# TRAFFIC NOISE STUDY REPORT

I-210 Sound Wall Project (Type II)

From Pennsylvania Avenue to Waltonia Drive

in La Crescenta and Montrose,

Unincorporated areas of the Los Angeles County, California

07 – LA – 210 – PM 16.8R/18.8R

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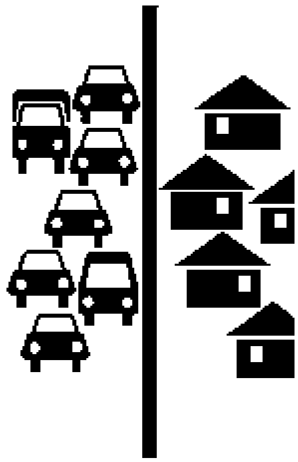


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# EXECUTIVE SUMMARY

This traffic noise study report (NSR) evaluates freeway traffic noise impacts based on existing worst-hour noise levels along Interstate 210 (I-210) freeway in the unincorporated areas of the Los Angeles County, known as La Crescenta and Montrose, from Pennsylvania Avenue to Waltonia Drive. This project would construct 15 sound barriers along Interstate 210 (I-210) from Post Mile (PM) 16.77 (Pennsylvania Av. Overcrossing) to PM 18.77 (500 ft. west of the SR-2 Interchange). All of the sound barriers would be located within the Caltrans' Right of Way. The area of concern has been currently identified under the Metro's Post 1989 Retrofit Soundwall Projects Phase II list.

This traffic noise study report has been prepared to comply with Title 23 Part 772 of the Code of Federal Regulations (23CFR772), "Procedures for Abatement of Highway Traffic Noise and Construction Noise", as described in the September 2013 Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) and Section 216 of the California Street and Highways Code.

Under 23CFR772.7, projects are categorized as Type I, Type II, or Type III projects. This project is considered a Type II retrofit noise abatement project. Corresponding State, federal and sponsoring RTPA (Los Angeles County Metropolitan Transportation Authority – Metro) policies for retrofit/Type II projects are applicable. A Type II project involves construction of noise abatement on an existing highway with no changes to highway capacity or alignment. The traffic noise analysis for this project has been conducted in accordance with State, Federal and Metro policies for Type II projects.

This noise study report evaluates based on Type II project requirements all residential areas and schools along I-210 freeway between Pennsylvania Avenue and Waltonia Drive. Preliminary noise abatement measures necessary for the proposed project to comply with State and Federal noise abatement regulations are also analyzed and presented in this document. This report will be used to provide information for the Noise Barrier Scope Summary Report (NBSSR).

The I-210 is a divided, east-west freeway with four to five mixed-flow lanes in each direction within the project limits. It also branches into a separate 3-lane connector to and from the State Route 2 (SR-2) at the eastern end of the project.

A Field noise investigation was conducted in order to determine existing noise levels and gather information to develop and calibrate the traffic noise model that was used for predicting future noise levels. Existing ambient noise levels were determined at locations acoustically representative of the noise environment and land uses within the limits of the project. The noise sensitive land uses consisted of residences and two schools along the freeway. Four long-term sites were used to monitor and record noise levels over a 24-hour period to determine the noisiest hour within various interchanges. In addition, thirty-five short-term locations were used where noise was recorded over a 10-minute period. Existing worst-hour noise levels recorded within the project limits ranged between 46 – 76 dBA-Leq(h) for residential areas with outdoor frequent human use. For the two schools, the interior classroom noise levels resulted in 28 – 47 dBA-Leq(h).

Sound level readings, traffic counts and pertinent field data such as traffic flow speed and topography of the locations were used to develop the computer traffic noise model for each analysis site. The computer traffic noise model was then used to predict future noise levels to determine feasible and reasonable noise abatement for the impacted areas. The computer program Traffic Noise Model (TNM 2.5), FHWA's Traffic Noise Prediction Model (FHWA-RD-77-108), was used in this analysis to develop the traffic noise model for both existing and future conditions.

Future traffic volume of 1950 vehicles per hour per lane was used in this retrofit soundwall project. This is considered the maximum volume with free flow traffic which will yield the most traffic noise. Future heavy and medium truck percentages were calculated from existing truck volume traffic counts. The future noise levels have been predicted to be in the range of 47 and 77 dBA-Leq(h) for residential areas and 29 – 49 dBA-Leq(h) for the two schools. Table 7-1 provides a summary of the traffic noise modeling results for the entire study area. All noise monitoring locations and modeling representative locations are shown in Layouts L-1 through L-3.

The traffic noise analysis indicates that residential areas within the project limits are currently impacted [i.e. the existing worst-hour noise level at activity areas exceeds FHWA Noise Abatement Criteria (NAC)]. The NACs are shown in Table 4-1. Based on Metro soundwall implementation policies, only impacted residential and educational/school classroom land uses qualify for noise abatement consideration under the retrofit sound wall program. To qualify for retrofit noise abatement, the ambient noise levels must exceed the 67 dBA threshold and the residences must have been developed prior to construction of the highway or before any expansion or alteration of the highway that would result in increased traffic noise at the residential areas. The study areas in this project qualify for retrofit noise abatement based on the above criteria. For any schools to qualify for noise abatement under the retrofit sound wall program, the interior classroom noise level must exceed the 52 dBA threshold based on the California Streets and Highways Code 216.

Since traffic noise impacts have been identified, noise abatement has been considered for the impacted receivers. As stated in 23CFR772 and in the Caltrans Protocol, noise abatement is considered where noise impacts are predicted and where frequent human use occurs and where a lowered noise level would be of benefit. For all impacted receptors, noise abatement has been evaluated for acoustical feasibility (noise reduction of 5 dBA or more) with calculated reasonable allowances. The overall reasonableness is determined by these factors: noise reduction design goal, the cost of abatement, and viewpoints of benefited receptors (including property owners and residents of the benefited receptors). The reasonable cost allowances for each acoustically feasible sound barrier were calculated based on the $107,000 per benefited residence. For any noise barrier to be considered reasonable from a cost perspective the estimated cost of the noise barrier should be equal to or less than the total cost allowance calculated for the barrier. Additionally, for a sound barrier to be considered reasonable, the 7 dB noise reduction design goal must be achieved at one or more benefited receptors. However, according to the 23CFR772, if the project has no federal funding, then, the 7 dB design goal may not apply. The noise barrier is not required to reduce noise levels to below the NAC for any noise sensitive land uses. Please note that a 5 dBA noise reduction is considered to be readily perceptible while a 3 dBA change is considered barely noticeable. A difference in 10 dBA is considered doubling or halving of noise.

Only acoustically feasible noise abatement measures along with their corresponding reasonable allowances are presented as part of this project. Based on the studies conducted, Caltrans and Metro intend to incorporate noise abatement measures in the form of sound walls to attenuate traffic noise in the impacted areas. Table 1 below summarizes acoustically feasible soundwall locations, height range, approximate length, noise attenuation range, number of benefited receivers and reasonable allowances. The locations of existing and feasible preliminary soundwalls are shown on Layouts L-1 through L-3.

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 is provided on the physical location, length, and range of heights of noise barriers. If pertinent parameters change substantially during the final project design, preliminary noise barrier designs may be modified or eliminated from the final project. A final decision on the construction of the noise abatement will be made upon completion of the project design.

**Table 1-1 Summary of Acoustically Feasible Soundwalls On I-210 Between Pennsylvania Av. and Waltonia Dr. in La Crescenta**

