SR-241 / SR-91 Express Lanes Connector Project

ORANGE COUNTY AND RIVERSIDE COUNTY, CALIFORNIA
City of Anaheim, City of Yorba Linda and City of Corona
12-ORA-241 PM 36.1/39.1
12-ORA-91 PM 14.7/18.9
08-RIV-91 PM 0.0/1.5

0K9700 / 1200020097

Noise Study Report

Prepared for:
Foothill/Eastern Transportation Corridor Agency, Project Sponsor

and for:
State of California Department of Transportation, Lead Agency

August 2015

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The use of the term predicted "Existing Noise Level" utilized in this document refers to the use of the No Build (2017) traffic modeling projections for the comparison of project impacts to the no build condition. The 2017 No Build Condition was determined, in consultation with Caltrans, to be the best approximation of existing conditions and was recommended for use in the noise analysis as the baseline for comparison purposes. Due to congestion on the SR-91 corridor throughout the day, traffic volumes/vehicle throughput are projected to remain fairly consistent between 2013 and 2017 since there is no capacity to accommodate more traffic volumes, even though demand may be increasing. Also, use of the 2017 predictions allowed for the use of a more accurate depiction of volumes throughout the corridor because the 2017 traffic volumes/vehicle throughput were derived from travel demand modeling completed as part of the Traffic Analysis Report (July 2015) and includes the SR-91 CIP.

Summary

The SR-241/SR-91 Express Lanes Connector project in Orange County, California has been reviewed for potential highway noise impacts. The project proposes to develop a median-to-median connection between State Route 241 and the SR-91 Express Lanes. This project would include new connectors – one lane in each direction. Connectors would bring vehicles from the median of NB SR-241 to the existing EB 91 Express Lanes. The reverse movement would also be accommodated, from the WB 91 Express Lanes to the median of SB SR-241. Parallel lanes that tapers back into the existing Express Lanes would also be needed. No additional improvements to SR-91 (besides the taper described above) are part of this project.

The purpose of this Noise Study Report (NSR) is to evaluate noise impacts and abatement. There is a single alternative, known as Design Option 2. The purpose and need of the proposed project is to provide direct access and reduce travel times in this very congested area.

Important land uses adjacent to the project area include the Canyon RV Park, Featherly Regional Park, and the Chino Hills State Park. The Santa Ana River also parallels SR-91. Residential uses include the Summit at Anaheim Hills and the Archstone at Yorba Linda communities. See **Figure S-1**.

The traffic noise model (TNM 2.5) was used to predict noise levels for the existing (using 2017 VISSIM projections) and future No-Build and Build conditions (using 2040 VISSIM projections). Receivers were input into the noise model to represent noise sensitive land uses. For this analysis the receivers were grouped into common noise environments (CNE's) to represent noise sensitive receivers within similar locations, terrain, adjacent roadways etc. **Figure 6-1** shows the location of the CNEs.

CNE 1-3 is located to the west of SR-241. CNE 1-3 is predominantly the Summit at Anaheim Hills subdivision. SR-241 has relatively low traffic volumes. The homes are located relatively far from the roadway and roughly 100 feet above it. The proposed fly-over ramps will touch down to SR-241 in the vicinity of CNE 1-3.

In CNE 1-3 no receivers are expected to experience noise levels that approach the Noise Abatement Criteria or to experience a substantial noise increase. Consequently, a traffic noise impact is not expected and the investigation of abatement is unnecessary.

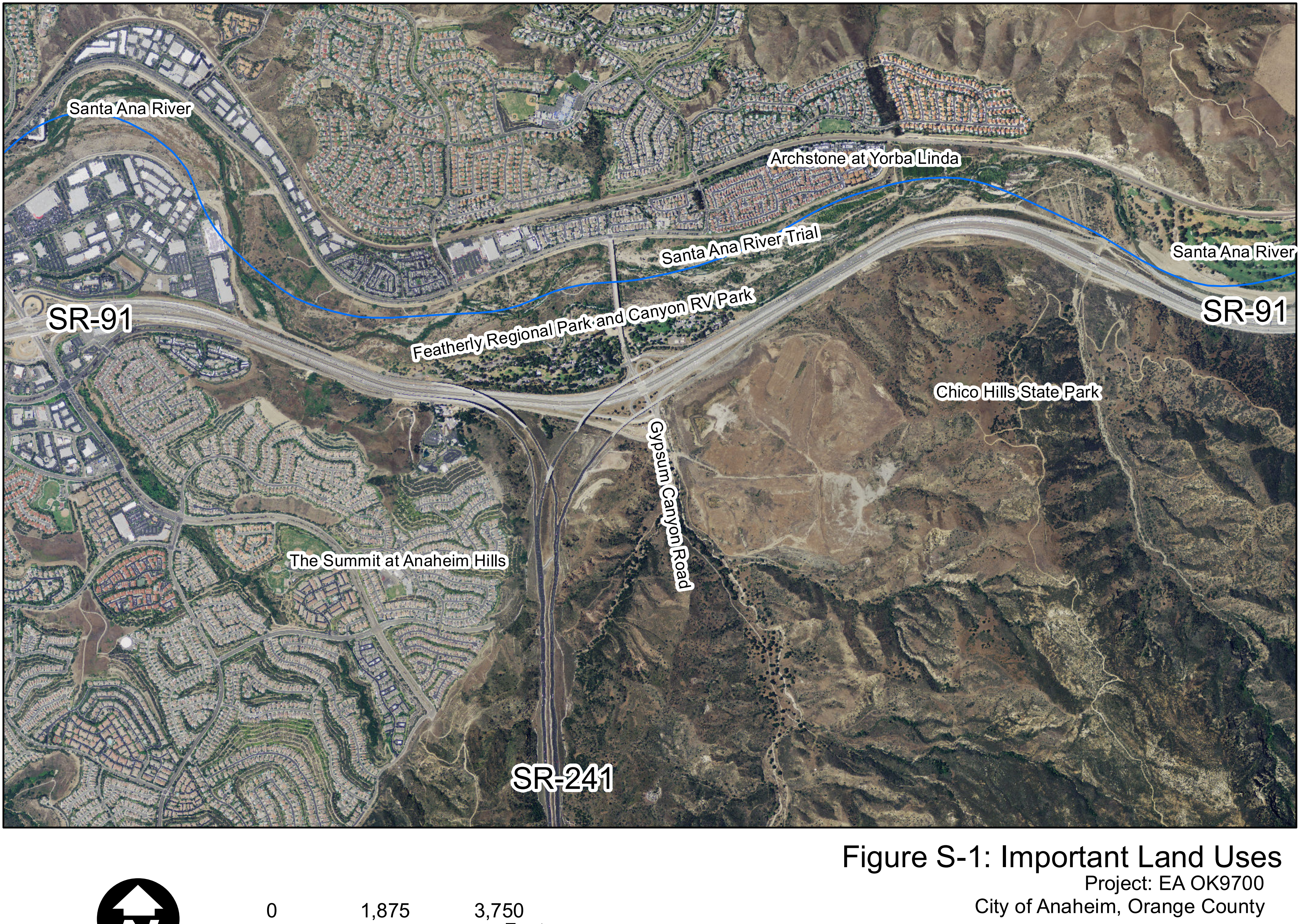

Figure S-1: Important Land Uses
Project: EA OK9700
City of Anaheim, Orange County

CNE 2-3 is located in the area to the north of the interchange, both to the east and west of Gypsum Canyon Road. This area contains the Canyon RV Park. The proposed fly-over ramps will be at their highest in the vicinity of CNE 2-3.

In CNE 2-3, nearly all of the modeled receivers are expected to experience a traffic noise impact. Consequently, the investigation of abatement is necessary. The major conclusions of this investigation include:

- Noise levels in the CNE 2-3 exceed the Noise Abatement Criteria – this applies to Existing (2017), Build (2040) and No-Build (2040) conditions.
- The noise levels under the existing, build and no-build conditions are virtually identical.
- The additional traffic noise associated with the Express Lane project is minimal.
- Noise barriers to reduce the noise associated with the Express Lane project have very limited effectiveness.
- The existing barriers along SR-91 are effective at reducing traffic noise.
- Increasing the size of the existing barriers along SR-91 provided limited additional benefits

Since the benefits of altering the existing barriers (or creating new barrier) in CNE 2-3 is below the typical threshold of perception, this approach is not considered feasible.

In CNE 3-3 is to the east of the SR-241/SR-91 interchange. The Archstone at Yorba Linda community and parkland are located within CNE 3-3. These resources are relatively far from the highway. The proposed fly-over ramps will merge into SR-91 in the vicinity of CNE 3-3.

In CNE 3-3 no receivers are expected to experience noise levels that approach the Noise Abatement Criteria or be a substantial noise increase. Consequently, a traffic noise impact is not expected and the investigation of abatement is unnecessary.

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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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

Chapter 1. Introduction

1.1 Purpose of the Noise Study Report

The purpose of this Noise Study Report (NSR) is to evaluate noise impacts and abatement for the SR-241/SR-91 Express Lanes Connector project in Orange County, California (see **Figure 1-1**). This NSR evaluates noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) "Procedures for Abatement of Highway Traffic Noise." 23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and Federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with Federal Highway Administration (FHWA) noise standards. Compliance with 23 CFR 772 provides compliance with the noise impact assessment requirements of the National Environmental Policy Act (NEPA).

The Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) (Caltrans 2011) provides Caltrans policy for implementing 23 CFR 772 in California. The Protocol outlines the requirements for preparing noise study reports (NSR). Noise impacts associated with this project under the California Environmental Quality Act (CEQA) are evaluated separately in the project's environmental document [EA OK9700].

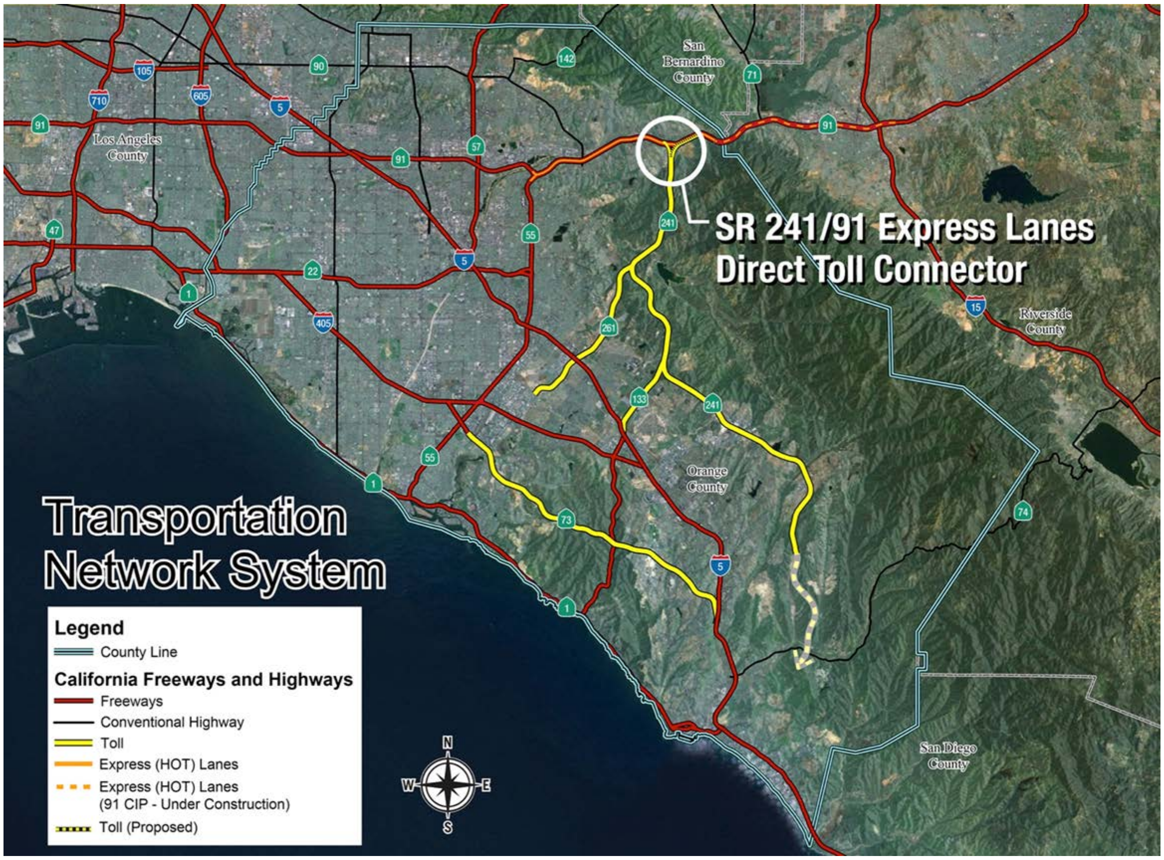


Figure 1-1: Project Location

1.2. Project Purpose and Need

The proposed SR-241/SR-91 Express Lane Connector Project is one of several projects intended to improve operations within this highly congested region. Several advantages of the project include:

- The direct connection closes the gap between two major toll systems (SR-91 Express Lanes and SR-241 Toll Roads)

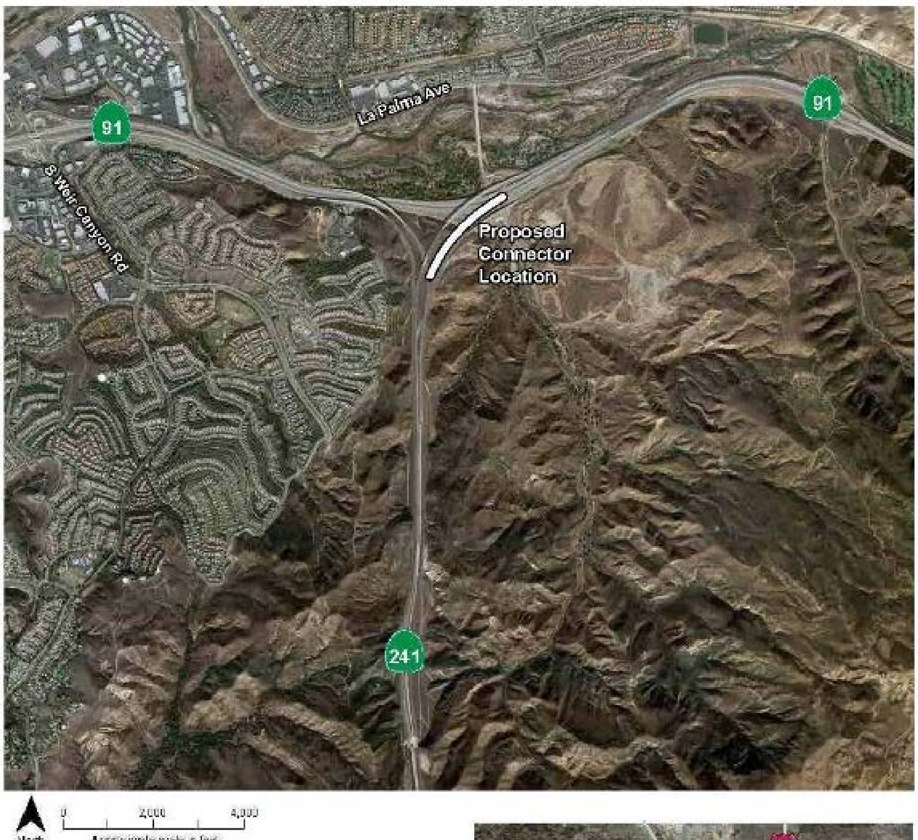
- The project improves vehicle throughput in SR 91 corridor since more vehicles can be pushed through the SR-91 Express Lanes (i.e., the project brings more cars into the express lanes in the mixing bowl and therefore the combined General Purpose and Express Lane throughput increases in the mixing bowl). The Express Lanes throughput upstream and downstream of the mixing bowl remains the same with or without the project (approximately 3,200 vehicles/hour), consistent with the Orange County Transportation Authority (OCTA) and Riverside County Transportation Commission (RCTC) tolling policy assumptions.

