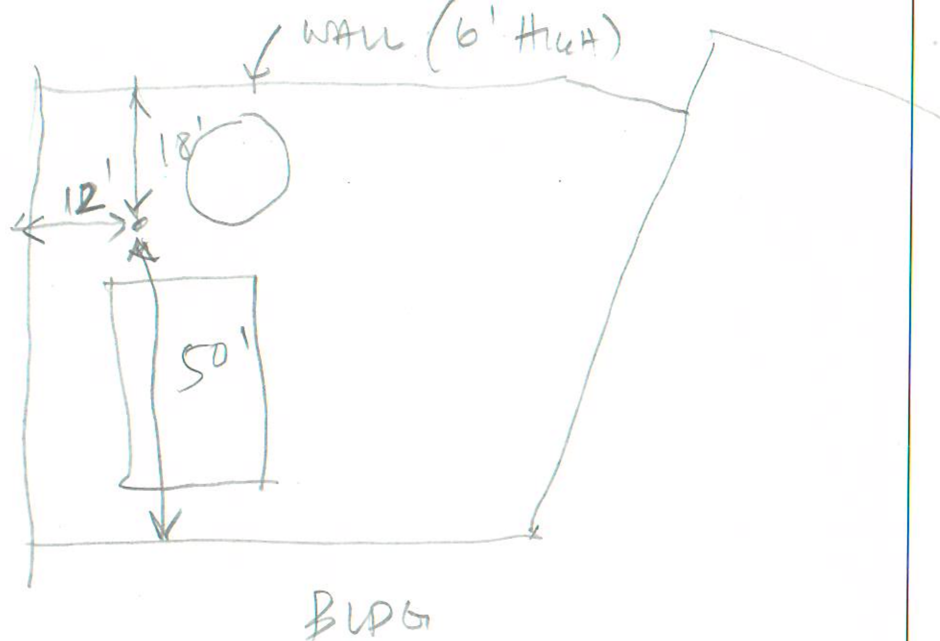
TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
73	0.5mph	S	41%

COMMENTS:

1:28pm BIRDS CHIRPING

INTERMITENT THROUGHOUT

15 mins



AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
59.8	64.3	55.5					

COMMUNITY NOISE MONITORING LOG SHEET

7

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE
0N8900		RC/RB	2/26/2019

LOCATION	POSITION ID

STREET NAME	BETWEEN	AND
114 Pacifica Court		

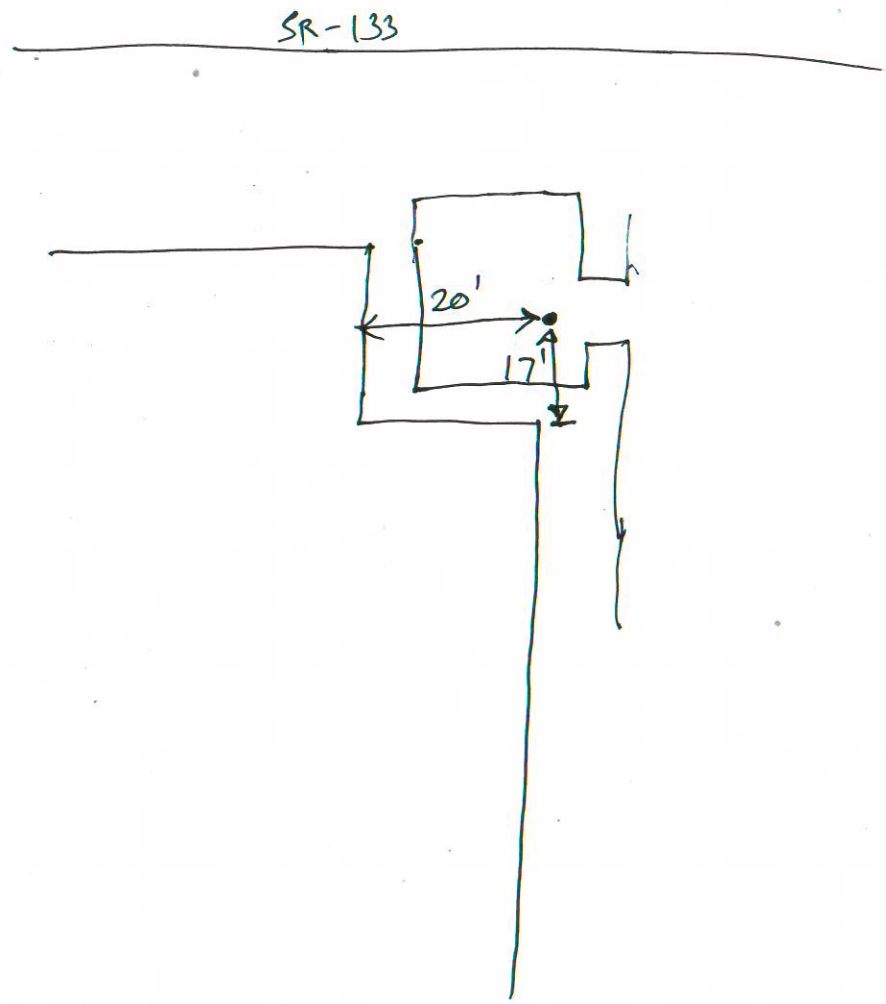
☐ LD 700	☒ LD 812	SERIAL No.	REMARKS

START TIME: AM (PM)	STOP TIME: AM (PM)	DURATION
2:03	2:18 pm	15

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
66.0 F	2.5 mph	N	53 %

COMMENTS:

2:17 pm TWO MEN TALKING AROUND METER.



AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
60.9	65.8	54.8					

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE

LOCATION	POSITION ID

STREET NAME	BETWEEN	AND

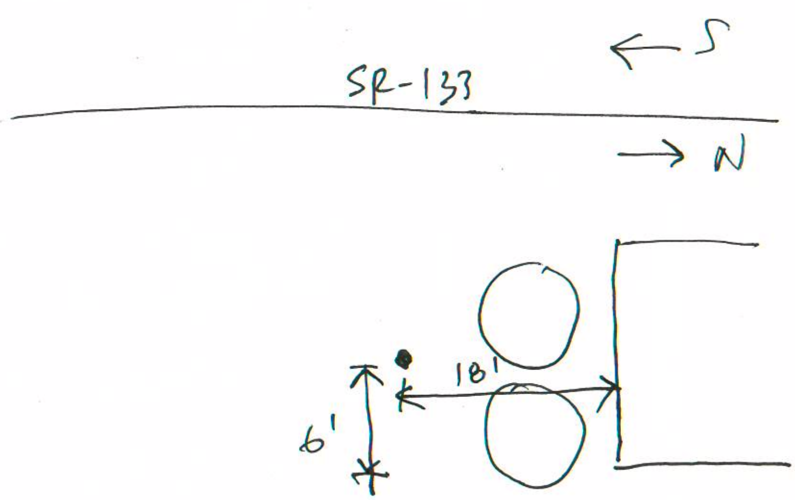
☐ LD 700	☐ LD 812	SERIAL No.	REMARKS

START TIME: AM (PM)	STOP TIME: AM (PM)	DURATION
2:25	2:40	15

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
67	1.4 mph	E	56

COMMENTS:

2:37 FEDEX ON STDBY LOCKED BACK DOOR.



AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
65.5	74.9	59.6					

65.5 < 71
-60.9
4

COMMUNITY NOISE MONITORING LOG SHEET

PROJECT/EA	PROJECT ID/JOB NO.	BY	DATE

LOCATION	POSITION ID
#8	

STREET NAME	BETWEEN	AND
7515		

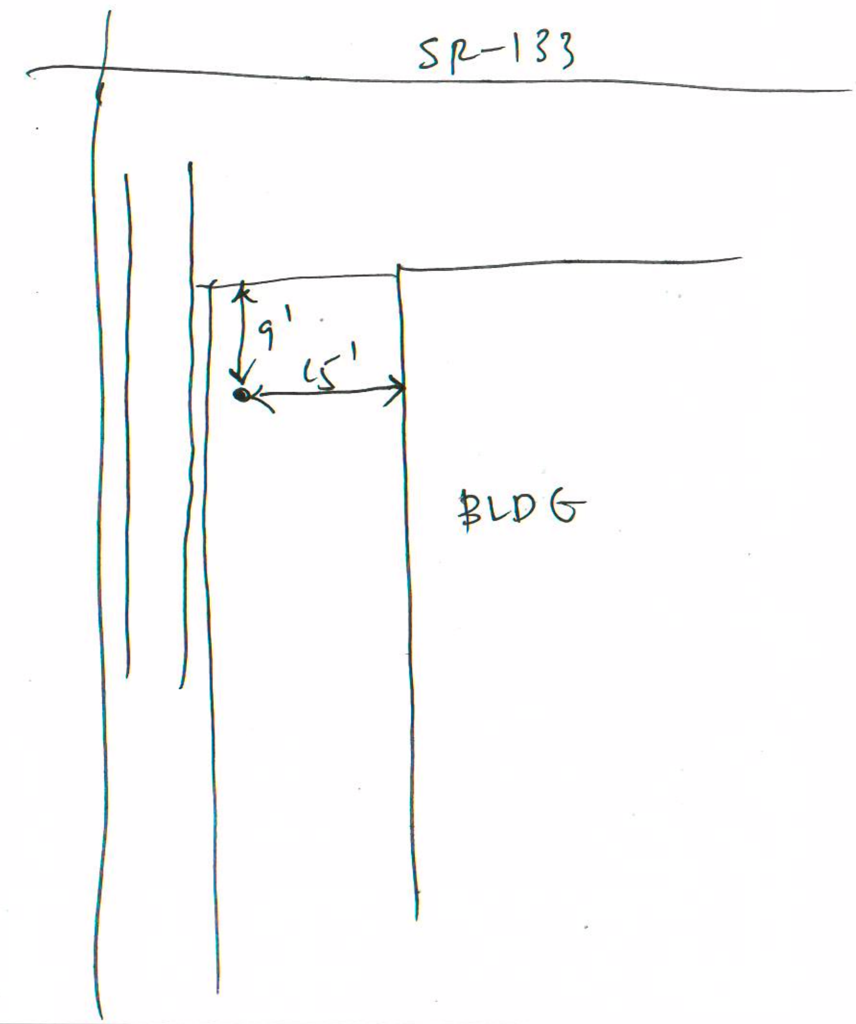
☐ LD 700	☒ LD 812	SERIAL No.	REMARKS

START TIME: AM (PM)	STOP TIME: AM PM	DURATION
3:06		15

TEMPERATURE	WIND SPEED	DIRECTION	HUMIDITY
67.4°F	1.1mph	S	53%

COMMENTS:

3:13 pm Helicopter above. — 3:16 pm



AVERAGE METER READING (dBA)

Leq	Lmax	Lmin	Lpeak	L10	L33	L50	L90
60.9	74.2	50.4					