| Soundwall | Direction | Location | Existing Worst-Hour Noise Level dBA-Leq(h) | Acoustically Feasible Height Range (Feet) | Approximate Length (Feet) | Noise Attenuation Range ( dBA ) | Number of Benefited Receivers | Reasonable Allowance |
|---|---|---|---|---|---|---|---|---|
| SW-200 + SW-202 | EB | From Pennsylvania Av. to Ramsdell Av. | 73 | 10 to 16 | 855 + 1066 | 6 to 10 | 17 to 27 | $1,819,000 to $2,889,000 |
| SW-201 + SW-203 | WB | From Pennsylvania Av. to Ramsdell Av. | 76 | 8 to 16 | 1202 + 821 | 5 to 11 | 8 to 20 | $856,000 to $2,140,000 |
| SW-204 | EB | From Ramsdell Av. to La Crescenta Av. | 70 | 8 to 16 | 1258 | 7 to 12 | 12 to 20 | $1,284,000 to $2,140,000 |
| SW-205 | WB | From Crescenta Valley HS to La Crescenta Av. | 73 | 8 to 16 | 802 | 6 to 9 | 7 to 12 | $749,000 to $1,284,000 |
| SW-206 | EB | From La Crescenta Av. to Rosemont Av. | 70 | 8 to 16 | 1652 | 6 to 7 | 10 to 22 | $1,070,000 to $2,354,000 |
| SW-207 | WB | From La Crescenta Av. to Rosemont Av. | 72 | 8 to 16 | 1686 | 6 to 8 | 22 | $2,354,000 |
| SW-208A + SW-208B | EB | From Rosemont Av. to Briggs Av. | 71 | 8 to 16 | 221 + 1262 | 9 to 12 | 19 to 24 | $2,033,000 to $2,568,000 |
| SW-209 | WB | From Rosemont Av. to Briggs Av. | 69 | 10 to 16 | 1490 | 5 to 7 | 12 to 24 | $1,284,000 to $2,568,000 |
| SW-210 + SW-212 | EB | From Ocean View Blvd. to Waltonia Dr. | 70 | 12 to 16 | 624 + 1479 | 5 to 7 | 26 to 46 | $2,782,000 to $4,922,000 |
| SW-211 | WB | From Ocean View Blvd. to Waltonia Dr. | 73 | 10 to 16 | 974 | 5 to 8 | 8 | $856,000 |
| SW-213 | WB | From Ocean View Blvd. to Waltonia Dr. | 73 | 12 to 16 | 1047 | 5 to 6 | 10 to 25 | $1,070,000 to $2,675,000 |

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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 |
| dBA | A-weighted decibels |
| FHWA | Federal Highway Administration |
| HOV | High Occupancy Vehicle |
| Hz | Hertz |
| kHz | Kilohertz |
| KP | Kilometer post |
| $L_{dn}$ | 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 |
| Loudness | Amplitude |
| mPa | Micro-Pascals |
| mph | Miles per Hour |
| NAC | Noise Abatement Criteria |
| NADR | Noise Abatement Decision Report |
| NEPA | National Environmental Policy Act |
| NSR | Noise Study Reports |
| PM | Post Mile |
| Protocol | Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects |
| SPL | Sound Pressure Level |
| TeNS | Caltrans' Technical Noise Supplement |
| TNAP | Caltrans' Traffic Noise Analysis Protocol |
| 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 traffic noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23CFR772) "Procedures for Abatement of Highway Traffic Noise". 23CFR772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under 23CFR772.7, projects are categorized as Type I, Type II, or Type III projects. This project is considered a Type II retrofit noise abatement project. Corresponding State, federal and sponsoring RTPA (Los Angeles County Metropolitan Transportation Authority – Metro) policies for retrofit/Type II projects are applicable. A Type II project involves construction of noise abatement on an existing highway with no changes to highway capacity or alignment. The traffic noise analysis for this project has been conducted in accordance with State, Federal and Metro policies for Type II projects.

The Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) (Caltrans 2011) provides Caltrans policy for implementing 23CFR772 in California. The Protocol outlines the requirements for preparing noise study reports. The purpose of this NSR is to evaluate noise impacts consistent with the requirements of 23CFR772 and to determine whether the noise abatement satisfies Federal Highway Administration (FHWA) requirements.

Noise impacts associated with this project under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) are evaluated in the project's Categorical Exclusion/Categorical Exemption (CE/CE).

## 1.2. Project Purpose and Need

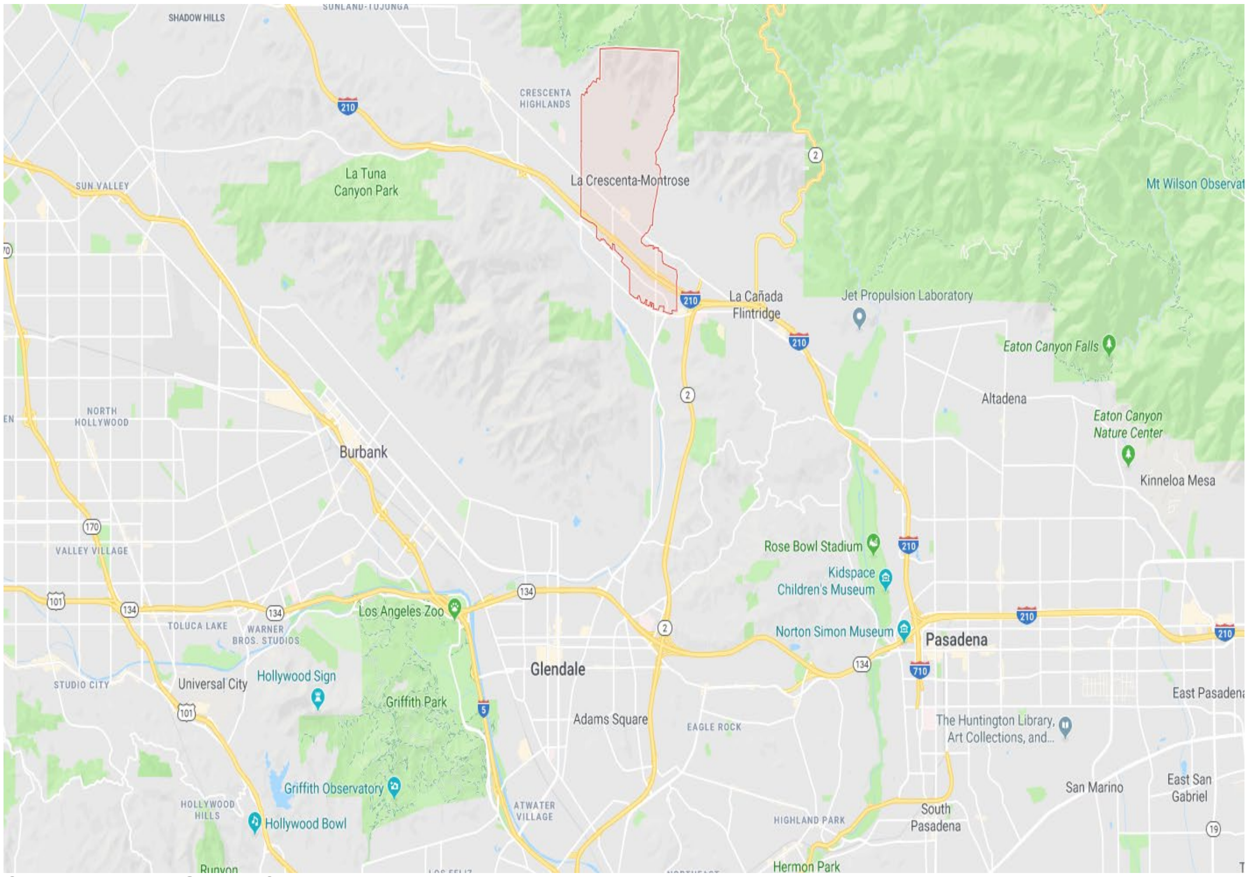
Based on existing worst-hour traffic noise measurements and complaints from local residents living close to I-210 in the communities of La Crescenta and Montrose, a detailed noise study was conducted in order to accurately determine existing traffic noise impacts. Los Angeles County Metropolitan Transportation Authority (Metro) Post 1989 Retrofit Soundwall Program's purpose is to identify impacted areas that qualify under the policy and to provide effective traffic noise abatement for eligible residences and schools.

# **Chapter 2.** Project Description

This soundwall retrofit project proposes to provide effective freeway traffic noise reduction for sensitive receivers in the residential areas of La Crescenta and Montrose within the unincorporated areas of the Los Angeles County. This project would construct 15 sound barriers along Interstate 210 (I-210) from Post Mile (PM) 16.77 (Pennsylvania Av. Overcrossing) to PM 18.77 (500 ft. west of the SR-2 Interchange). All of the sound barriers would be located within the Caltrans' Right of Way. The area of concern has been currently identified under the Metro's Post 1989 Retrofit Soundwall Projects Phase II list. Existing ambient noise was measured at various representative locations for each area, in May 2018. Noise levels exceeded the Noise Abatement Criteria (NAC) for residential areas (Activity Category B) of 67 dBA (Section 2, Chapter 30 of the Project Development Procedures Manual (PDPM)), therefore, detailed noise impact analysis and abatement studies were conducted and noise abatement was recommended.

As part of the proposed project, several of the existing lighting structures would be relocated in order to accommodate the proposed sound barriers. In areas where existing landscaping is removed, vegetation would be replaced with similar species as currently exist. Three bridge structures would require modification to accommodate the Department approval soundwalls for structures. Four existing retaining walls would require modification to construct the proposed sound barriers.