- The project improves vehicle miles traveled throughout the region.
- The project will pull 1,700 vehicles during the peak hours (AM/PM) from I-5, SR-55 and surrounding local arterials to SR-241 in the 2017 Opening Year.
- Travel time will be reduced by 24% for northbound SR-241 to eastbound SR-91 toll users in the 2017 Opening Year.

Chapter 2. Project Description

This NSR examines a single build alternative, known as Design Option 2. See **Figure 2-1**. Important recreational land uses adjacent to the project area include the Canyon RV Park in the Featherly Regional Park, and the Santa Ana River Trail. The Santa Ana River also parallels SR-91. Residential uses include the Summit at Anaheim Hills and the Archstone at Yorba Linda communities. Undeveloped lands include the areas associated with the Chino State Park and the former Mountain Park Specific Plan See **Figure S-1**.

Figure 2-1: Design Option 2



The project proposes to develop a median-to-median connection between State Route 241 and the SR-91 Express Lanes. This project would include new connectors – one lane in each direction. Connectors would bring vehicles from the median of NB SR-241 to the existing EB 91 Express Lanes. The reverse movement would also be accommodated, from the WB 91 Express Lanes to the median of SB SR-241. Parallel lanes that tapers back into the existing Express Lanes would also be needed. No additional improvements to SR-91 (besides the taper described above) are part of this project. **Appendix F** is the preoject description used in the project's Purpose and Need Statement.

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.

Chapter 4. Federal Regulations and State Policies

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

4.1. Federal Regulations

4.1.1. 23 CFR 772

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

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

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

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

A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment. A Type III project is a project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis. The SR-241/SR-91 Express Lanes Connector Project is a Type I project.

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

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

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

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

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

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

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

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

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

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

4.2. State Regulations and Policies

4.2.1. California Environmental Quality Act (CEQA)

Noise analysis under the California Environmental Quality Act (CEQA) may be required regardless of whether or not the project is a Type I project. The CEQA noise analysis is completely independent of the 23 CFR 772 analysis done for NEPA. Under CEQA, the baseline noise level is compared to the build noise level. The assessment entails looking at the setting of the noise impact and then how large or perceptible any noise increase would be in the given area. Key considerations include: the uniqueness of the setting, the sensitive nature of the noise receptors, the magnitude of the noise increase, the number of residences affected, and the absolute noise level.

The significance of noise impacts under CEQA are addressed in the environmental document rather than the NSR. Even though the NSR (or noise technical memorandum) does not specifically evaluate the significance of noise impacts under CEQA, it must contain the technical information that is needed to make that determination in the environmental document.

4.2.2. Section 216 of the California Streets and Highways Code

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

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

Chapter 5. Study Methods and Procedures

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

Review of aerial photography and a field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Land uses in the project area were categorized by land use type, Activity Category as defined in **Table 4-1**, and the extent of frequent human use. As stated in the Protocol, noise abatement is only considered for areas of frequent human use that would benefit from a lowered noise level. Although all developed land uses are evaluated in this analysis, the focus is on locations of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential backyards, front porches, playgrounds etc.

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

5.2. Field Measurement Procedures

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

Short-term monitoring was conducted at six locations on Wednesday, September 10, 2014, using Brüel & Kjaer 2236 Type 1 sound level meter. Measurements were taken over a 15-minute period at each site. The short-term measurement locations are identified in **Exhibit 5-1 (Appendix D)**.

Field staff attended the meter during each field measurement; this allowed them to pause the meter during noise events that might corrupt the traffic noise measurements (aircraft overflight, construction noise, lawnmower, dog barking etc.). Field staff took notes to precisely document the location of each measurement, existing roadway geometry, vehicle counts, and estimated speeds during the noise measurement periods. The calibration of the meter was checked before and after the measurement using a Brüel & Kjaer 4231 calibrator.

Temperature, wind speed, and humidity were recorded manually during the short-term monitoring session and confirmed using live data from the Weather Channel phone application (the nearest Personal Weather Stations were located in the immediate vicinity at Morning Star Drive [KCAANAHE27] and Yorba Linda [KCAYORBS6]). During the short-term measurements, wind speeds typically ranged from 0 to 5 miles per hour (mph) from the east/northeast. Temperatures ranged between 70–80° F during the measurements.

Traffic on SR-91 and SR-241 were classified and counted during short-term noise measurements. Vehicles were classified as automobiles, medium-duty trucks, or heavy-duty trucks. An automobile was defined as a vehicle with two axles and four tires that are designed primarily to carry passengers. Small vans and light trucks were included in this category. Medium-duty trucks included all cargo vehicles with two axles and six tires. Heavy-duty trucks included all vehicles with three or more axles.

5.3. Traffic Noise Levels Prediction Methods

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

Traffic noise was evaluated under existing conditions, design year no-project conditions, and design year conditions with the project. Noisiest-hour traffic volumes and traffic speeds under existing and design-year (2040) conditions were provided by the project's Traffic Study. Vehicle classification percentages were estimated using Caltrans' Annual Average Daily Truck Traffic on the California State Highway System. **Table A-1** in **Appendix A** summarizes the traffic volumes and speeds developed by VISSIM for the 2017 no-build (i.e. existing) condition. **Table A-2 in Appendix A** summarizes the traffic volumes and speeds developed by VISSIM for the Design Year condition, both with and without the express lane project. The VISSIM data was a component of the project's traffic report. This report was approved in July 2015 and reviewed by the Foothill/Eastern Transportation Corridor Agency, Caltrans District 12, Orange County Transportation Authority, Riverside County Transportation Commission and the Federal Highway Administration.

The Peak Noise Hour was predicted to occur during the 6:00 to 7:00 AM hour. Because of the very high traffic volumes and congestion, the Peak Noise Hour is not the Peak Traffic Hour. The process used to make this determination included the following:

- Using a 24-hour histogram of existing volumes and speeds, the hours with the highest speeds and volumes were identified.
- These were shoulder times (5-6 AM, 6-7 AM, 2-3 PM and 3-4 PM).
- These conditions were run in TNM (under the existing configuration).
- The results of these runs were very similar, but the Peak Noise Hour seems to be 6–7 AM.

To validate the accuracy of the model, TNM 2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations. For each receiver, traffic volumes counted during the short-term measurement periods were normalized to 1-hour volumes. These normalized volumes were assigned to the corresponding project area roadways to simulate the noise source strength at the roadways during the actual measurement period. Modeled and measured sound levels were then compared to determine the accuracy of the model and if additional calibration of the model was necessary.

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

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

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

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

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

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

The Protocol defines the procedure for assessing reasonableness of noise barriers from a cost perspective. Based on 2014 construction costs an allowance of $71,000 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 $71,000. The allowance for noise abatement is periodically adjusted based on the Construction Price Index (CPI). If the estimated construction cost of a barrier is less than the total calculated allowance for the barrier, the barrier is considered reasonable from a cost perspective. The viewpoints of benefits receptors are determined by a survey that is typically conducted after completion of the noise study report. The process for conducting the survey is described in detail in the Protocol.

The noise study report identifies traffic noise impacts and evaluates noise abatement for acoustical feasibility. It also reports information that will be used in the reasonableness analysis including if the 7 dB design goal reduction in noise can be achieved and the abatement allowances.

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.

As required by the Protocol, 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 yards (backyard or front yard- whichever is closest to the nearest study roadway) and common use areas at multi-family residences.

Land uses in the project area have been grouped into a series of Common Noise Environments (CNE). See **Figure 6-1** and **Exhibit 6-1a – 6-1c (Appendix D)**. CNEs were established to aide in the identification of representative receptor locations in the study area. The CNEs are representative of land uses and noise sources in the study area. Each of these CNE analysis areas is considered to be acoustically equivalent.

Figure 6-1: Common Noise Environments (CNE)

SR-241 is a toll-only facility, starting at the Oso Parkway interchange in south Orange County, to its terminus at SR-91. There are two mainline toll stations, including one at Windy Ridge south of the SR-91 interchange. Approximately half of the ramps are tolled as well, depending on the direction of travel and proximity to the mainline stations. Toll stations have both cash and FasTrak-only areas. The toll pricing structure on SR-241 is the same for all vehicle types, regardless of occupancy. Transportation Corridor Agencies (TCA) is the owner and operator of SR 241.

The 91 Express Lanes is a two-lane toll facility on SR-91 in each direction from SR-55 to the Orange/Riverside County line (east of the SR-241 interchange). To the west and east of the 91 Express Lanes termini, SR-91 has HOV lanes to the Interstate 110 (I 110) freeway in Gardena to the west and to the Madison Street interchange in Riverside to the east. OCTA operates the 91 Express Lanes.

The 91 Express Lanes require all drivers to have a FasTrak transponder to pay for the toll. There is no ingress/egress except at the endpoints, so there is only a single toll station in the middle of the tolled segment. Toll rates vary by day-of-week and time-of-day, and these are set in advance by OCTA, using historical traffic patterns.

Vehicles with three or more persons can use the 3+ lane toll-free (although they still are required to have a transponder), except when traveling eastbound (EB) on Monday through Friday between the hours of 4:00 and 6:00 PM. During that peak time, when traveling through the 3+ lane, drivers receive a 50 percent discount on the posted toll. The discount policy also applies to zero emission vehicles (ZEVs), motorcycles, disabled plates and disabled veterans.

6.1.1. Common Noise Environment (CNE) 1-3

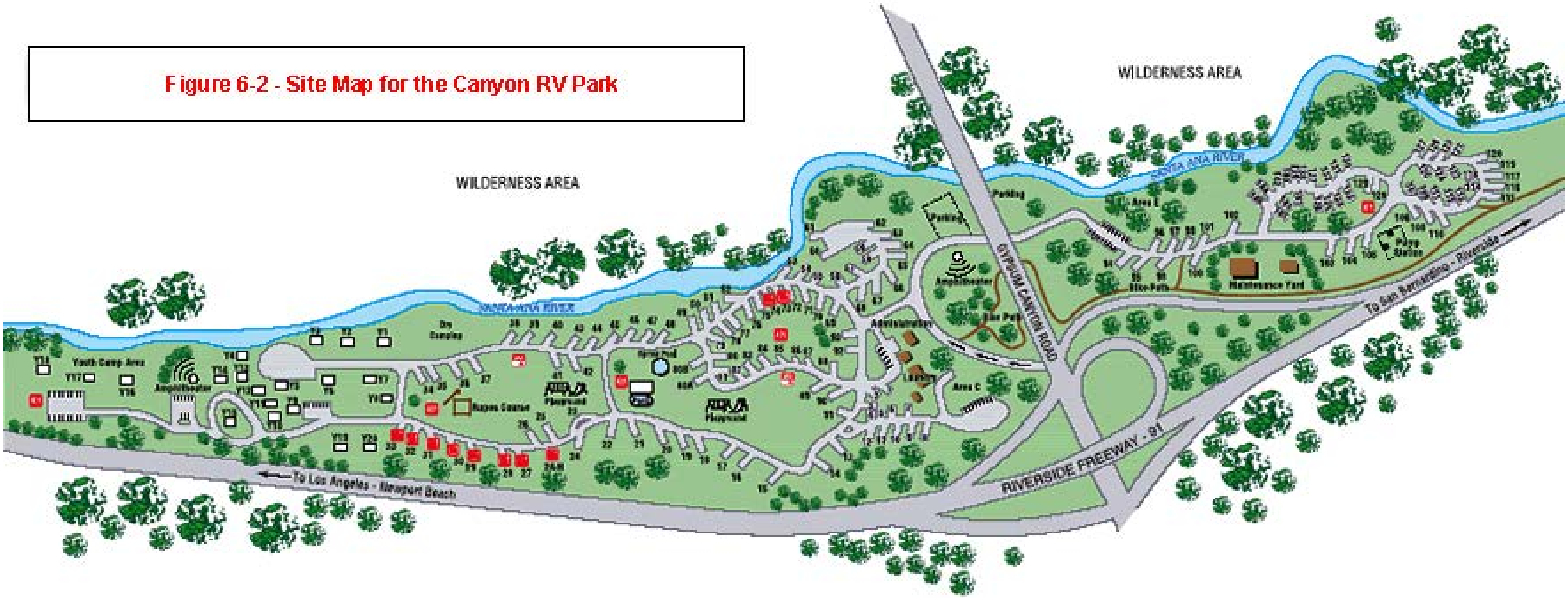
CNE 1-3 is located to the west of SR-241. CNE 1-3 encompasses the Summit at Anaheim Hills subdivision. SR-241 has relatively sparse traffic volumes. The homes are located relatively far from the roadway and roughly 100 feet above it. The proposed fly-over ramps will touch down to SR-241 in the vicinity of CNE 1-3.