**Figure 2-1. Project Location**




*Source: Map data @ 2018 Google*

# 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, September 2013), a technical supplement to the Protocol, which is available on Caltrans Web site http://env.onramp.dot.ca.gov/noise/technical-noise-supplement-traffic-noise-analysis-protocol or the FHWA Highway Noise Barrier Design Handbook available on the FHWA website https://www.fhwa.dot.gov/environment/noise/index.cfm

## 3.1. Sound, Noise, and Acoustics

Sound is a vibratory disturbance created by a moving or vibrating source in a gaseous or liquid medium or in the elastic strain of a solid that is capable of being detected by the hearing organs. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. The medium of main concern is air. In absence of any other qualifying statements, sound will be considered airborne sound, as opposed to, for example, structure borne or earth borne sound.

Noise is defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Sound (and noise) is actually a process that consists of three components: 1) the sound source, 2) the sound path, and 3) the sound receiver. All three components must be present for sound to exist. Without a source to produce sound, there obviously is no sound. Likewise, without a medium to transmit sound pressure waves there is also no sound. And finally, sound must be received, i.e. a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise. In most situations, there are many different sound sources, paths, and receivers, instead of just one of each.

Acoustics is the field of science that deals with the production, propagation, reception, effects, and control of sound. The field is very broad, and transportation related noise and its abatement covers just a small, specialized part of acoustics.

Traffic noise typically results from the interaction of the sources (moving vehicles) and the roadway. A considerable portion of traffic noise derives from the sound emitted by the combustion engines of these vehicles. From the source to the receiver, noise varies both in level and frequency.

## 3.2. Frequency

Sound can be described by its frequency (pitch) and amplitude (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch, like the low notes on a piano, whereas high-frequency sounds are high in pitch, like the high notes on a piano. Frequency is expressed in terms of oscillations, or cycles per second. Cycles per second are commonly referred to as Hertz (Hz). A frequency of 250 cycles per second is referred to as 250 Hz. High frequencies are sometimes more conveniently expressed in units of kilo-Hertz (kHz), or thousands of Hertz. The extreme ranges of frequencies that can be heard by the healthiest human ears spans from 16–20 Hz on the low end to about 20,000 Hz (or 20 kHz) on the high end.

## 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.

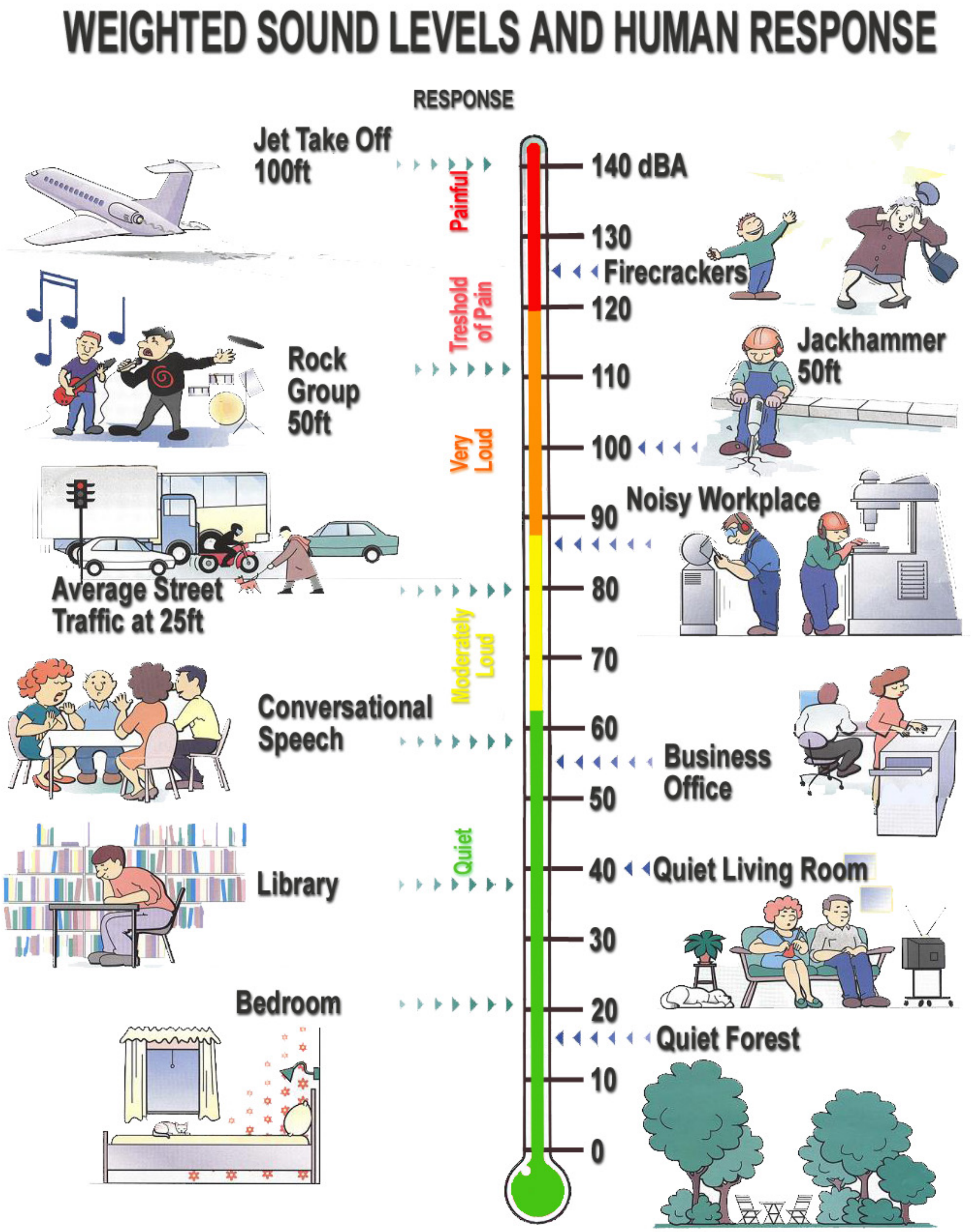
The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgments correlate well with the A-scale sound levels of those sounds. Other weighting networks 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. Figure 3-1 describes typical A-weighted noise levels for various noise sources and shows levels of noise associated with common activities and human response.

## 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.

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


WEIGHTED SOUND LEVELS AND HUMAN RESPONSE
RESPONSE
Jet Take Off
100ft
Painful
Treshold
of Pain
Very
Loud
Moderately
Loud
Quiet
140 dBA
130
Firecrackers
120
Jackhammer
50ft
Rock
Group
50ft
110
100
Noisy Workplace
90
Average Street
Traffic at 25ft
80
70
Conversational
Speech
60
Business
Office
50
Library
40
Quiet Living Room
30
Bedroom
20
Quiet Forest
10
0

Source: B&K

## 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 receiver 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 receiver, 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 receiver, 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 receiver can substantially attenuate noise levels at the receiver. 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. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the highway and receiver is rarely effective in reducing noise because it does not create a solid barrier.

# Chapter 4. Federal Regulations and State Policies

The traffic noise analysis for this project has been conducted in accordance with State, Federal and Metro (sponsoring RTPA) policies for Type II projects, as discussed below.

## 4.1. Federal Regulations

### 4.1.1. 23CFR772 - Title 23, Part 772 of the Code of Federal Regulations (23CFR772), "Procedures for Abatement of Highway Traffic Noise and Construction Noise"

23CFR772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. Under 23CFR772.7, projects are categorized as Type I, Type II projects, 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 or increases the number of through-traffic lanes. A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment. A Type III project is a project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

Under 23CFR772.13, noise abatement must be considered and evaluated for feasibility and reasonableness for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23CFR772 requires that the project sponsor "consider" noise abatement before adoption of the NEPA Categorical Exclusion (CE), Finding of No Significant Impact (FONSI), or Record of Decision (ROD). This process involves identification of noise abatement measures that are feasible, reasonable, and likely to be incorporated into the project, and noise impacts for which no noise abatement measures are feasible and reasonable.

For Type II projects, traffic noise impacts shall be determined from current year conditions. Traffic noise impacts, as defined in 23CFR772, occur when the existing worst-hour noise level exceeds the NAC specified in 23CFR772. Noise levels are expressed in terms the *A-weighted decibel (dBA)* and the *one-hour equivalent sound level* (*Leq[h]*).

Retrofit noise abatement applies to all activity categories in Table 4-1. Table 4-1 summarizes the NAC corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in a given area. Based on Metro soundwall implementation policies, only residential and schools are considered for noise abatement consideration. To qualify for retrofit noise abatement, the ambient noise levels within the project limits must meet or exceed the 67 dBA threshold and the activity areas must have been developed prior to construction of the highway or before any expansion or alteration of the highway that would result in increased traffic noise at the residential areas.

### Table 4-1. Activity Categories and Noise Abatement Criteria

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

[1] The Leq(h) and L10(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.

In identifying areas for retrofit noise abatement, primary consideration is given to exterior areas. Noise abatement is considered only where frequent human use occurs and a lowered noise level would be beneficial.

## 4.2. State Regulations and Policies

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

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 NAC specified in the Protocol are the same as those specified in 23CFR772.

Type II projects, as defined in the Protocol, are retrofit noise abatement projects on existing transportation facilities within the State right-of-way or projects proposed by an agency using Type II Federal-aid funds under 23CFR772. Under current State law, regional transportation planning agencies (RTPAs), rather than Caltrans, are responsible for sponsoring retrofit noise abatement projects. However, abatement must be approved by Caltrans and therefore must meet certain minimum requirements.

Caltrans has established the following criteria for retrofit noise abatement proposed within the State right-of-way.

1. Activity areas must have been developed before construction of the highway or before any expansion or alteration of the highway that would result in increased traffic noise at the residential areas.

2. Existing worst-hour noise level at activity areas must exceed the applicable noise abatement criterion in Table 4-1.

3. Any other FHWA-approved criteria established and implemented by sponsoring RTPAs responsible for retrofit noise abatement program must be met.

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

### 4.2.2. 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 D for classroom interiors, but it is a requirement that must be addressed in addition to the requirements of 23CFR772.

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

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 types, Activity Categories 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 noise impact analysis focuses on locations with defined frequent human use areas, such as residences and schools.

Short-term measurement locations were selected to represent each major developed area within the project area. Long-term measurements were conducted in order to capture diurnal traffic noise level patterns in the project area. Short-term measurement locations were selected to serve as representative modeling locations. Several other non-measurement locations were selected as modeling locations. The field survey for all noise measurements included visiting the project sites in order to identify land uses within the project limits and to select the noise measurement sites.

The noise measurement sites were selected taking into consideration the following general site requirements:

1. Sites were acoustically representative of areas and conditions of interest. They were located at areas of human use.

2. Sites were clear of major obstructions between source and receiver. Microphone positions were more than 10 feet away from reflecting surfaces.

3. Sites were free of noise contamination by sources other than those of interest. Sites were not located near barking dogs, lawn mowers, pool pumps, air conditioners, etc.

4. Sites were not exposed to prevailing meteorological conditions that are beyond the constraints discussed in the Technical Noise Supplement (TeNs).

## 5.2. Field Measurement Procedures

A field noise study was conducted in accordance with recommended procedures in TeNS. Caltrans Noise and Vibration Branch conducted noise measurements (short-term, long-term, and background) for all areas of concern. The following is a summary of the procedures used to collect short-term and long-term sound level data. All noise monitoring locations and modeling locations are shown on Layouts L-1 through L-3.

### 5.2.1. Short-Term Measurements

Thirty-five short-term noise measurements were conducted at representative locations within each area using the precision integrating Larson-Davis Model 831 noise meters. The short-term measurement locations are listed on Tables 6-1-1 through 6-1-4.

During the short-term measurements, field staff attended each meter. The 10-minute $L_{eq}$ values collected during the measurement period were logged into the meter's internal memory, and dominant noise sources observed during each individual 10-minute period were also identified and logged. Using this approach, other non-traffic noise sources (such as aircraft and lawn equipment) can be identified and excluded from the noise readings. The calibration of the meter was checked before and after the measurement using the corresponding calibrators for each meter.

Traffic on I-210 was classified and counted during short-term noise measurements. Vehicles were classified as automobiles, medium-duty trucks, or heavy-duty trucks. An automobile is defined as a vehicle with two axles and four tires that are designed primarily to carry passengers. Small vans and light trucks are included in this category. Medium-duty trucks included all cargo vehicles with two axles and six tires. Heavy-duty trucks included all vehicles with three or more axles. The posted speed limit on I-210 freeway within the project limits is 65 mph.

Community background noise readings (10-minute duration) were taken within the project limits. The average noise levels recorded ranged from 45 to 54 dBA-Leq(h). Background noise measurements are presented in Table 6-2. Background noise is the total of all noise generated within a community and is measured away from the main noise source of interest where freeway traffic noise does not contribute to the total ambient noise levels. Background noise levels are typically measured to determine the acoustical feasibility (noise reducibility of 5 dBA) of noise abatement and to ensure that noise reduction goals can be achieved. Noise abatement cannot reduce noise levels below background noise levels.

### 5.2.2. Long -Term Measurements

Long-term monitoring was conducted at 4 locations using Larson-Davis Model 831 precision integrating sound level meters. The purpose of these measurements was to identify variations in sound levels throughout the day. 24-hour readings were taken at locations representative of residential areas in order to determine the noisiest hour. A sound level meter was placed at the representative site and was left to run continuously monitoring and recording noise levels for a 24-

hour period. The short-term noise levels were recorded within the 24-hour noise monitoring for that particular area. The noise level data collected was then analyzed and adjusted using the 24-hour noise readings to determine the noisiest hour. Please see Tables 6-3-1 through 6-3-4 for noise monitoring results at each long-term noise measurement sites.

## 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 2004). 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 and future conditions. The maximum traffic volumes, vehicle classification percentages, and traffic speeds in design-year conditions were input into the traffic noise model.

Traffic volumes of 1950 vehicles per hour per lane were used in future prediction noise models. This is considered the maximum volume with free flow traffic which will yield the most traffic noise. Future heavy and medium truck percentages were calculated from current existing condition traffic counts.

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 intensity from 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 receiver locations where the existing worst-hour noise level exceeds the NAC for the applicable activity category. Based on Metro soundwall implementation policies, only residential and schools are considered for noise abatement. Where traffic noise impacts are identified, noise abatement must be considered for feasibility and reasonableness as required by 23CFR772, Caltrans Protocol and Metro policy.

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dBA at impacted receiver 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 receivers, as recommended 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. For safety reasons, the Caltrans Highway Design Manual states that noise barriers should not exceed 14 feet in height (measured from the pavement surface at the face of the safety-shape barrier) when located 15 feet or less from the edge of the traveled way. However, barriers more than 16 feet high can be considered if necessary to achieve acoustical feasibility [i.e. at least 5 dB noise reduction] or reasonableness [i.e. 7 dB design goal noise reduction at one or more benefited receptors], taking into consideration safety and other technical factors.

The overall reasonableness is determined by these factors: acoustical design goal, the cost of abatement, and viewpoints of benefited receptors (including property owners and residents of the benefited receptors). 23CFR722 requires that an acoustical design goal be applied to all noise abatement. Caltrans acoustical design goal is that a barrier must be predicted to provide at least 7 dB of noise reduction at one or more benefited receptors. In order for a sound barrier to be considered reasonable, the 7 dB design goal must be achieved at one or more benefited receptors. This design goal applies to any receptor and is not limited to impacted receptors. However, according to the 23CFR772, if the project has no federal funding, then, the 7 dB design goal may not apply. Cost considerations in the reasonableness determination of noise abatement are based on the allowance per benefited receptor of $107,000 (Metro Soundwall Implementation Policy). A benefited receptor is a dwelling unit that is predicted to receive a noise reduction of at least 5 dBA from the proposed noise abatement measure. A receptor can be a benefited receptor even if it is not subject to a traffic noise impact. The noise barrier is not required to reduce noise levels to below the NAC for any noise sensitive land uses. Please note that a 5 dBA noise reduction is considered to be readily perceptible while a 3 dBA change is considered barely noticeable. A difference in 10 dBA is considered doubling or halving of noise.

# Chapter 6. Existing Noise Environment

## 6.1. Existing Land Uses

A Field investigation was conducted in order to identify land uses that are currently impacted by the freeway traffic noise. Single-family residences and multi-family residences are identified as Activity Category B while schools, parks, recreation areas, playgrounds, golf courses, places of worship, medical facilities, and public or nonprofit institutional structures are identified as Activity Category C land uses. Hotels/motels, offices, and restaurants are considered Activity Category E. Industrial, maintenance facilities, manufacturing, and warehousing facilities are considered Activity Category F. As mentioned before, based on Metro soundwall implementation policies, only residential and schools are considered for noise abatement consideration.

I-210 freeway is a divided east-west freeway with four to five mixed-flow lanes in each direction. At the eastern end of the project limits, the I-210 freeway intersects with the State Route (SR) 2. In La Crescenta and Montrose, land uses consist of single and multi-family residences and two schools. The I-210 freeway is mostly depressed throughout the project limits except at the Pennsylvania Ave. interchange, where the homes along both EB-210 and WB-210 freeway are below the freeway elevation.

As required by the Protocol, all developed land uses that fulfill Type II project requirements are evaluated in this analysis. However, 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 backyards and common use areas at multi-family residences.