In CNE 1-3, 20 modeling receivers were established. All represent single-family residences.

6.1.2. Common Noise Environment (CNE) 2-3

CNE 2-3 is located in the area to the north of the interchange, both to the east and west of Gypsum Canyon Road. This area contains the Featherly Regional Park and the Canyon RV Park. The proposed fly-over ramps will be at their highest in the vicinity of CNE 2-3. **Figure 6-2** depicts the site map of the Canyon RV Park and its relationship with the Gypsum Canyon interchange.

Figure 6-2 - Site Map for the Canyon RV Park



Source: http://www.canyonrvpark.com/park 1

The Canyon RV Park contains 140 Recreational Vehicle sites equipped with water, sewer and electric hook-ups. Recreational Vehicles up to 45 feet long can be accommodated. The facility also contains ten cabins. These cabins have bunk beds, bathroom facilities, kitchens and air-conditioning. Other amenities at the Canyon RV Park include swimming pools, playgrounds, meeting rooms and an amphitheater. The Santa Ana River Bike Trail runs through the site. The Santa Ana River forms the boundary between the Canyon RV Park and the Featherly Regional Park. In CNE 2-3, a total of 22 modeling receivers were established. These receivers represent all of the over 100 residential site and the other noise-sensitive land uses in the vicinity of the SR-91/SR-241 interchange.

Noise barriers already exist along the mainline of SR-91, adjacent to the Canyon RV Park. Except for jersey barriers, there are no noise barriers adjacent to the existing fly-over ramps (see photo).

6.1.3. Common Noise Environment (CNE) 3-3

CNE 3-3 is located to the east of the SR-241/SR-91 interchange. The Archstone at Yorba Linda community and parkland are located within CNE 3-3. These resources are relatively far from the highway. The proposed fly-over ramps will touch down in the vicinity of CNE 3-3.

In CNE 3-3, a total of 13 modeling receivers were established. These receivers represent the frequent human uses in the recreational areas and the single/multi-family residences.

6.2. Noise Measurement Results

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

Table 6-1 summarizes the results of the short-term noise monitoring conducted in the project area. Field notes from each short-term measurement are provided in **Appendix C.**

Table 6-1. Summary of Short-Term Measurements

Position	Address	CNE	Land Uses	Start Time	Duration (minutes)	Measured L_{eq}
M1	Canyon RV Park	2-3	Recreation	9:00 am	15	69.1
M2	Featherly Regional Park	2-3	Recreation	9:30 am	15	69.0
M3	25580 Aragon Way	3-3	Residential	10:15 am	15	49.3
M4	Beneath I-91 EB off ramp	2-3	Vacant	10:35 am	15	76.0
M5	Oak Canyon Road	1-3	Residential	11:15 am	15	50.7
M6	Garden View Drive	1-3	Residential	12:20 pm	15	52.0

Note: Refer to **Exhibit 5-1 (Appendix D)** for measurement locations.

TNM 2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations. **Table 6-2** compares measured and modeled noise levels at each measurement location (see **Exhibit 5-1 in Appendix D**). The predicted sound levels are within 3 dB of the measured sound levels and are, therefore, considered to be in reasonable agreement with the measured sound levels.

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

Measurement Position	Measured Sound Level (dBA)	Predicted Sound Level (dBA)	Measured minus Predicted (dB)	K-Factor	Receivers that K-Factor applies to
M1	69.1	66.5	-2.6	2.6	2-3: 11 thru 2-3: 22
M2	69.0	68.2	-0.8	0.8	2-3: 1 thru 2-3: 10
M3	49.3	51.8	2.5	-2.5	3-3: 1 thru 3-3:11
M4	76.0	78.4	2.4	-2.4	1-3: 18 thru 1-3: 20
M5	50.7	49.1	-1.6	1.6	1-3: 1 thru 1-3: 7
M6	52.0	54.9	2.9	-2.9	1-3: 8 thru 1-3: 17

Correction factors, known as K-factors, were applied to each of the modeled receiver locations so that the monitored and modeled noise levels were the same. Table 6-2 shows the K-factors at each of the monitoring locations and the receivers that they are applied to. These K-factors are applied to the output data in Appendix B.

6.3. Predicted Existing Noise Levels

Using the 2017 traffic modeling projections, noise levels were predicted at the 55 receivers within the study area. **Tables B-1 through B-3** in **Appendix B** presents existing noise levels at each receiver. **Exhibit 6-1 in Appendix D** shows the location of the receivers. **Appendix E** contains the TNM files and the Appendix B spreadsheets.

In CNE 1-3, existing noise levels are predicted to be between 46.3 and 60.7 dBA. No receivers are predicted to approach or exceed the NAC at any of the 20 receivers established within the Summit at Anaheim Hills neighborhood.

In CNE 2-3, existing noise levels are predicted to be between 63.3 and 74.4 dBA. Thirteen of the 22 receivers are predicted to approach or exceed the NAC. The receivers are located at camp sites and will be treated in a manner identical to residential dwellings.

In CNE 3-3, existing noise levels are predicted to be between 56.4 and 65.4 dBA. No receivers are predicted to approach or exceed the NAC.

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

This section discusses the predicted traffic noise level under existing and design-year conditions (with and without the project), identifies traffic noise impacts, and considers noise abatement.

7.1. Future Noise Environment and Impacts

Table B-1 - B-3 in **Appendix B** summarize the traffic noise modeling results for existing conditions (2017) and design-year conditions (2040) with and without the project. Predicted design-year traffic noise levels with the project are compared to existing conditions and to design-year no-project conditions. The comparison to existing conditions is included in the analysis to identify traffic noise impacts under 23 CFR 772. The comparison to no-project conditions indicates the direct effect of the project.

Modeling results indicate that predicted traffic noise levels for the design-year with, or without the project, fall within a very narrow range. No receivers are predicted to experience conditions greater than 2 dBA higher than the existing condition. Likewise, the build and no-build conditions are virtually identical. The Express Lane project will add little additional traffic noise to the study area. **Exhibit 6-1 in Appendix D** shows the location of the receivers. **Exhibit 6-2** shows the preliminary engineering of the Expressway Connector Road project.

7.1.1. CNE 1-3 Impacts

CNE 1-3 is located to the west of SR-241. CNE 1-3 is predominantly the Summit at Anaheim Hills subdivision. SR-241 has relatively sparse traffic volumes. The homes are located relatively far from the roadway and roughly 100 feet above it. The proposed fly-over ramps will touch down to SR-241 in the vicinity of CNE 1-3.

In CNE 1-3 no receivers are expected to experience noise levels that approach the Noise Abatement Criteria or constitute a substantial noise increase. Consequently, a traffic noise impact is not expected and the investigation of abatement is unnecessary.

7.1.2. CNE 2-3 Impacts

CNE 2-3 is located in the area to the north of the interchange, both to the east and west of Gypsum Canyon Road. This area contains the Canyon RV Park. The proposed fly-over ramps will be at their highest in the vicinity of CNE 2-3.

In CNE 2-3, nearly all of the modeled receivers are expected to experience a traffic noise impact. This applies for the existing and design year conditions, with or without the project. Under all conditions the noise levels are above the Noise Abatement Criteria. Overall, the traffic level increases associated with the Express Lanes project are very low (roughly plus or minus a decibel). Nevertheless, because conditions approach or exceed the NAC, noise abatement was considered.

Barriers were analyzed so that future noise levels (with the noise barrier) may be determined and the number of residential units that achieve a minimum noise level reduction of 5 dBA can be counted. Two conditions were evaluated. First, a barrier along the proposed/new Express Lane flyover ramp was evaluated. A 4-foot D Type barrier is assumed as the base case. The Express Lane Barrier increased the height of that roadside barrier to 16 feet tall. The second barrier examined the impact of increasing the height of the existing noise barriers along SR-91 (excepting the small portion of barrier on the interchanges WB on ramp). Noise barriers were modeled starting with the existing height and increased in 2 foot increments an additional 8-feet.

7.1.3. CNE 3-3 Impacts

CNE 3-3 is to the east of the SR-241/SR-91 interchange. Thehe Archstone at Yorba Linda community and parkland are located within CNE 3-3. These resources are relatively far from the highway. The proposed fly-over ramps will touch down in the vicinity of CNE 3-3.

In CNE 3-3 no receivers are expected to experience noise levels that approach the Noise Abatement Criteria or constitute a substantial noise increase. Consequently, a traffic noise impact is not expected and the investigation of abatement is unnecessary.

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. Post-installation maintenance and operational costs for noise insulation are not eligible for Federal-aid funding.

Noise barriers are the only form of noise abatement considered practical for this project. Each noise barrier 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 $71,000.

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

7.2.1. CNE 1-3

No traffic noise impacts are predicted for CNE 1-3. Accordingly, noise abatement does not need to be considered in this area.

7.2.2. CNE 2-3

Traffic noise impacts are predicted at the Canyon RV Park. Barriers were evaluated to determine the level of noise reduction that was possible. Two conditions were evaluated:

Noise Barriers along the New Express Lane Flyover Ramp

A 4-foot D Type barrier is assumed as the base case. The modeling examined barriers up to 16 feet tall. Even at a maximum height, the Express Lane Barrier fails to reduce noise in any discernable way. No receiver receives an insertion loss of over 1 dBA. Consequently, the express lane barrier is not feasible. The primary cause for this is the low number of the vehicles using the express ramps (1,876 in the peak noise hour). **Table B-2a** in **Appendix B** summarize these traffic noise modeling results.

Improved Noise Barriers along SR-91

The second barrier examined the impact of increasing the height of the existing noise barriers along SR-91. Noise barriers were modeled starting with the existing height were modeled in 2 foot increments up to an additional 8 feet.

The existing SR-91 barrier segments examined for modification include the portion west of Gypsum Canyon (currently 14 to 16 feet tall) and the portion east of Gypsum Canyon (currently12 to 14 feet tall). The existing ramp from SR-91 to SR-241 was also included in this analysis. Currently, there is a 4 foot jersey barrier on that ramp.

Adding height to the existing barriers provides limited benefits. At the maximum, an addition of 8 feet to the existing barrier height, provides between 0 and 3 dBA in additional insertion loss. The receivers with the greatest benefits (2-3 dBA) are located nearest to the termini of the SR-91 noise barriers. **Table B-2b** in **Appendix B** summarize these traffic noise modeling results. Since the benefits of altering the existing barriers is below the typical threshold of perception, this approach is not considered feasible.

The existing barrier is effective, but increasing the size of the barrier will have limited value. **Table 7-1** summarizes the average noise levels and reductions associated with CNE 2-3 and alternations to the existing SR-91 noise barriers.

Table 7-1. Average Noise Levels at CNE 2-3 Receivers (dBA)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Existing (2017)	**No-Build (2040)**	**Build (2040)**	**Build (2040) with Additional 8 –foot Barrier Height**	**Build (2040) without Existing Barriers**	**Abatement from Existing Barriers (#5 - #3)**	**Additional Abatement from Improved Barriers (#4 - #3)**
66.78	66.77	67.05	65.84	71.16	4.11	1.21

Average TNM results of the 22 receivers in CNE 2-3

This table encapsulates the major conclusions of the NSR, as it relates to the noise sensitive receptors in the vicinity of CNE 2-3:

- Noise levels in the Canyon RV Park exceed the Noise Abatement Criteria – this applies to Existing (2017), Build (2040) and No-Build (2040) conditions.
- The noise levels under the existing, build and no-build conditions are virtually identical.
- The additional traffic noise associated with the Express Lane project is minimal.
- Noise barriers to reduce the noise associated with the Express Lane project have very limited effectiveness.
- The existing barriers along SR-91 are effective at reducing traffic noise.
- Increasing the size of the existing barriers along SR-91 provided limited additional benefits.

7.2.3. CNE 3-3

No traffic noise impacts are predicted for CNE 3-3. Accordingly, noise abatement does not need to be considered in this area.