### 6.1.1. Existing Traffic Noise

Existing worst-hour noise measurements were conducted in order to determine qualification for Metro's soundwall retrofit program and gather information to develop and calibrate the traffic noise models that were used for predicting future noise levels and proposed traffic noise abatement feasibility. Existing noise levels were measured at representative sites within project limits. All analysis locations are acoustically representative of the study areas within the limits of the project. The existing ambient noise levels measured were between 46 and 74 decibels (dBA). Long-term (24-hour) noise level readings were conducted to determine the noisiest hour within the project limits at each of the study areas. Tables 7-1-1 summarizes the traffic noise measurements taken in the project areas and the noise modeling results for existing conditions.

### 6.1.2. Existing Sound Barriers

There is only one existing sound barrier within the project limits.

1) 6 – 8 ft. high soundwall on the State Right of Way from Briggs Ave. to Ocean View Blvd. along the Eastbound I-210 freeway.

## 6.2. Noise Measurement Results

The existing noise levels in the project area are summarized in Tables 6-1-1 through 6-1-4; Table 6-2, Tables 6-3-1 through Table 6-3-4; and Table 7-1. They consist of short-term and long-term noise monitoring including background noise levels at representative noise sensitive locations within the project limits.

### 6.2.1. Short-Term Monitoring

Short-term monitoring was conducted at 35 locations, using the Larson-Davis Model 831 sound level meters. Measurements were taken over a 10-minute period at each site. Table 6-1-1 through Table 6-1-4 summarize the results of the short-term noise monitoring conducted in the project area. Table 6-2 summarizes the 5 community background noise levels within the project limits.

### 6.2.2. Long-Term Monitoring

Long-term monitoring was conducted at four locations using Larson-Davis Model 831 sound level meters. The purpose of these measurements was to capture variations in traffic noise levels throughout the day, rather than absolute noise levels at a specific receptor of concern. The long-term sound level data was collected over 144 consecutive 10-minute intervals over a 24-hour period. Tables 6-3-1 through Table 6-3-4 summarize the results of the long-term noise monitoring conducted in the project area. Figures 6-1 through 6-4 show graphically the results of the 24-hour noise testing.

**Table 6-1-1 Summary of Short-Term Noise Measurements Along I-210 Freeway Between Pennsylvania Av. and La Crescenta Av.**

| Site | Address | Land Use | Date | Start Time | Duration (minutes) | Measured Leq-dBA | Freeway Direction | Number of MF Lanes | Autos | Medium Trucks | Heavy Trucks | Buses | Motorcycles | Observed Speed (mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | 3130 Encinal Av. | Residential | 5/15/2018 | 10:20 AM | 10 | 72.3 | EB | 5 | 739 | 33 | 40 | 0 | 0 | 65 |
| | | | | | | | WB | 5 | 597 | 20 | 60 | 0 | 1 | 65 |
| A2 | 3150 Encinal Av. | Residential | 5/15/2018 | 10:52 AM | 10 | 69.1 | EB | 5 | 628 | 27 | 63 | 0 | 2 | 65 |
| | | | | | | | WB | 5 | 544 | 17 | 60 | 0 | 1 | 65 |
| A3 | 2900 Community Av. | School | 5/16/2018 | 7:00 AM | 10 | 27.1 | Traffic counts not performed for La Crescenta Valley High School since primary concern is classrooms interior noise levels. | | | | | | | |
| A4 | 2808 Altura Av. | Residential | 5/15/2018 | 9:40 AM | 10 | 64.2 | EB | 5 | 991 | 24 | 80 | 0 | 0 | 65 |
| | | | | | | | WB | 5 | 784 | 24 | 50 | 3 | 0 | 65 |
| A5 | 3155 Montrose Av. #202 | Residential | 5/16/2018 | 9:15 AM | 10 | 64.8 | EB | 5 | 1002 | 34 | 71 | 3 | 1 | 65 |
| | | | | | | | WB | 5 | 707 | 17 | 56 | 1 | 0 | 65 |
| A6 | Northwood Village Condos | Residential | 5/15/2018 | 1:00 PM | 10 | 69.5 | EB | 5 | 623 | 23 | 68 | 0 | 3 | 65 |
| | | | | | | | WB | 5 | 614 | 14 | 74 | 1 | 1 | 65 |
| A7 | 2930 Mayfield Av. | Residential | 5/15/2018 | 12:37 PM | 10 | 65.7 | EB | 5 | 714 | 22 | 52 | 0 | 1 | 65 |
| | | | | | | | WB | 5 | 660 | 17 | 67 | 3 | 0 | 65 |
| A8 | 2832 Mayfield Av. | Residential | 5/15/2018 | 1:17 PM | 10 | 63.5 | EB | 5 | 653 | 33 | 53 | 0 | 2 | 65 |
| | | | | | | | WB | 5 | 637 | 13 | 42 | 2 | 0 | 65 |
| Aw | 3037 Altura Av. | Residential | 5/15/2018 | 10:34 AM | 10 | 56.5 | EB | 5 | 739 | 33 | 40 | 0 | 0 | 65 |
| | | | | | | | WB | 5 | 597 | 20 | 60 | 0 | 1 | 65 |
| Ax | 3002 Evelyn St. | Residential | 5/15/2018 | 11:08 AM | 10 | 52.5 | EB | 5 | 628 | 27 | 63 | 0 | 2 | 65 |
| | | | | | | | WB | 5 | 544 | 17 | 60 | 0 | 1 | 65 |
| Ay | 2823 Altura Av. | Residential | 5/15/2018 | 9:55 AM | 10 | 57.1 | EB | 5 | 991 | 24 | 80 | 0 | 0 | 65 |
| | | | | | | | WB | 5 | 784 | 24 | 50 | 3 | 0 | 65 |
| Az | 2940 Fairway Av. | Residential | 5/15/2018 | 1:33 PM | 10 | 53.8 | EB | 5 | 653 | 33 | 53 | 0 | 2 | 65 |
| | | | | | | | WB | 5 | 637 | 13 | 42 | 2 | 0 | 65 |

**Table 6-1-2 Summary of Short-Term Noise Measurements Along I-210 Freeway Between La Crescenta Av. and Ocean View Blvd.**

| Site | Address | Land Use | Date | Start Time | Duration (minutes) | Measured Leq-dBA | Freeway Direction | Number of MF Lanes | Autos | Medium Trucks | Heavy Trucks | Buses | Motorcycles | Observed Speed (mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B1 | 2737 Mayfield Av. | Residential | 5/16/2018 | 9:42 AM | 10 | 60.1 | EB | 5 | 1068 | 29 | 67 | 0 | 0 | 65 |
| | | | | | | | WB | 5 | 775 | 22 | 42 | 4 | 1 | 65 |
| B2 | 2559 Mayfield Av. | Residential | 5/16/2018 | 10:12 AM | 10 | 65.6 | EB | 5 | 775 | 28 | 77 | 2 | 0 | 65 |
| | | | | | | | WB | 5 | 737 | 25 | 62 | 1 | 0 | 65 |
| B3 | 2505 Mayfield Av. | Residential | 5/16/2018 | 10:50 AM | 10 | 64.5 | EB | 5 | 722 | 18 | 57 | 2 | 0 | 65 |
| | | | | | | | WB | 5 | 685 | 21 | 65 | 3 | 0 | 65 |
| B4 | 2333 Del Mar Rd. | Residential | 5/16/2018 | 11:12 AM | 10 | 60.0 | EB | 5 | 634 | 24 | 55 | 4 | 2 | 65 |
| | | | | | | | WB | 5 | 659 | 15 | 59 | 2 | 2 | 65 |
| B5 | 2733 Altura Av. | Residential | 5/17/2018 | 9:50 AM | 10 | 64.7 | EB | 5 | 1051 | 14 | 65 | 2 | 4 | 65 |
| | | | | | | | WB | 5 | 612 | 36 | 49 | 1 | 4 | 65 |
| B6 | 2609 Altura Av. | Residential | 5/17/2018 | 10:24 AM | 10 | 64.7 | EB | 5 | 338 | 7 | 19 | 3 | 0 | 65 |
| | | | | | | | WB | 5 | 727 | 17 | 54 | 0 | 3 | 65 |
| B7 | 2497 Altura Av. | Residential | 5/16/2018 | 1:06 PM | 10 | 63.2 | EB | 5 | 718 | 25 | 54 | 2 | 3 | 65 |
| | | | | | | | WB | 5 | 919 | 18 | 60 | 0 | 1 | 65 |
| B8 | 4242 Briggs Av. | Residential | 5/17/2018 | 10:47 AM | 10 | 72.6 | EB | 5 | 496 | 14 | 27 | 0 | 1 | 65 |
| | | | | | | | WB | 5 | 772 | 22 | 66 | 3 | 0 | 65 |
| B9 | 4315 Ocean View Blvd. | Residential | 5/17/2018 | 12:20 PM | 10 | 63.5 | EB | 5 | 774 | 33 | 56 | 3 | 3 | 65 |
| | | | | | | | WB | 5 | 750 | 19 | 81 | 3 | 1 | 65 |
| B10 | 2361 Del Mar Rd. | School | 5/16/2018 | 12:43 PM | 10 | 44.6 | Traffic counts not performed for St. Monica Academy since primary concern is classrooms interior noise levels. | | | | | | | |
| Bv | 2649 Prospect Av. | Residential | 5/17/2018 | 10:05 AM | 10 | 52.2 | EB | 5 | 1051 | 14 | 65 | 2 | 4 | 65 |
| | | | | | | | WB | 5 | 612 | 36 | 49 | 1 | 4 | 65 |
| Bw | 2518 Evelyn St. | Residential | 5/16/2018 | 1:20 PM | 10 | 51.9 | EB | 5 | 718 | 25 | 54 | 2 | 3 | 65 |
| | | | | | | | WB | 5 | 919 | 18 | 60 | 0 | 1 | 65 |
| Bx | 2344 Bartan Ln. | Residential | 5/17/2018 | 11:03 AM | 10 | 48.2 | EB | 5 | 496 | 14 | 27 | 0 | 1 | 65 |
| | | | | | | | WB | 5 | 772 | 22 | 66 | 3 | 0 | 65 |
| By | 2643 Fairway Av. | Residential | 5/16/2018 | 9:56 AM | 10 | 44.8 | EB | 5 | 1068 | 29 | 67 | 0 | 0 | 65 |
| | | | | | | | WB | 5 | 775 | 22 | 42 | 4 | 1 | 65 |
| Bz | 2503 Fairway Av. | Residential | 5/16/2018 | 10:32 AM | 10 | 48.2 | EB | 5 | 775 | 28 | 77 | 2 | 0 | 65 |
| | | | | | | | WB | 5 | 737 | 25 | 62 | 1 | 0 | 65 |

**Table 6-1-3 Summary of Short-Term Noise Measurements Along I-210 Freeway - Westbound Between Ocean View Blvd. and SR-2**

| Site | Address | Land Use | Date | Start Time | Duration (minutes) | Measured Leq-dBA | Freeway Direction | Number of MF Lanes | Autos | Medium Trucks | Heavy Trucks | Buses | Motorcycles | Observed Speed (mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C1 | 2126 Waltonia Dr. | Residential | 5/18/2018 | 10:20 AM | 10 | 69.8 | EB | 5 | 471 | 19 | 57 | 2 | 2 | 65 |
| | | | | | | | WB | 5 | 445 | 13 | 66 | 0 | 1 | 65 |
| C2 | 2101 Crescent Av. | Residential | 5/18/2018 | 10:34 AM | 10 | 67.1 | EB | 5 | 406 | 13 | 8 | 0 | 0 | 65 |
| | | | | | | | WB | 5 | 155 | 4 | 7 | 1 | 0 | 65 |
| Cx | 2283 Waltonia Dr. | Residential | 5/18/2018 | 1:10 PM | 10 | 68.2 | EB | 5 | 337 | 8 | 11 | 3 | 1 | 65 |
| | | | | | | | WB | 5 | 181 | 4 | 2 | 1 | 0 | 65 |
| Cy | 2215 Waltonia Dr. | Residential | 5/18/2018 | 10:53 AM | 10 | 60.4 | EB | 5 | 451 | 22 | 46 | 4 | 1 | 65 |
| | | | | | | | WB | 5 | 415 | 15 | 68 | 2 | 0 | 65 |

**Table 6-1-4 Summary of Short-Term Noise Measurements Along I-210 Freeway - Eastbound Between Ocean View Blvd. and SR-2**

| Site | Address | Land Use | Date | Start Time | Duration (minutes) | Measured Leq-dBA | Freeway Direction | Number of MF Lanes | Autos | Medium Trucks | Heavy Trucks | Buses | Motorcycles | Observed Speed (mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D1 | 2270 Del Mar Rd. | Residential | 5/18/2018 | 9:25 AM | 10 | 66.6 | EB | 5 | 461 | 25 | 48 | 2 | 1 | 65 |
| | | | | | | | WB | 5 | 494 | 11 | 52 | 2 | 2 | 65 |
| D2 | 1982 Waltonia Dr. | Residential | 5/18/2018 | 9:42 AM | 10 | 66.3 | EB | 5 | 461 | 25 | 48 | 2 | 1 | 65 |
| | | | | | | | WB | 5 | 494 | 11 | 52 | 2 | 2 | 65 |
| Dx | 4112 Rincon Av. | Residential | 5/17/2018 | 12:43 PM | 10 | 56.8 | EB | 5 | 774 | 33 | 56 | 3 | 0 | 65 |
| | | | | | | | WB | 5 | 750 | 19 | 81 | 3 | 1 | 65 |
| Dy | 1946 Waltnia Dr. | Residential | 5/18/2018 | 9:55 AM | 10 | 60.6 | EB | 5 | 471 | 19 | 57 | 2 | 2 | 65 |
| | | | | | | | WB | 5 | 445 | 13 | 66 | 0 | 1 | 65 |

**Table 6-2. Summary of Background Noise Measurements**

| Site | Address | Freeway Direction | Land Uses | Start Time | Date | Duration (minutes) | Measured Leq dBA |
|---|---|---|---|---|---|---|---|
| BG1 | 3002 Evelyn St. | WB | Residential | 11:08 AM | 5/15/2018 | 10 | 52.5 |
| BG2 | 2832 Mayfield Av. | EB | Residential | 1:33 PM | 5/15/2018 | 10 | 53.8 |
| BG3 | 2649 Prospect Av. | WB | Residential | 10:05 AM | 5/17/2018 | 10 | 52.2 |
| BG4 | 2737 Mayfield Av. | EB | Residential | 9:56 AM | 5/16/2018 | 10 | 44.8 |
| BG5 | 2344 Barton Ln. | WB | Residential | 11:03 AM | 5/17/2018 | 10 | 48.2 |
| BG6 | 2503 Fairway Av. | EB | Residential | 10:32 AM | 5/16/2018 | 10 | 48.2 |

**Table 6-3-1 Summary of Long-Term Measurements Along I-210 Freeway Between Pennsylvania Av. and La Crescenta Av.**

| Site | Address | Land Uses | Start Time | Start Date | Duration (Hours) | Noisiest Hour | |
|---|---|---|---|---|---|---|---|
| | | | | | | Noise Level (dBA) | Time |
| Site #A | 2846 Altura Av. | Residential | 9:30 AM | 5/15/2018 | 24 | 70.0 | 6:10 - 7:10 PM |