Chapter 8. Construction Noise

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

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

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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Appendix A Traffic Data

Appendix A **Existing (2017) VISSIM Model Summary - Build Option 2 (Peak Hour: 6-7 AM)**			**Throughput Volumes** **2017 AM - No Build**			**VISSIM Speed** **2017 AM - No Build**	
#	**Location**		**6-7**	**TNM Input**	**Auto/MT/HT**	**6-7**	**TNM Input**
SR-91 EB MAINLINE (depicted in two TNM segments)							
2	Off Ramp to Weir Canyon to On Ramp from SB Weir Canyon	West of 241/91 Interchange (TNM Segment 5)	5,936	**7,015**	**6,665** **158** **193**	68	**65**
3	On Ramp from SB Weir Canyon to On Ramp from NB Weir Canyon		6,861			63	
4	On Ramp from NB Weir Canyon to Off Ramp to SR 241		7,826			65	
5	Off Ramp to SR 241 to Off Ramp to Gypsum Canyon		7,174			66	
6	Off Ramp to Gypsum Canyon to On Ramp from SB Gypsum Canyon		7,006			66	
7	On Ramp from SB Gypsum Canyon to On Ramp from NB Gypsum Canyon		6,939			62	
8	On Ramp from NB Gypsum Canyon to On Ramp from SR 241 GP		7,367			63	
9	On Ramp from SR 241 GP to On Ramp from HOT Lanes (east of SR 241)	Near East of 241/91 Interchange (TNM Segment 10)	9,171	**8,601**	**8,171** **194** **237**	62	**65**
10	On Ramp from HOT Lanes (east of SR 241) to Off Ramp to HOT Lanes (west of Green River)		8,549			66	
11	Off Ramp to HOT Lanes (west of Green River) to Off Ramp to Green River		8,084			67	
12	Off Ramp to Green River to On Ramp From Green River	Far East of 241/91 Interchange (TNM Segment 13)	8,010	**7,732**	**7,346** **174** **213**	67	**67**
13	On Ramp From Green River to Off Ramp to SR 71		8,370			66	
14	Off Ramp to SR 71 to On Ramp from SR 71		6,816			67	
SR-91 EB RAMPS							
25	Off Ramp to SR 241	TNM Segment 25	637	**637**	**624/6/6**	n/a	**60/65**
26	Off Ramp to Gypsum Canyon	TNM Segment 26	219	**219**	**208/5/6**	n/a	**40/45**
27	On Ramp from SB Gypsum Canyon	TNM Segment 27	211	**211**	**200/5/6**	n/a	**30/35**
28	On Ramp from NB Gypsum Canyon	TNM Segment 28	313	**313**	**297/7/9**	n/a	**60/65**
29	On Ramp from SR 241 GP	TNM Segment 29	1,708	**1,708**	**1,674/17/17**	n/a	**60/65**
30	On Ramp from SR 241 HOV	n/a	n/a	**n/a**	**n/a**	n/a	**n/a**
SR-91 EB EXPRESS LANES							
19	Begin Study Area to On ramp from SR 241 HOV	West of Gypsum (TNM Segment 19)	1,343	**1,343**	**1,343** **0** **0**	69	**69**
21	On Ramp from GP Lanes (west of Green River) to End of Study Area	East of Gypsum (TNM Segment 21)	2,096	**2,096**	**2,096** **0** **0**	69	**69**
SR-91 WB MAINLINE (depicted in two TNM segments)							
43	Off Ramp SR 71 to Off Ramp to SR 71	Far East of 241/91 Interchange (TNM Segment 44)	6,569	**7,179**	**6,820** **162** **197**	11	**12**
44	On Ramp from SR 71 to Off Ramp to Green River		7,522			11	
45	Off Ramp to Green River to On Ramp from Green River		7,447			13	
46	On Ramp from Green River to On Ramp from HOT Lanes (west of Green River)	Near East of 241/91 Interchange (TNM Segment 47)	8,987	**9,333**	**8,866** **210** **257**	18	**37**
47	On Ramp from HOT Lanes (west of Green River) to Off Ramp to HOT Lanes (east of SR 241)		9,374			28	
48	Off Ramp to HOT Lanes (east of SR 241) to Off Ramp to SR 241 GP		9,638			66	
49	Off Ramp to SR 241 GP to Off Ramp to Gypsum Canyon	West of 241/91 Interchange (TNM Segment 53)	7,501	**7,280**	**6,916** **164** **200**	67	**66**
50	Off Ramp to Gypsum Canyon to On ramp from NB Gypsum Canyon		7,077			68	
51	On Ramp from NB Gypsum Canyon to On ramp from SB Gypsum Canyon		7,214			64	
52	On Ramp from SB Gypsum Canyon to On Ramp from SR 241		7,395			64	
53	On Ramp from SR 241 to Off Ramp to Weir Canyon		7,668			66	
54	Off Ramp to Weir Canyon to On Ramp from NB Weir Canyon		6,491			69	
55	On Ramp from NB Weir Canyon to On Ramp from SB Weir Canyon		7,067			64	
56	On Ramp from SB Weir Canyon to End of study area		7,829			67	
SR-91 WB RAMPS							
66	On Ramp from Green River	TNM Segment 66	1,622	**1,622**	**1541/36/45**	n/a	**60/65**
69	Off Ramp to SR 241 GP	TNM Segment 69	2,077	**2,077**	**1973/47/57**	n/a	**60/65**
70	Off Ramp to SR 241 HOV	TNM Segment 70	n/a	**n/a**	**n/a**	n/a	**n/a**
71	Off Ramp to Gypsum Canyon	TNM Segment 71	509	**509**	**484/11/14**	n/a	**40/45**
72	On Ramp from NB Gypsum Canyon	TNM Segment 72	135	**135**	**128/3/4**	n/a	**30/35**
73	On Ramp from SB Gypsum Canyon	TNM Segment 73	177	**177**	**168/4/5**	n/a	**60/65**
74	On Ramp from SR 241	TNM Segment 74	290	**290**	**284/3/3**	n/a	**60/65**
SR-91 WB EXPRESS LANES							
57	Begin Study Area to Off Ramp to GP Lanes (west of Green River)	East of Gypsum (TNM Segment 57)	3,088	**3,088**	**3,088** **0** **0**	68	**68**
60	Off Ramp to SR 241 HOV to End of Study Area	West of Gypsum (TNM Segment 60)	2,454	**2,454**	**2,454** **0** **0**	69	**69**

Appendix A Build and No-Build (2040) VISSIM Summary - Build Option 2 (Peak Hour 6-7 Am)			Throughput Volumes						VISSIM Speed			
			2040 AM No Build			2040 AM Build Option 2			2040 AM No Build		2040 AM Build Option 2	
#	Location		6-7	TNM Input	Auto/MT/HT	6-7	TNM Input	Auto/MT/HT	6-7	TNM Input	6-7	TNM Input
SR-91 EB MAINLINE (depicted as two TNM segments)												
2	Off Ramp to Weir Canyon to On Ramp from SB Weir Canyon		7,339			6,852			46		67	
3	On Ramp from SB Weir Canyon to On Ramp from NB Weir Canyon		8,249			7,991			32		59	
4	On Ramp from NB Weir Canyon to Off Ramp to SR 241		9,229		**7,931**	9,144		**8,361**	49		58	
5	Off Ramp to SR 241 to Off Ramp to Gypsum Canyon	West of 241/91 Interchange (Segment 5)	8,453	**8,348**	**188**	8,339	**8,801**	**198**	65	**52**	65	**61**
6	Off Ramp to Gypsum Canyon to On Ramp from SB Gypsum Canyon		8,264		**230**	8,155		**242**	64		65	
7	On Ramp from SB Gypsum Canyon to On Ramp from NB Gypsum Canyon		8,195			8,261			53		57	
8	On Ramp from NB Gypsum Canyon to On Ramp from SR 241 GP		8,711			8,697			56		57	
9	On Ramp from SR 241 GP to On Ramp from HOT Lanes (east of SR 241)		10,881		**10,006**	10,377		**9,809**	64		65	
10	On Ramp from HOT Lanes (east of SR 241) to Off Ramp to HOT Lanes (west of Gre	Near East of 241/91 Interchange (Segment 10)	10,572	**10,533**	**237**	10,369	**10,325**	**232**	66	**66**	66	**66**
11	Off Ramp to HOT Lanes (west of Green River) to Off Ramp to Green River		10,145		**290**	10,228		**284**	67		66	
12	Off Ramp to Green River to Off Ramp to SR 71 CD		9,599		**8,157**	9,696		**8,233**	56		64	
13	Off Ramp to SR 71 CD to On Ramp from Green River	Far East of 241/91 interchange (Segment 13)	7,852	**8,587**	**193**	7,912	**8,666**	**195**	63	**62**	67	**65**
14	On Ramp from Green River to On Ramp from SR 71		8,310		**236**	8,390		**238**	66		65	
SR-91 EB RAMPS												
25	Off Ramp to SR 241	Segment 25	759	**759**	**721/17/21**	781	**781**	**742/18/21**	n/a	**60/65**	n/a	**60/65**
26	Off Ramp to Gypsum Canyon	Segment 26	255	**255**	**242/6/7**	267	**267**	**254/6/7**	n/a	**40/45**	n/a	**40/45**
27	On Ramp from SB Gypsum Canyon	Segment 27	260	**260**	**247/6/7**	262	**262**	**249/6/7**	n/a	**30/35**	n/a	**30/35**
28	On Ramp from NB Gypsum Canyon	Segment 28	384	**384**	**365/9/11**	387	**387**	**368/9/11**	n/a	**60/65**	n/a	**60/65**
29	On Ramp from SR 241 GP	Segment 29	2,051	**2,051**	**1948/46/56**	1,629	**1,629**	**1,548/37/45**	n/a	**60/65**	n/a	**60/65**
30	On Ramp from SR 241 HOV	Segment 30	n/a	**n/a**	**n/a**	674	**674**	**640/15/19**	n/a	**n/a**	n/a	**60/65**
SR-91 EB EXPRESS LANES												
19	Begin Study Area to Off ramp to GP Lanes (east of SR 241)	West of Gypsum	1,343	**1,343**	**1,343**	1,349	**1,349**	**1,349**	69	**69**	69	**69**
21	On Ramp from GP Lanes (west of Green River) to End of Study Area	East of Gypsum	2,058	**2,058**	**2,058**	2,082	**2,082**	**2,082**	69	**69**	69	**69**
SR-91 WB MAINLINE (depicted as two TNM segments)												
44	Off Ramp SR 71 to Off Ramp to SR 71		8,084		**8,479**	8,734		**9,289**	16		20	
45	On Ramp from SR 71 to Off Ramp to Green River	Far East of 241/91 interchange	9,345	**8,926**	**201**	10,343	**9,778**	**220**	17	**16**	21	**20**
46	Off Ramp to Green River to On Ramp from Green River		9,349		**245**	10,258		**269**	15		20	
47	On Ramp from Green River to On Ramp from HOT Lanes (west of Green River)		10,874		**10,610**	11,784		**10,950**	18		24	
48	On Ramp from HOT Lanes (west of Green River) to Off Ramp to HOT Lanes (east c	Near East of 241/91 Interchange	11,081	**11,168**	**251**	11,533	**11,526**	**259**	26	**26**	29	**30**
49	Off Ramp to HOT Lanes (east of SR 241) to Off Ramp to SR 241 GP		11,549		**307**	11,261		**317**	33		38	
50	Off Ramp to SR 241 GP to Off Ramp to Gypsum Canyon		9,186			8,956			21		24	
51	Off Ramp to Gypsum Canyon to On ramp from NB Gypsum Canyon		8,704			8,498			27		30	
52	On Ramp from NB Gypsum Canyon to On ramp from SB Gypsum Canyon		8,921		**8,442**	8,742		**8,241**	31		34	
53	On Ramp from SB Gypsum Canyon to On Ramp from SR 241	West of 241/91 Interchange	9,139	**8,887**	**200**	8,973	**8,675**	**195**	49	**46**	50	**48**
54	On Ramp from SR 241 to Off Ramp to Weir Canyon		9,463		**244**	9,304		**239**	65		64	
55	Off Ramp to Weir Canyon to On Ramp from NB Weir Canyon		8,043			7,772			68		68	
56	On Ramp from NB Weir Canyon to On Ramp from SB Weir Canyon		8,751			8,483			63		63	
SR-91 WB RAMPS												
67	On Ramp from Green River Rd		1,545	**1,545**	**1468/35/42**	1,592	**1,592**	**1512/36/44**	n/a	**60/65**	n/a	**60/65**
70	Off Ramp to SR 241 GP	Segment 70	2,161	**2,161**	**2,053/49/59**	2,232	**2,232**	**2,120/50/61**	n/a	**60/65**	n/a	**60/65**
71	Off Ramp to SR 241 HOV	Segment 71	n/a	**n/a**	**n/a**	1,202	**1,202**	**1,142/27/33**	n/a	**n/a**	n/a	**60/65**
72	Off Ramp to Gypsum Canyon Rd	Segment 72	666	**666**	**633/15/18**	702	**702**	**667/16/19**	n/a	**40/45**	n/a	**40/45**
73	On Ramp from NB Gypsum Canyon Rd	Segment 73	166	**166**	**158/4/5**	166	**166**	**158/4/5**	n/a	**30/35**	n/a	**30/35**
74	On Ramp from SB Gypsum Canyon Rd	Segment 74	218	**218**	**207/5/6**	218	**218**	**207/5/6**	n/a	**60/65**	n/a	**60/65**
75	On Ramp from SR 241	Segment 75	360	**360**	**342/8/10**	355	**355**	**337/8/10**	n/a	**60/65**	n/a	**60/65**
SR-91 WB EXPRESS LANES												
58	Begin Study Area to Off Ramp to GP Lanes (west of Green River)	East of Gypsum	3,086	**3,086**	**3,086**	3,086	**3,086**	**3,086**	68	**68**	68	**68**
61	Off Ramp to SR 241 HOV to End of Study Area	West of Gypsum	2,445	**2,445**	**2,445**	2,471	**2,471**	**2,471**	68	**68**	69	**69**

Appendix B Predicted Future Noise Levels and Noise Barrier Analysis

Exhibit B-1. Predicted Existing/Future Noise levels and Barrier Analysis
CNE 1-3 (West-Side of SR-241 (Summit at Anaheim Hills))

Receiver I.D.	K-Factor	Land Use	Number of Dwelling Units	Address	Future Worst Hour Noise Levels - L_{eq}(h), dBA																							
					Existing Noise Level Leq(h), dBA	Design Year Noise Level without Project Leq(h), dBA	Design Year Noise Level with Project Leq(h), dBA	Design Year Noise Level with Project minus Existing Conditions Leq(h), dBA	Design Year Noise Level with Project Minus No Project Conditions Leq(h), dBA	Activity Category (NAC)	Impact Type (A: Approach; E: Exceed)	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)																	
												6 feet			8 feet			10 feet			12 feet			14 feet			16 feet		
												L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR
1	1.6	SF Residental	5	Heatherwood Road	53.1	53.8	54.3	1.2	0.5	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	1.6	SF Residental	5	Heatherwood Road	54.7	55.4	56.2	1.5	0.8	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	1.6	SF Residental	6	Cloudview Way	54.4	55.0	56.0	1.6	1.0	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	1.6	SF Residental	4	Cloudview Way	54.3	54.9	56.2	1.9	1.3	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	1.6	SF Residental	6	Cloudview Way	57.7	58.5	59.9	2.2	1.4	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	1.6	SF Residental	4	Cloudview Way	47.7	47.8	48.3	0.6	0.5	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7	1.6	SF Residental	5	Cloudview Way	60.2	60.8	62.1	1.9	1.3	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	-2.9	SF Residental	6	Banner Ridge Drive	56.0	56.5	58.8	2.8	2.3	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	-2.9	SF Residental	6	Banner Ridge Drive	57.3	57.8	59.5	2.2	1.7	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	-2.9	SF Residental	7	Banner Ridge Drive	57.0	57.4	58.4	1.4	1.0	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11	-2.9	SF Residental	6	Banner Ridge Drive	56.5	57.0	58.5	2.0	1.5	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12	-2.9	SF Residental	5	Banner Ridge Drive	52.5	52.7	53.9	1.4	1.2	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13	-2.9	SF Residental	4	Grand View Drive	51.2	51.3	53.4	2.2	2.1	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14	-2.9	SF Residental	4	Grand View Drive	53.9	54.5	56.7	2.8	2.2	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15	-2.9	SF Residental	4	Grand View Drive	55.5	56.0	58.0	2.5	2.0	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	-2.9	SF Residental	4	Fox Hollow Drive	47.2	46.8	47.5	0.3	0.7	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
17	-2.9	SF Residental	4	Fox Hollow Drive	54.6	54.9	56.8	2.2	1.9	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
18	-2.4	SF Residental	4	Fox Hollow Drive	53.3	53.5	55.3	2.0	1.8	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
19	-2.4	SF Residental	4	Fox Hollow Drive	49.5	49.2	50.0	0.5	0.8	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
20	-2.4	SF Residental	4	Fox Hollow Drive	50.0	49.7	50.5	0.5	0.8	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Exhibit B-2a. Predicted Existing/Future Noise levels and Barrier Analysis
CNE 2-3 (North-Side of SR-91 at Gypsum Canyon Road)
Noise Barrier on Express Lanes

Receiver I.D.	K-Factor	Land Use	Number of Dwelling Units	Address	Existing Noise Level L_{eq}(h), dBA	Future Worst Hour Noise Levels - L_{eq}(h), dBA: Design Year Noise Level without Project Leq(h), dBA	Design Year Noise Level with Project Leq(h), dBA	Design Year Noise Level with Project minus Existing Conditions Leq(h), dBA	Design Year Noise Level with Project Minus No Project Conditions Leq(h), dBA	Activity Category (NAC)	Impact Type (A: Approach; E: Exceed)	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR) — *Noise Barrier on Express Lanes*: 6 feet			8 feet			10 feet			12 feet			14 feet			16 feet		
												L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR
1	0.8	Recreational	6	Canyon RV Park - West	68.8	67.7	68.7	-0.1	1	B/C (67)	E	68.7	0.0	0	68.7	0.0	0	68.7	0.0	0	68.7	0.0	0	68.7	0.0	0	68.6	0.1	0
2	0.8	Recreational	4	Canyon RV Park - West	64.5	63.9	64.8	0.3	0.9	B/C (67)	-	64.8	0.0	0	64.7	0.1	0	64.7	0.1	0	64.7	0.1	0	64.7	0.1	0	64.7	0.1	0
3	0.8	Recreational	5	Canyon RV Park - West	68.3	67.2	68.2	-0.1	1	B/C (67)	E	68.2	0.0	0	68.1	0.1	0	68.1	0.1	0	68.1	0.1	0	68.1	0.1	0	68.1	0.1	0
4	0.8	Recreational	2	Canyon RV Park - West	64.3	63.7	64.7	0.4	1	B/C (67)	-	64.6	0.1	0	64.6	0.1	0	64.6	0.1	0	64.5	0.2	0	64.5	0.2	0	64.5	0.2	0
5	0.8	Recreational	6	Canyon RV Park - West	64.1	63.7	64.7	0.6	1	B/C (67)	-	64.6	0.1	0	64.5	0.2	0	64.5	0.2	0	64.5	0.2	0	64.5	0.2	0	64.5	0.2	0
6	0.8	Recreational	6	Canyon RV Park - West	67.4	66.7	67.7	0.3	1	B/C (67)	E	67.7	0.0	0	67.5	0.2	0	67.5	0.2	0	67.5	0.2	0	67.5	0.2	0	67.5	0.2	0
7	0.8	Recreational	8	Canyon RV Park - West	65.5	65.3	66.2	0.7	0.9	B/C (67)	-	66.2	0.0	0	66.1	0.1	0	66.1	0.1	0	66.1	0.1	0	66.0	0.2	0	66.0	0.2	0
8	0.8	Recreational	7	Canyon RV Park - West	68.0	67.7	68.6	0.6	0.9	B/C (67)	E	68.6	0.0	0	68.5	0.1	0	68.5	0.1	0	68.5	0.1	0	68.5	0.1	0	68.5	0.1	0
9	0.8	Recreational	6	Canyon RV Park - West	66.3	66.2	67.1	0.8	0.9	B/C (67)	E	67.1	0.0	0	67.0	0.1	0	67.0	0.1	0	67.0	0.1	0	67.0	0.1	0	67.0	0.1	0
10	0.8	Recreational	0	Canyon RV Park - West	71.3	71.0	71.7	0.4	0.7	B/C (67)	E	71.7	0.0	0	71.7	0.0	0	71.7	0.0	0	71.7	0.0	0	71.7	0.0	0	71.7	0.0	0
11	2.6	Recreational	2	Canyon RV Park - East	67.4	67.9	68.2	0.8	0.3	B/C (67)	E	68.2	0.0	0	68.3	-0.1	0	68.3	-0.1	0	68.3	-0.1	0	68.3	-0.1	0	68.3	-0.1	0
12	2.6	Recreational	2	Canyon RV Park - East	65.6	66.1	66.5	0.9	0.4	B/C (67)	-	66.5	0.0	0	66.5	0.0	0	66.5	0.0	0	66.5	0.0	0	66.5	0.0	0	66.5	0.0	0
13	2.6	Recreational	2	Canyon RV Park - East	69.3	69.8	69.7	0.4	-0.1	B/C (67)	E	69.7	0.0	0	69.7	0.0	0	69.7	0.0	0	69.7	0.0	0	69.7	0.0	0	69.7	0.0	0
14	2.6	Recreational	3	Canyon RV Park - East	67.5	68.0	68.0	0.5	0	B/C (67)	-	68.0	0.0	0	68.1	-0.1	0	68.1	-0.1	0	68.1	-0.1	0	68.1	-0.1	0	68.1	-0.1	0
15	2.6	Recreational	0	Canyon RV Park - East	73.7	74.1	73.8	0.1	-0.3	B/C (67)	E	73.8	0.0	0	73.8	0.0	0	73.8	0.0	0	73.8	0.0	0	73.8	0.0	0	73.8	0.0	0
16	2.6	Recreational	11	Canyon RV Park - East	70.1	70.6	70.2	0.1	-0.4	B/C (67)	E	70.2	0.0	0	70.2	0.0	0	70.2	0.0	0	70.2	0.0	0	70.2	0.0	0	70.2	0.0	0
17	2.6	Recreational	3	Canyon RV Park - East	77.0	77.4	76.5	-0.5	-0.9	B/C (67)	E	76.5	0.0	0	76.5	0.0	0	76.5	0.0	0	76.5	0.0	0	76.5	0.0	0	76.5	0.0	0
18	2.6	Recreational	8	Canyon RV Park - East	72.8	73.3	72.3	-0.5	-1	B/C (67)	E	72.3	0.0	0	72.3	0.0	0	72.3	0.0	0	72.3	0.0	0	72.3	0.0	1	72.3	0.0	1
19	2.6	Recreational	3	Canyon RV Park - East	71.0	71.3	71.0	0	-0.3	B/C (67)	E	71.0	0.0	0	71.0	0.0	0	71.0	0.0	0	71.0	0.0	0	71.0	0.0	0	71.0	0.0	0
20	2.6	Recreational	6	Canyon RV Park - East	68.6	69.0	69.0	0.4	0	B/C (67)	E	69.0	0.0	0	69.0	0.0	0	69.0	0.0	0	69.0	0.0	0	69.0	0.0	0	69.0	0.0	0
21	2.6	Recreational	5	Canyon RV Park - East	69.1	69.4	68.4	-0.7	-1	B/C (67)	E	68.4	0.0	0	68.4	0.0	0	68.4	0.0	0	68.4	0.0	0	68.4	0.0	0	68.4	0.0	0
22	2.6	Recreational	6	Canyon RV Park - East	67.8	68.2	68.4	0.6	0.2	B/C (67)	E	68.4	0.0	0	68.4	0.0	0	68.4	0.0	0	68.4	0.0	0	68.4	0.0	0	68.4	0.0	0

Exhibit B-2b. Predicted Existing/Future Noise levels and Barrier Analysis
CNE 2-3 (North-Side of SR-91 at Gypsum Canyon Road)
Noise Barrier along SR-91 (above existing)

Receiver I.D.	K-Factor	Land Use	Number of Dwelling Units	Address	Existing Noise Level L_{eq}(h), dBA	Future Worst Hour Noise Levels - L_{eq}(h), dBA: Design Year Noise Level without Project Leq(h), dBA	Design Year Noise Level with Project Leq(h), dBA	Design Year Noise Level with Project minus Existing Conditions Leq(h), dBA	Design Year Noise Level with Project Minus No Project Conditions Leq(h),	Activity Category (NAC)	Impact Type (A: Approach; E: E	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR) — *Noise Barrier along SR-91 (above existing)*: Existing L_{eq}(h)	Existing I.L.	Existing NBR	+2 feet L_{eq}(h)	+2 feet I.L.	+2 feet NBR	+4 feet L_{eq}(h)	+4 feet I.L.	+4 feet NBR	+6 feet L_{eq}(h)	+6 feet I.L.	+6 feet NBR	+8 feet L_{eq}(h)	+8 feet I.L.	+8 feet NBR
1	0.8	Recreational	6	Canyon RV Park - West	68.8	67.7	68.7	-0.1	1	B/C (67)	E	68.7	0.0	0	67.6	1.1	0	66.7	2.0	0	66.0	2.7	0	65.4	3.3	0
2	0.8	Recreational	4	Canyon RV Park - West	64.5	63.9	64.8	0.3	0.9	B/C (67)	-	64.8	0.0	0	64.2	0.6	0	63.8	1.0	0	63.4	1.4	0	63.0	1.8	0
3	0.8	Recreational	5	Canyon RV Park - West	68.3	67.2	68.2	-0.1	1	B/C (67)	E	68.2	0.0	0	67.2	1.0	0	66.4	1.8	0	65.7	2.5	0	65.1	3.1	0
4	0.8	Recreational	2	Canyon RV Park - West	64.3	63.7	64.7	0.4	1	B/C (67)	-	64.7	0.0	0	64.1	0.6	0	63.7	1.0	0	63.3	1.4	0	63.0	1.7	0
5	0.8	Recreational	6	Canyon RV Park - West	64.1	63.7	64.7	0.6	1	B/C (67)	-	64.7	0.0	0	64.2	0.5	0	63.9	0.8	0	63.6	1.1	0	63.4	1.3	0
6	0.8	Recreational	6	Canyon RV Park - West	67.4	66.7	67.7	0.3	1	B/C (67)	E	67.7	0.0	0	67.1	0.6	0	66.6	1.1	0	66.0	1.7	0	65.4	2.3	0
7	0.8	Recreational	8	Canyon RV Park - West	65.5	65.3	66.2	0.7	0.9	B/C (67)	-	66.2	0.0	0	65.9	0.3	0	65.6	0.6	0	65.4	0.8	0	65.2	1.0	0
8	0.8	Recreational	7	Canyon RV Park - West	68.0	67.7	68.6	0.6	0.9	B/C (67)	E	68.6	0.0	0	68.3	0.3	0	68.0	0.6	0	67.7	0.9	0	67.4	1.2	0
9	0.8	Recreational	6	Canyon RV Park - West	66.3	66.2	67.1	0.8	0.9	B/C (67)	E	67.1	0.0	0	66.9	0.2	0	66.7	0.4	0	66.5	0.6	0	66.4	0.7	0
10	0.8	Recreational	0	Canyon RV Park - West	71.3	71.0	71.7	0.4	0.7	B/C (67)	E	71.7	0.0	0	71.7	0.0	0	71.6	0.1	0	71.6	0.1	0	71.6	0.1	0
11	2.6	Recreational	2	Canyon RV Park - East	67.4	67.9	68.2	0.8	0.3	B/C (67)	E	68.2	0.0	0	68.2	0.0	0	68.1	0.1	0	68.1	0.1	0	68.0	0.2	0
12	2.6	Recreational	2	Canyon RV Park - East	65.6	66.1	66.5	0.9	0.4	B/C (67)	-	66.5	0.0	0	66.4	0.1	0	66.4	0.1	0	66.3	0.2	0	66.3	0.2	0
13	2.6	Recreational	2	Canyon RV Park - East	69.3	69.8	69.7	0.4	-0.1	B/C (67)	E	69.7	0.0	0	69.7	0.0	0	69.6	0.1	0	69.6	0.1	0	69.6	0.1	0
14	2.6	Recreational	3	Canyon RV Park - East	67.5	68.0	68.0	0.5	0	B/C (67)	-	68.0	0.0	0	68.0	0.0	0	68.0	0.0	0	67.9	0.1	0	67.9	0.1	0
15	2.6	Recreational	0	Canyon RV Park - East	73.7	74.1	73.8	0.1	-0.3	B/C (67)	E	73.8	0.0	0	73.8	0.0	0	73.8	0.0	0	73.8	0.0	0	73.8	0.0	0
16	2.6	Recreational	11	Canyon RV Park - East	70.1	70.6	70.2	0.1	-0.4	B/C (67)	E	70.2	0.0	0	70.2	0.0	0	70.2	0.0	0	70.1	0.1	0	70.1	0.1	0
17	2.6	Recreational	3	Canyon RV Park - East	77.0	77.4	76.5	-0.5	-0.9	B/C (67)	E	76.5	0.0	0	76.5	0.0	0	76.5	0.0	0	76.5	0.0	0	76.5	0.0	0
18	2.6	Recreational	8	Canyon RV Park - East	72.8	73.3	72.3	-0.5	-1	B/C (67)	E	72.3	0.0	0	72.2	0.1	0	72.2	0.1	0	72.1	0.2	0	72.1	0.2	1
19	2.6	Recreational	3	Canyon RV Park - East	71.0	71.3	71.0	0	-0.3	B/C (67)	E	71.0	0.0	0	71.0	0.0	0	70.9	0.1	0	70.8	0.2	0	70.7	0.3	0
20	2.6	Recreational	6	Canyon RV Park - East	68.6	69.0	69.0	0.4	0	B/C (67)	E	69.0	0.0	0	68.1	0.9	0	67.2	1.8	0	66.5	2.5	0	66.3	2.7	0
21	2.6	Recreational	5	Canyon RV Park - East	69.1	69.4	68.4	-0.7	-1	B/C (67)	E	68.4	0.0	0	67.4	1.0	0	66.6	1.8	0	65.9	2.5	0	65.3	3.1	0
22	2.6	Recreational	6	Canyon RV Park - East	67.8	68.2	68.4	0.6	0.2	B/C (67)	E	68.4	0.0	0	67.2	1.2	0	66.2	2.2	0	65.5	2.9	0	65.1	3.3	0