**Figure 6-1 Long-Term Noise Monitoring Graph at Site #A**

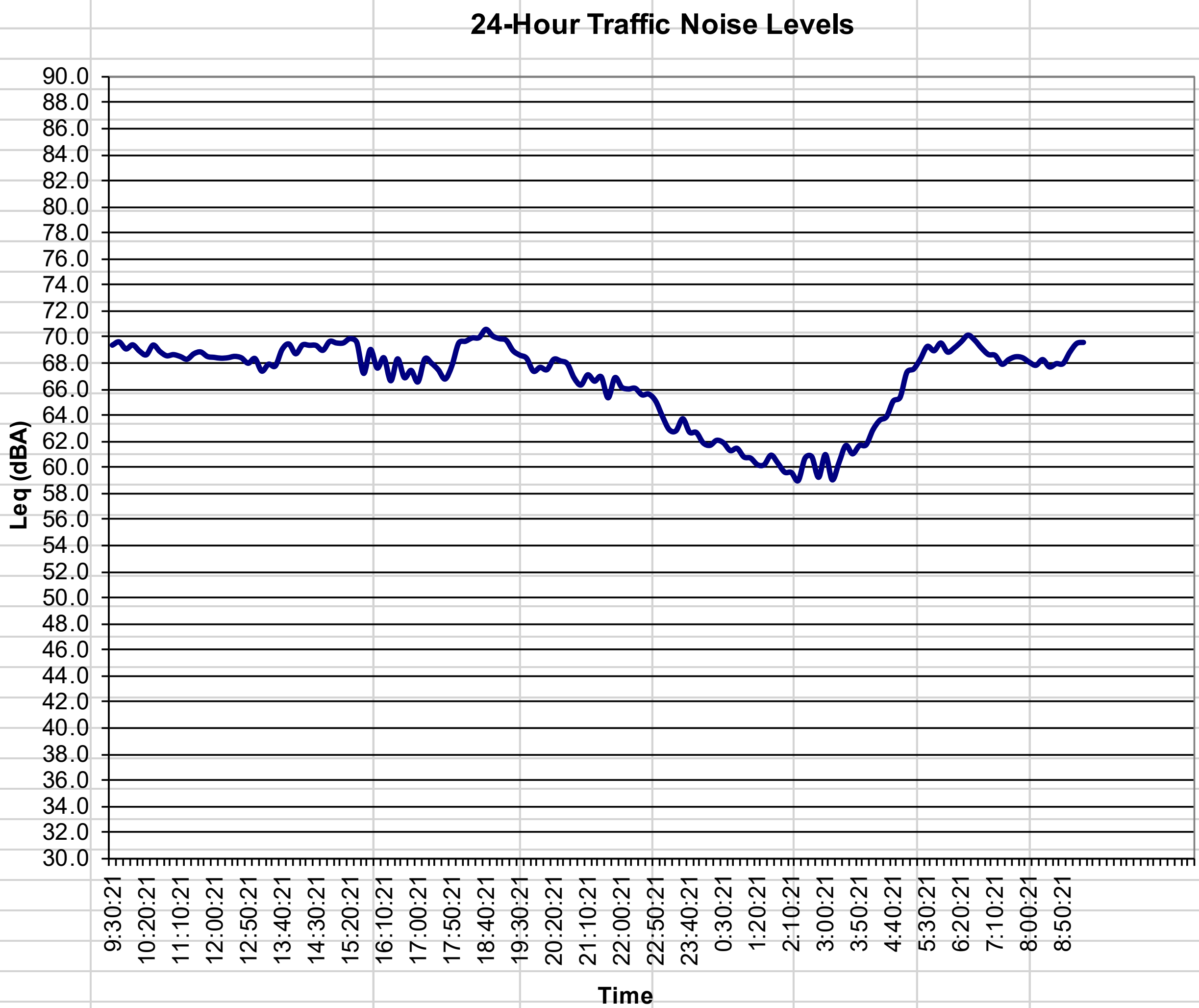


**Table 6-3-2 Summary of Long-Term Measurements Along I-210 Freeway Between La Crescenta Av. and Ocean View Blvd.**

| Site | Address | Land Uses | Start Time | Start Date | Duration (Hours) | Noisiest Hour | |
|---|---|---|---|---|---|---|---|
| | | | | | | Noise Level (dBA) | Time |
| Site #B | 2639 Mayfield Av. | Residential | 8:03 AM | 5/16/2018 | 24 | 67.3 | 5:33 - 6:33 AM |

**Figure 6-2 Long-Term Noise Monitoring Graph at Site #B**

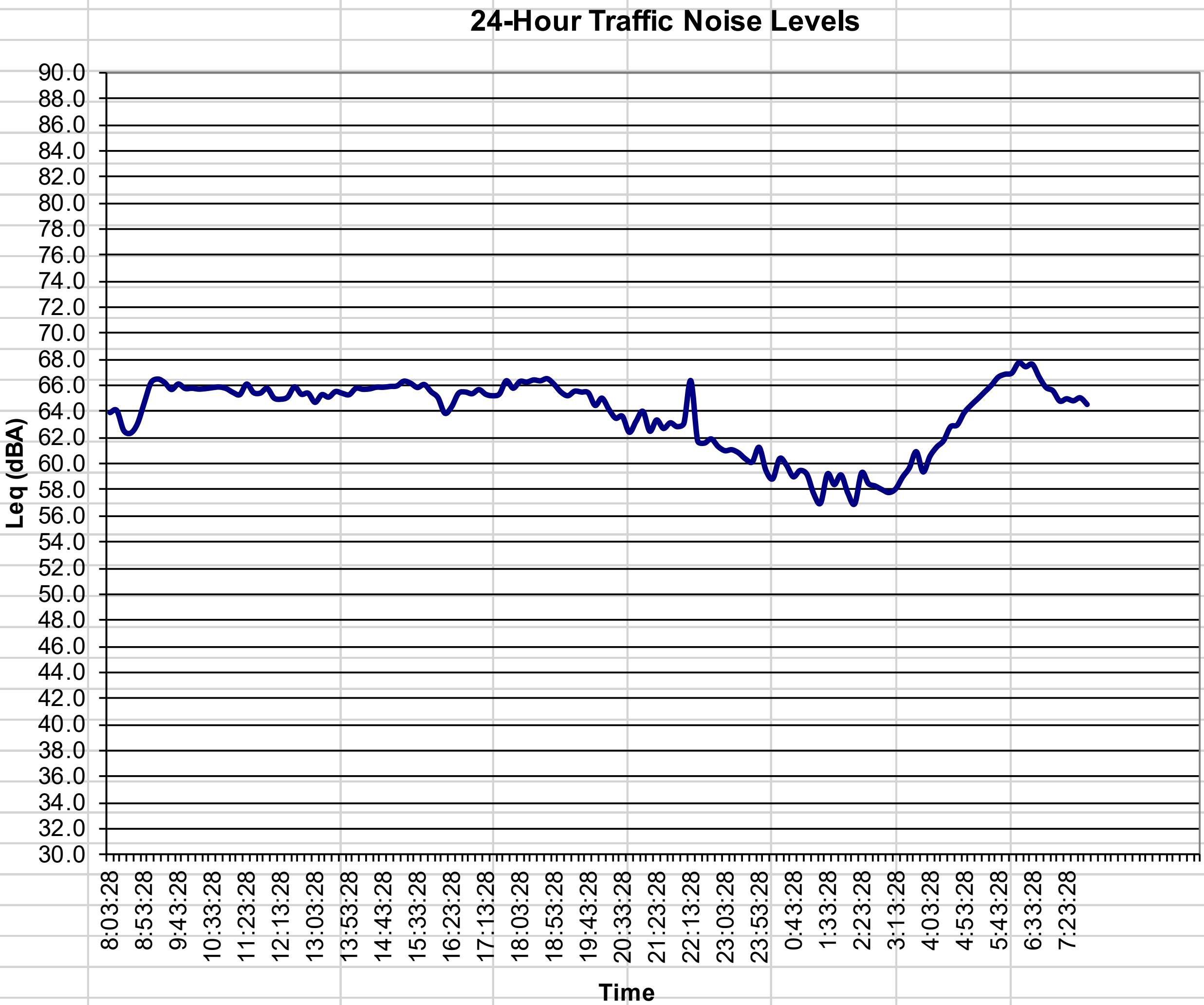


**Table 6-3-3 Summary of Long-Term Measurements Along I-210 Freeway - Westbound Between Ocean View Blvd. and SR-2**

| Site | Address | Land Uses | Start Time | Start Date | Duration (Hours) | Noisiest Hour | |
|---|---|---|---|---|---|---|---|
| | | | | | | Noise Level (dBA) | Time |
| Site #C | 2240 Waltonia Dr. | Residential | 1:35 PM | 5/17/2018 | 24 | 61.2 | 2:25 - 3:25 PM |