Exhibit B-3. Predicted Existing/Future Noise levels and Barrier Analysis
CNE 3-3 (North-Side of SR-91 (Archstone at Yorba Linda and Sycamore Park)

Receiver I.D.	K-Factor	Land Use	Number of Dwelling Units	Address	Existing Noise Level L_{eq}(h), dBA	Future Worst Hour Noise Levels - L_{eq}(h), dBA																							
						Design Year Noise Level without Project Leq(h), dBA	Design Year Noise Level with Project Leq(h), dBA	Design Year Noise Level with Project minus Existing Conditions Leq(h), dBA	Design Year Noise Level with Project Minus No Project Conditions Leq(h), dBA	Activity Category (NAC)	Impact Type (A: Approach; E: Exceed)	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receivers (NBR)																	
												6 feet			8 feet			10 feet			12 feet			14 feet			16 feet		
												L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR
1	-2.5	SF Residental	6	Corsica Road	53.9	54	54.1	0.2	0.1	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	-2.5	SF Residental	7	Corsica Road	54.2	54.2	54.4	0.2	0.2	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	-2.5	Recreational	0	Sycamore Park	59.9	59.9	60.2	0.3	0.3	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	-2.5	SF Residental	7	Corsica Road	54.2	54.2	54.3	0.1	0.1	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	-2.5	Recreational	0	Sycamore Park	62.5	62.4	62.7	0.2	0.3	C (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	-2.5	Recreational	0	Sycamore Park	60.6	60.5	60.8	0.2	0.3	C (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7	-2.5	SF Residental	5	Corsica Road	55.4	55.3	55.5	0.1	0.2	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	-2.5	MF Residental	8	Corsica Road	59.2	59	59.3	0.1	0.3	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8a	-2.5	MF Residental	8	Corsica Road	61	60.8	61.1	0.1	0.3	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	-2.5	MF Residental	8	Corsica Road	56.5	56.4	56.6	0.1	0.2	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9a	-2.5	MF Residental	8	Corsica Road	60.6	60.4	60.7	0.1	0.3	B (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	-2.5	Recreational	0	Sycamore Park	59.4	59.2	59.5	0.1	0.3	C (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11	-2.5	Recreational	0	Sycamore Park	61.3	61.2	61.4	0.1	0.2	C (67)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix C Noise Monitoring Field Sheets

Noise Measurement Record

Project Name: SR 241/91		Project No.:
Site ID: M1		Measurement No.: 1a + 1b
Conducted by: Rachel + Wa,		Date: 9/12
Start Time:	Stop Time:	L_{eq} Range:
Length of Measurement:		Microphone Height: 3.5

Street Address: Canyon RV Park

	Sound Level Meter	Microphone	Calibrator	Pistonphone
Model:	Bruel + Kjaer 2236	B+K 4188	B+K 4231	B+K 4188
Serial No.:	2015142	2120733	2010154	2120733

Calibration Check: 2.6

Winds	Temperature	Humidity	Precipitation
5 MPH	75		

Noticeable Events

Source	dBA	Source	dBA

Optional

	1a	1b		1a	1b
L_{eq} at 5 minutes:	69.8 dBA	65.7	L_1:	dBA	
L_{eq} at 10 minutes:	69.7 dBA	68.3	L_{10}:	70.5 dBA	70.5
L_{eq} at 15 minutes:	69.5 dBA	69.1	L_{50}:	69.0 dBA	69.0
L_{eq} at 20 minutes:	dBA		L_{90}:	68.0 dBA	67.0

Max L 74.0 | 77.9

Min L 66.2 | 64.3

Overall L_{eq}: 69.5 | 69.1

WB 91 ramp

A 56

H 1

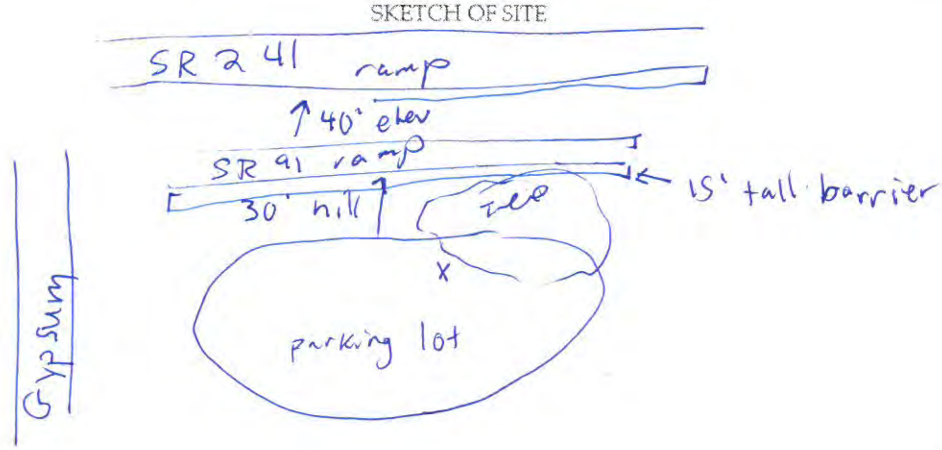
Traffic (Optional)

	Roadway:			Roadway:			Roadway:		
	Counted		Hr. Equiv.	Counted		Hr. Equiv.	Counted		Hr. Equiv.
Autos		=			=			=	
Medium Trucks		=			=			=	
Heavy Trucks		=			=			=	
Speed									

Noise Sources Other than Traffic Noise: ______________________

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: ____________

SKETCH OF SITE



(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

Supplementary Information

Comments:

birds chirping

lawn mower

motorcycle on a side road

primary noise is from highway

CH2MHILL

Noise Measurement Record

Project Name: SR 241/91	Project No.:
Site ID: M2	Measurement No.: 2a + 2b
Conducted by: Rachel + Wai	Date: 9/12
Start Time: 9:30 Stop Time: 9:45	L_{eq} Range:
Length of Measurement: 15 min	Microphone Height: 3.5'

Street Address: Featherly Regional Park

	Sound Level Meter	Microphone	Calibrator	Pistonphone
Model:	Bruel+Kjaer 2236	B+K 4188	B+K 4231	B+K 4188
Serial No.:	2015142	2120733	2010154	2120733

Calibration Check: 2.6

Winds	Temperature	Humidity	Precipitation
5 mph	79		

Noticeable Events

Source	dBA	Source	dBA
Highway is primary noise source			

Optional

	2a	2b		2a	2b
L_{eq} at 5 minutes:	69.1 dBA	69.2	L_1:	dBA	
L_{eq} at 10 minutes:	69.6 dBA	69.2	L_{10}:	70.5 dBA	70.0
L_{eq} at 15 minutes:	69.8 dBA	69.0	L_{50}:	69.5 dBA	68.5
L_{eq} at 20 minutes:	dBA		L_{90}:	68 dBA	67.0

L Max L 73.2 | 74.4

Min L 66 | 64.8

Overall L_{eq}: 69.8 | 69.0

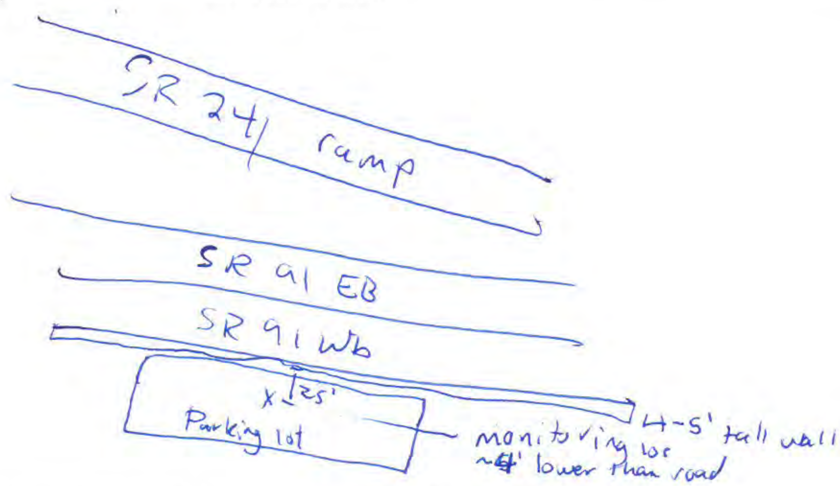
Traffic (Optional)

	2a Roadway: SR 91 EB		2a Roadway: SR 91 WB		2b Roadway: SR 91 EB		2b Rd SR 91 WB	
	Counted	Hr. Equiv.	Counted	Hr. Equiv.	Counted	Hr. Equiv.	Cnted	Hr Eq
Autos	996	= 3984	1710	= 6840	1022	= 4088	1611	= 6444
Medium Trucks	61	= 244	30	= 120	35	= 140	30	= 120
Heavy Trucks	83	= 332	65	= 260	78	= 312	79	= 316
Speed								

Noise Sources Other than Traffic Noise: __________

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: Roadway 5' higher

SKETCH OF SITE



(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

Supplementary Information

Comments:

Traffic primary noise source

CH2MHILL

Noise Measurement Record

Project Name: SR 241/91		Project No.:
Site ID: M3		Measurement No.: 3a +3b
Conducted by: Rachel + Wai		Date: 9/12
Start Time: 10:15	Stop Time: 10:30	L_{eq} Range:
Length of Measurement: 15 min		Microphone Height: 3.5'

Street Address: 25580 Aragon Way

	Sound Level Meter	Microphone	Calibrator	Pistonphone
Model:	Bruel + Kjaer 2236	B+K 4188	B+K 4231	B+K 4188
Serial No.:	2015142	2120733	2010154	2120733

Calibration Check: 26

Winds	Temperature	Humidity	Precipitation
< 5 mph	80		

Noticeable Events

Source	dBA	Source	dBA

Optional

	3a	3b		3a	3b
L_{eq} at 5 minutes:	50.0 dBA	49.5	L_1:	dBA	
L_{eq} at 10 minutes:	49.6 dBA	48.9	L_{10}:	50.5 dBA	51.0
L_{eq} at 15 minutes:	49.8 dBA	49.3	L_{50}:	49.0 dBA	48.0
L_{eq} at 20 minutes:	dBA		L_{90}:	47.0 dBA	47.0

Max L 67.2 58.1

Overall L_{eq}: 49.8 | 49.3

Min L 46.3 46.6

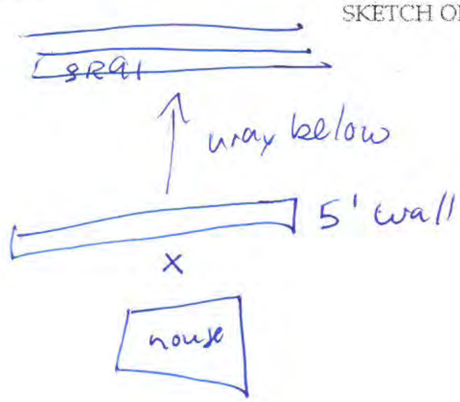
Traffic (Optional)

	Roadway: SR91 WB			Roadway: SR 91 EB			Roadway:		
	Counted		Hr. Equiv.	Counted		Hr. Equiv.	Counted		Hr. Equiv.
Autos	1248	=	4992	1190	=	4260		=	
Medium Trucks	54	=	216	69	=	276		=	
Heavy Trucks	41	=	164	95	=	380		=	
Speed									

Noise Sources Other than Traffic Noise: ______________________

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: __________

SKETCH OF SITE



(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

Supplementary Information

Comments:
wind chime and air conditioner

CH2MHILL

Noise Measurement Record

Project Name: SR241/91	Project No.:
Site ID: M4	Measurement No.: 4a + 4b
Conducted by: Rachel + Mai	Date: 9/12
Start Time: 10:35 / Stop Time: 10:50	L_{eq} Range:
Length of Measurement: 15 min	Microphone Height: 5.5

Street Address: Beneath I-91 EB off ramp

	Sound Level Meter	Microphone	Calibrator	Pistonphone
Model:	Bruel + Kjaer 2236	B+K 4188	B+K 4231	B+K 4188
Serial No.:	2015142	2120733	2010154	2120733

Calibration Check: 26

Winds	Temperature	Humidity	Precipitation
< 5 mph	80		

Noticeable Events

Source	dBA	Source	dBA

Optional

	4a	4b		4a	4b
L_{eq} at 5 minutes:	75.9 dBA	76.1	L_1:	dBA	
L_{eq} at 10 minutes:	75.9 dBA	76.0	L_{10}:	77 dBA	77.0
L_{eq} at 15 minutes:	76.0 dBA	76.0	L_{50}:	75.5 dBA	75.5
L_{eq} at 20 minutes:	dBA		L_{90}:	74.5 dBA	74.0
Max L	80.0	80.1			
Min L	73.1	71.7			

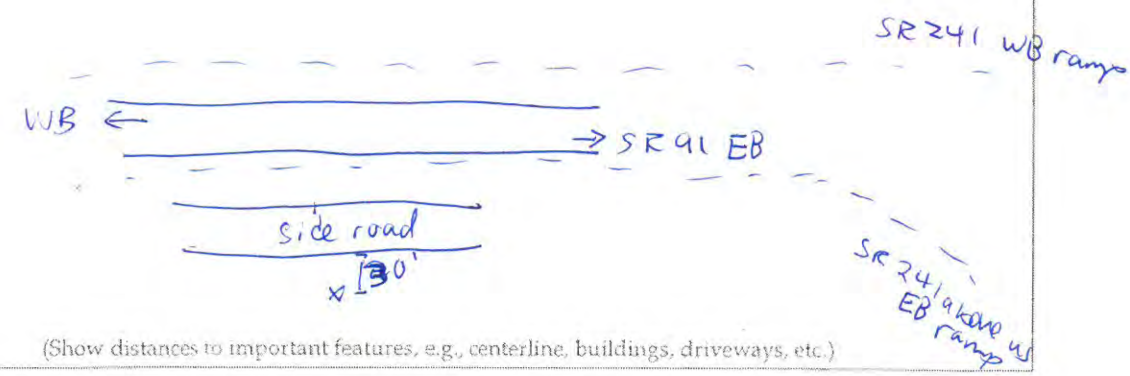
Overall L_{eq}: 76.0 | 76.0

Traffic (Optional)	4a		4a		4b		4b	
	Roadway: SR 91 WB		Roadway: SR 91 EB		Roadway: SR 91 WB		SR91 EB	
	Counted	Hr. Equiv.	Counted	Hr. Equiv.	Counted	Hr. Equiv.	Cntd	Hr Eq
Autos	972	= 3888	1203	= 4812	844	= 3376	924	= 3696
Medium Trucks	52	= 208	65	= 260	43	= 172	31	= 124
Heavy Trucks	66	= 264	108	= 432	41	= 164	47	= 188
Speed								

Noise Sources Other than Traffic Noise: ______

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: Equal

SKETCH OF SITE



(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

Supplementary Information

Comments:

Car in parking lot backing up

primary noise levels - road)

CH2MHILL

Noise Measurement Record

Project Name: SR 241 / 91		Project No.:
Site ID: M5		Measurement No.: 5 A + 5 b
Conducted by: Rachel + Wai		Date: 9/12
Start Time:	Stop Time:	L_{eq} Range:
Length of Measurement: 15 min		Microphone Height: 3.5'

Street Address: Oak Canyon Rd

	Sound Level Meter	Microphone	Calibrator	Pistonphone
Model:	Bruel + Kjaer 2236	B+K 4188	B+K 4231	B+K 4188
Serial No.:	2015142	2120733	2010154	2120733

Calibration Check: 2.6

Winds	Temperature	Humidity	Precipitation
5 mph	75°		

Noticeable Events

Source	dBA	Source	dBA
leaves rustling windy horn honk motorcycle			

Optional

	5a	5b		5a	5b
L_{eq} at 5 minutes:	48.5 dBA	50.8	L_1:	dBA	
L_{eq} at 10 minutes:	47.9 dBA	50.7	L_{10}:	50.5 dBA	52.5
L_{eq} at 15 minutes:	48.3 dBA		L_{50}:	46.0 dBA	46.0
L_{eq} at 20 minutes:	dBA		L_{90}:	42.5 dBA	42.5

Max L 61.7 67.3

Overall L_{eq}: 48.3 | 50.7

Min L 40.8

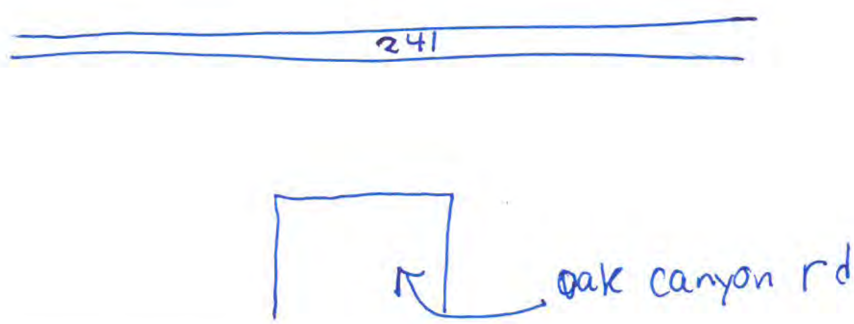
Traffic (Optional)

	5		5a		5a		5a	
	Roadway: SR 241 SB		Roadway: SR 241 NB		Roadway: SR 241 NB Ramp to EB 91		SR 241 SB Ramp from 91 W	
	Counted	Hr. Equiv.	Counted	Hr. Equiv.	Counted	Hr. Equiv.		
Autos	41 =	164	47 =	188	264 =	1056	221 :	84
Medium Trucks	3 =	12	4 =	16	23 =	92	15 =	64
Heavy Trucks	1 =	4	0 =	0	6 =	24	6 =	24
Speed								

Noise Sources Other than Traffic Noise: ____________________

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: ____________________

SKETCH OF SITE



(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

Supplementary Information

Comments:

CH2MHILL

Noise Measurement Record

Project Name: SR 241/91		Project No.:	
Site ID: M6		Measurement No.: 6	
Conducted by: Rachel + Wai		Date: 9/12	
Start Time:	Stop Time:	L_{eq} Range:	
Length of Measurement: 15 min		Microphone Height: 3.5'	

Street Address: Garden View Dr

	Sound Level Meter	Microphone	Calibrator	Pistonphone
Model:	Bruel + Kjaer 2236	B+K 4188	B+K 4231	B+K 4188
Serial No.:	2015142	2120733	2010154	2120733

Calibration Check: 2.6

Winds	Temperature	Humidity	Precipitation
<5 mph	75°		

Noticeable Events

Source	dBA	Source	dBA

Optional

L_{eq} at 5 minutes: 51.7 dBA	L_1: dBA
L_{eq} at 10 minutes: 52.0 dBA	L_{10}: 53.0 dBA
L_{eq} at 15 minutes: 52.0 dBA	L_{50}: 51.5 dBA
L_{eq} at 20 minutes: dBA	L_{90}: 50.0 dBA

Max L 61.8
Min L 48.6

Overall L_{eq}: 52.0

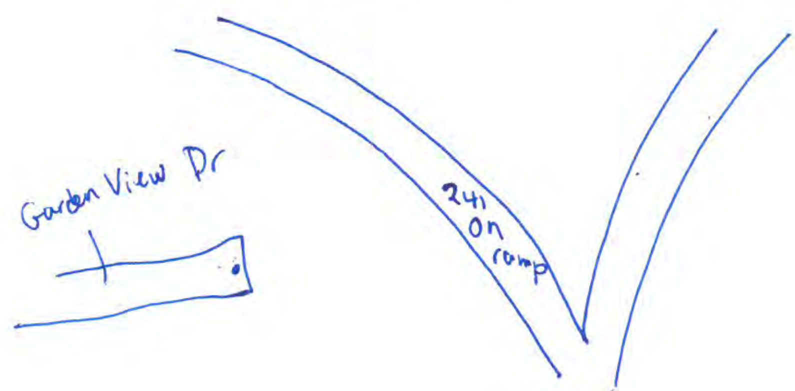
Traffic (Optional)

	Roadway: 91 WB		Roadway: 91 EB		Roadway:	
	Counted	Hr. Equiv.	Counted	Hr. Equiv.	Counted	Hr. Equiv.
Autos	1414	= 5656	1807	= 7228		=
Medium Trucks	80	= 320	87	= 348		=
Heavy Trucks	76	= 304	60	= 240		=
Speed						

Noise Sources Other than Traffic Noise: ______________________

Elevation of Roadway in Relation to Elevation of Ground at Measurement Site: ______________

SKETCH OF SITE



(Show distances to important features, e.g., centerline, buildings, driveways, etc.)

Supplementary Information

Comments:

Appendix D Exhibits

Exhibit 5-1: Measurement Areas

Exhibit 6-1 a-c: CNE and Receiver Maps

0 187.5 375 Feet

1 inch = 200 feet

Exhibit 6-1a: Receivers (CNE 1-3)

Project: EA OK9700

City of Anaheim, Orange County

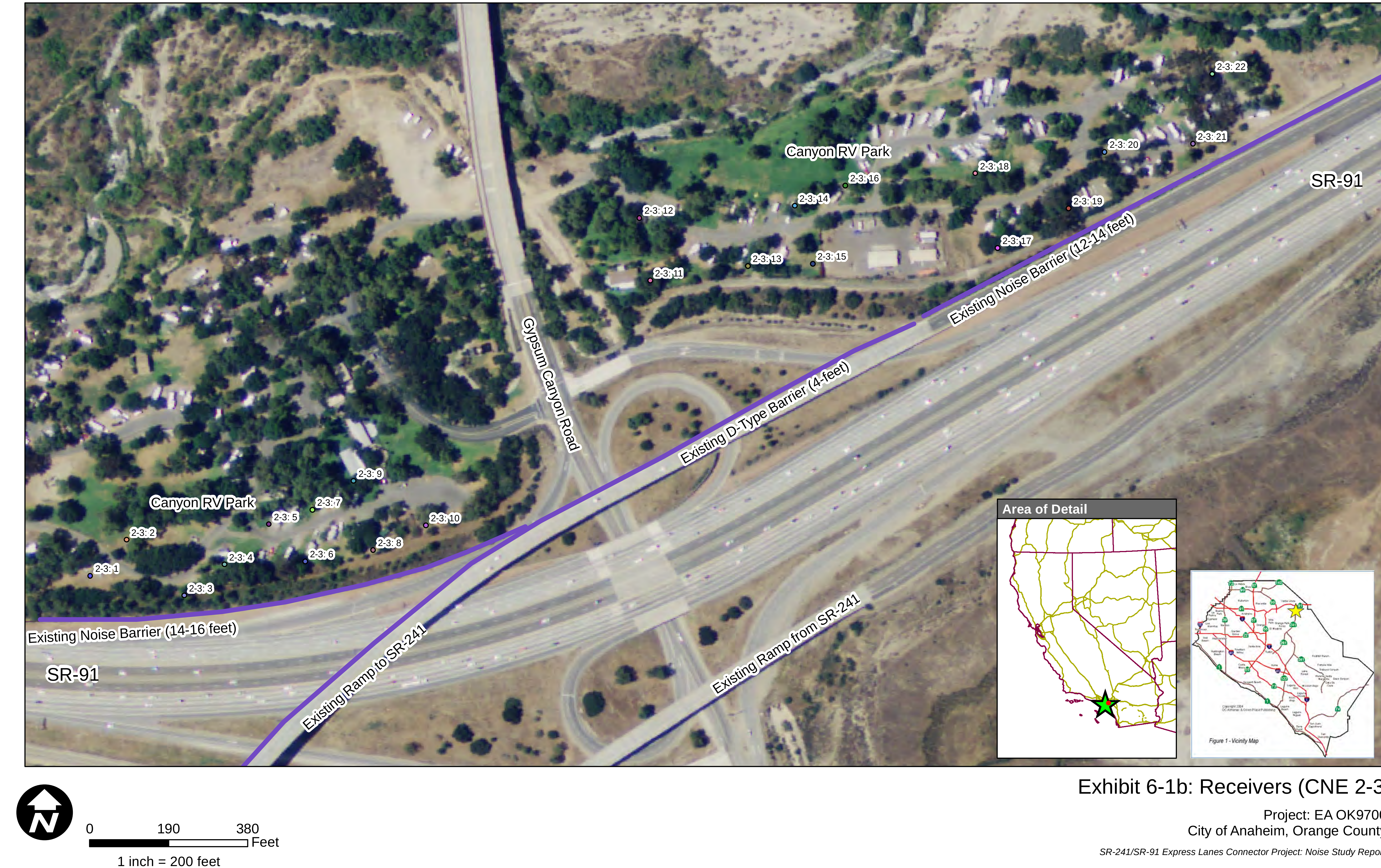


Exhibit 6-1b: Receivers (CNE 2-3)

Project: EA OK9700
City of Anaheim, Orange County

SR-241/SR-91 Express Lanes Connector Project: Noise Study Report

0 190 380
Feet

1 inch = 200 feet

Exhibit 6-1c: Receivers (CNE 3-3)

Project: EA OK9700
City of Anaheim, Orange County

Exhibit 6-1c: Receivers (CNE 3-3)

Project: EA OK9700
City of Anaheim, Orange County

Exhibit 6-2: Preliminary Engineering of Expressway Connectors

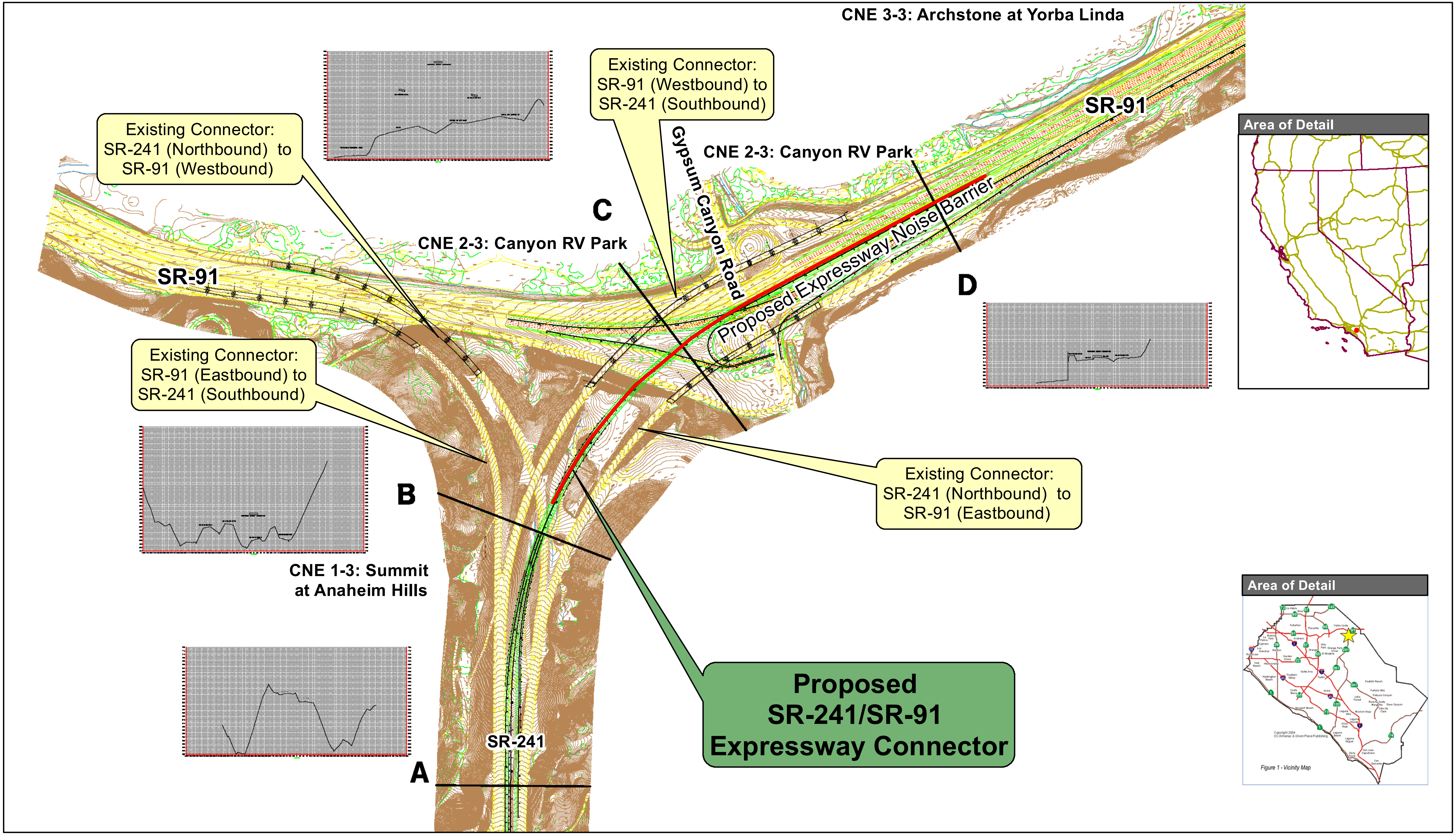


Exhibit 6-2: Proposed Expressway Connector

Project: EA OK9700

City of Anaheim, Orange County

Appendix E TNM Files

Folder/File Structure:

- Validation
- Existing
    - Existing CNE 1-3
    - Existing CNE 2-3
    - Existing CNE 3-3
- No-Build 2040
    - NB 2040 CNE 1-3
    - NB 2040 CNE 2-3
    - NB 2040 CNE 3-3
- Build 2040
    - Build 2040 CNE 1-3
    - Build 2040 CNE 2-3
    - Build 2040 CNE 3-3
    - Barrier 2040 CNE 2-3 (improve existing barrier)
        - ✓ Express Barrier

Appendix F Project Description/Purpose And Need

PROJECT DESCRIPTION

INTRODUCTION

The California Department of Transportation (Caltrans) District 12, in cooperation with the Foothill/Eastern Transportation Corridor Agency (F/ETCA) proposes the State Route 241 (SR-241) / State Route 91 (SR-91) Express Lanes Connector Project (Proposed Project) to construct a median-to-median connector between SR-241 and the tolled lanes in the median of SR-91 (SR-91 Express Lanes). SR-241 is a tolled facility, starting at the Oso Parkway interchange, in south Orange County, to its terminus at SR-91. The SR-91 Express Lanes is a two-lane tolled facility, in each direction, located within the median of SR-91, from State Route 55 (SR-55), to the Orange/Riverside County line (east of the SR-241 interchange). The existing interchange connects all lanes of the northbound and southbound SR-241 to non-tolled, general purpose lanes of eastbound and westbound SR-91. There is currently no direct connection between the SR-241 and the SR-91 Express Lanes.

The Proposed Project, located at the junction of SR-241 and SR-91 within the cities of Anaheim, Yorba Linda, and Corona and counties of Orange and Riverside, would provide improved access between SR-241 and SR-91 and is proposed to be a tolled facility. The proposed median-to-median connector project encompasses 12-ORA-241 (PM 36.1/39.1), 12-ORA-91 (PM 14.7/18.9), and 08 RIV-91 (PM 0.0/1.5) for a length of approximately 8.7 mi. The Project Location and Project Vicinity are shown in Figure 1.

Improvements for the connector are limited to 5.9 mi in the cities of Anaheim and Yorba Linda from south of the Windy Ridge Wildlife Undercrossing on SR-241 to Coal Canyon Undercrossing on SR-91. The remaining 2.8 mi of the Proposed Project is limited to FasTrak signage improvements (advance signage) in the cities of Anaheim (1.2 mi total), Yorba Linda (0.1 mi) and Corona (1.5 mi), with exact placement pending the Final Design process. The Proposed Project is mostly within existing Caltrans right-of-way, with one partial acquisition adjacent to eastbound SR-91. Construction access and staging areas would occur within existing Caltrans right-of-way.

The proposed median-to-median connector is a later phase of the Eastern Transportation Corridor (ETC) project, previously approved in 1994. It was originally evaluated as a SR-241/SR-91 high-occupancy vehicle (HOV) direct connector in the 1991 ETC Draft Environmental Impact Report/ Environmental Impact Statement (Draft EIR/EIS), 1992 ETC Final EIR, and the 1994 ETC Final EIS (all of which studied a broader project area with improvements on SR-133, SR-241, and SR-261).

The Systems Management Concept (SMC) for the ETC projected that each Build Alternative would be staged, incorporating general purpose traffic and eventually HOV lanes, to meet the forecasted demand. Under the SMC, ETC construction would be completed in one stage, with three or more phases.

To implement this later phase of the ETC, a Supplemental Draft EIR/EIS is being prepared to focus on the eastern portion of the original project and to address changes to environmental conditions and regulatory requirements. Various alternatives were studied in the 1991 ETC Draft EIR/EIS, 1992 ETC Final EIR, and the 1994 ETC Final EIS; however, the Supplemental Draft EIR/EIS will include a No Build and only one Build Alternative for the median-to-median connector for the following reasons:

- There are limited locations for a median-to-median connector between SR-241 and SR-91;
- The median-to-median connector is a component of a previously approved project and alternative selected during a 1992 EIR Certification and 1994 Record of Decision (ROD);
- Various alternatives were studied for the previously approved project which required consideration of a reasonable range of alternatives; and
- The Supplemental Draft EIR/EIS is being prepared to address changes to environmental conditions and regulatory requirements and not to change the previously approved project as a whole.

The Proposed Project is being coordinated with the Orange County Transportation Authority (OCTA) and the Riverside County Transportation Commission (RCTC). The SR-91 Express Lanes are tolled and are operated by OCTA, from SR-55 to the Orange County/Riverside County line. Easterly from the county line, the lanes are HOV non-tolled lanes; however, as part of the RCTC SR-91 Corridor Improvement Project (SR-91 CIP), RCTC will operate median tolled lanes starting from the County line and ending at Interstate 15 (I-15). As part of the SR-91 CIP, the median tolled lanes include a connector to southbound I-15 general purpose lanes. Implementation of the SR-91 CIP along with the Proposed Project would provide a direct connection between SR-241 and southbound I-15.

Caltrans and the F/ETCA intend to begin construction of the Proposed Project in 2017.

NEED AND PURPOSE

NEED

The project is needed to improve access between the SR-241 and SR-91 Express Lanes. The lack of connectivity between SR-241 and the SR-91 Express Lanes negatively affects traffic flow, worsens an already congested SR-91 during peak hours, and results in a long queue of vehicles on northbound SR-241 trying to access eastbound SR-91. As a result, motorists inappropriately “queue jump” (i.e., change lanes at the last minute) during congested traffic periods, contributing to delays.

Purpose

As stated in the Final EIR and Final EIS, the overall objective of the ETC was to accommodate traffic growth associated with planned and approved development in the

County of Orange. Specifically, the ETC was proposed to meet the following objectives, which are applicable to the Proposed Project (which is a later phase of the ETC):

- To provide relief for existing freeways;
- To improve traffic flow on the regional transportation system;
- To service existing and planned development consistent with the General Plans of the counties and the cities in areas that will benefit from the project;
- To employ advanced transportation technology for the maximum operational and design efficiency and automatic vehicle monitoring for toll collections; and
- To implement the County of Orange Master Plan of Arterial Highways.

In addition to the originally intended objectives, changed circumstances at the junction of SR-241 and SR-91 have led to the following updated objectives for the Proposed Project:

- Implement the buildout of the ETC, as approved in 1994;
- Attain compatibility with the SR-91 mainline and Express Lanes;
- To improve traffic flow by minimizing queue-jumping on northbound SR-241 at the westbound SR-91 general purpose lane connector and at the eastbound SR-91 general purpose lane connector;
- To help achieve the Regional Mobility Plan goals of reducing emissions from transportation sources by improving movement in congested areas along the SR-241 and SR-91; and
- To enhance the efficiency of the tolled system, thereby reducing congestion on the non-tolled system on the SR-91.

PROJECT ALTERNATIVES

Two alternatives are being analyzed in this document: the Build Alternative and the No Build Alternative.

Build Alternative (Two-lane Express Lanes Connector)

The Build Alternative would construct a two-lane express lane median-to-median connector between SR-241 and SR-91 which would connect lanes from the median of northbound SR-241 to the existing eastbound SR-91 Express Lanes. The reverse movement would also be accommodated, from the westbound SR-91 Express Lanes to the median of southbound SR-241. The connector would be tolled. The Build Alternative is shown in Figure 2.

On SR-241 at the southern end of the project (near PM 36), FasTrak signage would be improved approximately 0.2 mi south of the Windy Ridge Wildlife Undercrossing. For southbound SR-241, an additional lane and shoulder would be provided by widening the Windy Ridge Wildlife Undercrossing into the existing median and improving the highway median approximately 10,000 ft to the north. For northbound SR-241, starting approximately 5,000 ft north of the Windy Ridge Wildlife Undercrossing, an additional lane and shoulder will be provided by improving the highway median approximately 5,000 ft to the north. At this point on SR-241 (approximately PM 38), the two connector lanes would converge within the existing median on fill and two new bridge structures approximately 700 ft (over the northbound SR-241 to westbound SR-91 general purpose lane connector) and 2,000 ft in length (to merge with SR-91). All approximate lengths will be further refined during the Final Design process.

Additional pavement would be added between the existing northbound SR-241/eastbound SR-91 and the northbound SR-241/westbound SR-91 general purpose connectors in order to accommodate a concrete barrier separation to prevent vehicles traveling on the westbound SR-91 general purpose connector to “queue jump” into the eastbound SR-91 general purpose connector. This would improve traffic flow on the SR-241.

The Build Alternative would merge into the existing OCTA SR-91 Express Lanes at the western limits of the RCTC SR-91 CIP which extends the SR-91 Express Lanes further east to I-15. The Build Alternative is also compatible with the approved SR-91 CIP for both the initial and ultimate configurations, including the number and widths of the SR-91 Express Lanes, express auxiliary lanes, and general purpose lanes.

Improvements on Eastbound SR-91

At the western end of SR-91 project terminus, FasTrak signage improvements would occur approximately within the first 0.1 mi of the project. The Gypsum Canyon Road on- and off-ramps and the northbound-SR-241-to-eastbound-SR-91 general purpose connector would be realigned to accommodate the Proposed Project.

To accommodate the addition of the median-to-median connector, the existing eastbound SR-91 lanes would be shifted to the south by adding pavement to the south and restriping. The number of existing eastbound SR-91 general purpose lanes would be maintained within the project limits. At the eastern terminus of the connector bridge structure, the eastbound connector lane would continue for approximately 1 mi within the SR-91 median prior to tapering to tie in to the SR-91 CIP Express Lanes at Coal Canyon Undercrossing. Also near the eastern terminus of the connector lane bridge structure (approximately 2,000 ft west of Gypsum Canyon Road), one additional eastbound auxiliary express lane would be provided, connecting to the auxiliary lane for the SR-91 CIP also at Coal Canyon Undercrossing. These improvements would provide a four-lane express lane facility and tapering down to three lanes, between the connector and Coal Canyon Undercrossing.

The eastbound SR-91 Express Lanes would also have striped buffers (tapering from 0 ft to 4 ft). The Proposed Project would provide a striped buffer to separate the general purpose lanes from the SR-91 Express Lanes and a new striped buffer to temporarily separate the connector lane from the SR-91 Express Lanes. Additional separators within the striped buffers will be further considered during the Final Design process.

Approximately 3,600 ft west of Coal Canyon Undercrossing, grading would occur to accommodate the shift of the lanes to the south. The grading and construction of an access road would encroach into County-owned land on Assessor's Parcel Number (APN) 085-071-56. Approximately 5 ac of land on this parcel would be acquired from the County of Orange for Caltrans right-of-way. To the north of this parcel, a 1,000 ft retaining wall would be required, but would not be viewable from the highway. Further details for the retaining wall and the exact length will be determined during the Final Design process.

Improvements on Westbound SR-91

At the eastern terminus of the connector bridge structure, the westbound connector lane would extend for approximately 1 mi within the SR-91 median, with the lane tapering approximately 1,000 ft west of Coal Canyon Undercrossing. For the eastern 1,000 ft of the westbound connector express lane, one additional westbound auxiliary express lane would be provided to accommodate merging and diverging to and from the SR-91 Express Lanes. These improvements would provide a four-lane express lane facility for approximately 1,000 ft. To provide the additional SR-91 Express Lanes, restriping would occur between points east of the Gypsum Canyon Road Undercrossing and west of Coal Canyon Undercrossing.

There would be a striped buffer (tapering from 0 ft to 2 ft) to separate the westbound SR-91 Express Lanes from the general purpose lanes. Additional separators within the striped buffer will be further considered during the Final Design process. At the eastern end of SR-91 project terminus, FasTrak signage improvements would occur between Coal Canyon Undercrossing and Green River Road within the existing median and highway footprint of westbound SR-91. (No roadway improvements would occur in this area.)

No Build

Under this alternative, no direct toll connector would be constructed between SR-241 and SR-91. The No Build Alternative:

- Would not close the toll connector gap between SR-241 and the SR-91 Express Lanes;
- Would not prevent motorists from inappropriately "queue jumping" during congested traffic periods, thereby disrupting traffic flow on the northbound SR-241 connector to the eastbound SR-91 general purpose lanes during PM Peak hours; and
- Would provide a benchmark by which the public and decision-makers can compare the magnitude of the effects of the Build Alternative.