**Figure 6-3 Long-Term Noise Monitoring Graph at Site #C**

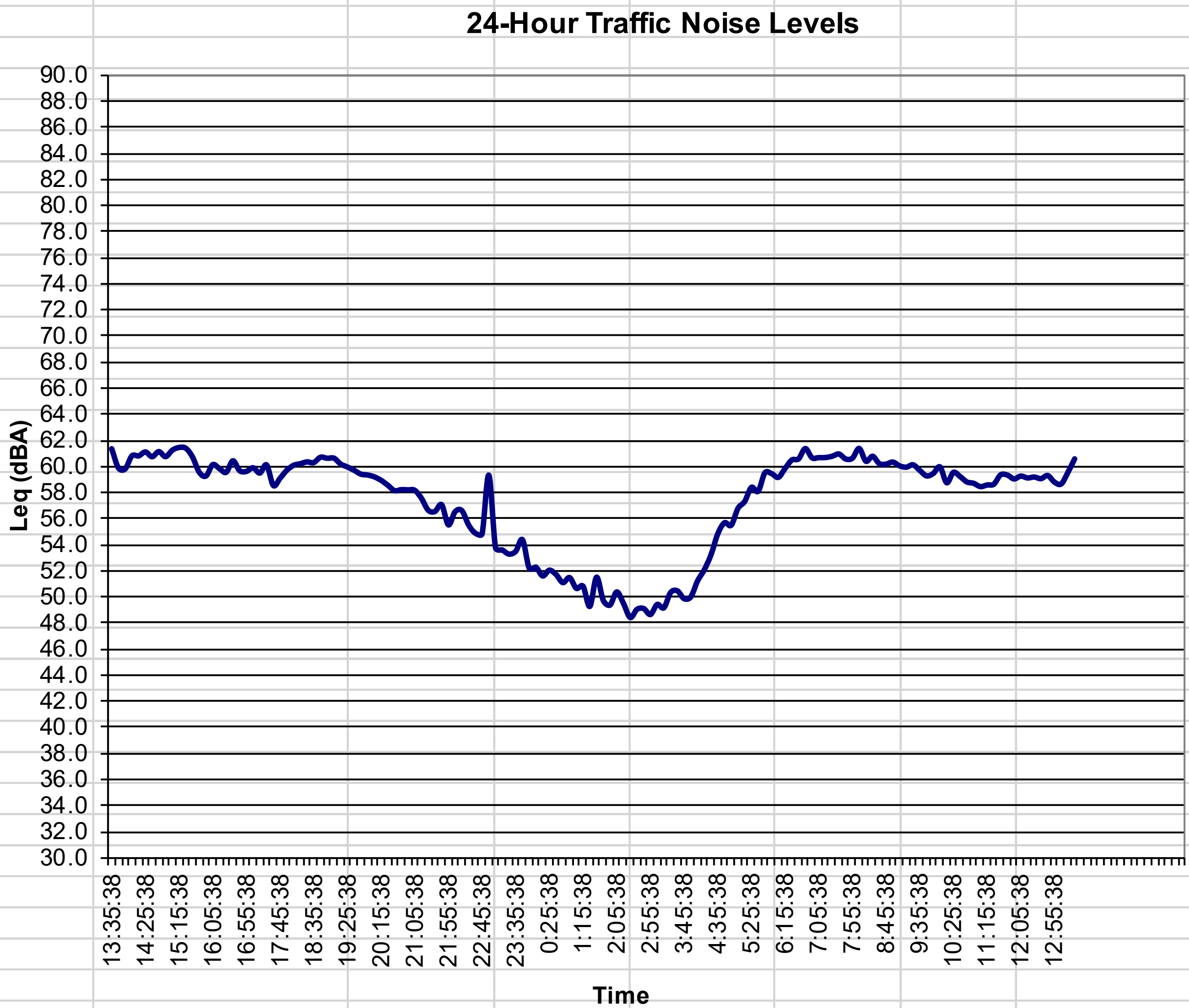
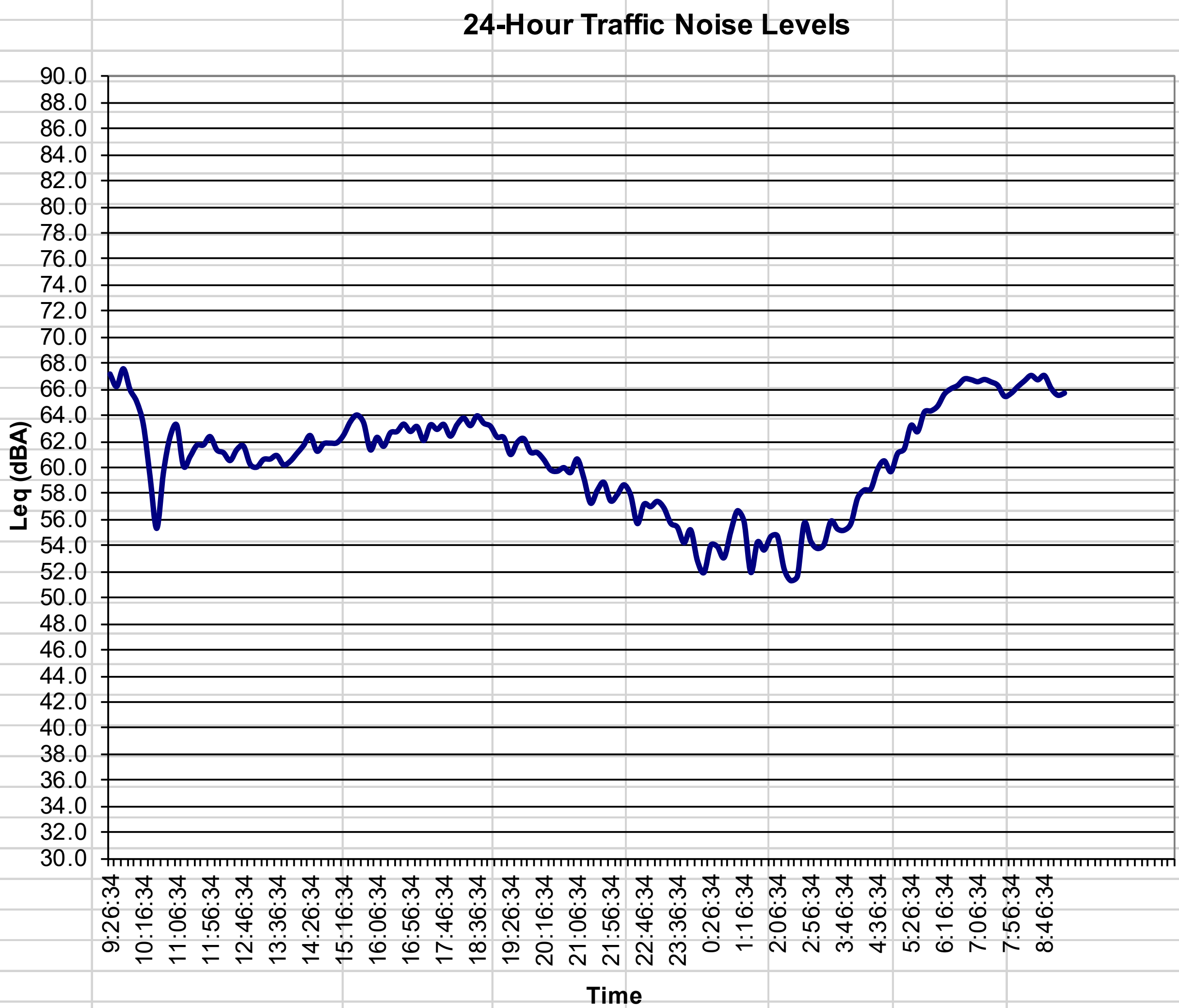


**Table 6-3-4 Summary of Long-Term Measurements Along I-210 Freeway - Eastbound Between Ocean View Blvd. and SR-2**

| Site | Address | Land Uses | Start Time | Start Date | Duration (Hours) | Noisiest Hour | |
|---|---|---|---|---|---|---|---|
| | | | | | | Noise Level (dBA) | Time |
| Site #D | 2207 Del Mar Rd. | Residential | 9:26 AM | 5/17/2018 | 24 | 66.6 | 7:56 - 8:56 AM |

**Figure 6-4 Long-Term Noise Monitoring Graph at Site #D**



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

## 7.1. Future Noise Environment and Impacts

Future noise levels were predicted using traffic characteristics that would yield the worst hourly traffic noise impact on a regular basis. As described in Section 5.3 of this report, the maximum traffic volume with free flow traffic (1950 vphpl) was used as the future traffic for all areas. This is considered the maximum volume with free flow traffic which will yield the most traffic noise. Future heavy and medium truck percentages were calculated from the percentages of truck volumes determined from existing traffic counts. The future noise levels have been predicted to be in the range of 47 to 77 dBA-Leq(h). Table 7-1 provides a summary of the traffic noise modeling results for the study areas.

Tables 7-3 summarize the traffic noise modeling results for existing conditions and design-year conditions. Predicted design-year traffic noise levels with the project are compared to existing conditions.

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

Traffic noise impacts, based on existing worst-hour noise levels, have been identified at Activity Category B land use within the project area, and noise abatement has been considered. The following is a discussion of noise abatement considered for each evaluation area where traffic noise impacts are predicted. For a detailed description of considered abatement (i.e. the location, length, height, and noise reduction of soundwalls) for the impacted receivers, please see Tables 7-2, and Section 7.3. Preliminary soundwall locations are shown in Layouts L-1 through L-3.

It must be noted that there are other modeled site locations (that are not shown on tables or layouts) used in this report for the purpose of determining the number of benefited receptors.

### 7.1.1. Activity Category A

This activity category does not qualify for noise abatement under Metro's Retrofit Soundwall Program.

### 7.1.2. Activity Category B

Most of the noise sensitive land uses are residences (single-family and multi-family) along the I-210 between Pennsylvania Av. and Waltonia Dr. Traffic noise impacts are considered to occur at receiver locations where the existing worst-hour noise levels exceed the NAC of 67 dBA. All impacted residential areas within the project limits have been considered for noise abatement and acoustically feasible soundwalls have been provided in this report. Please see Table 7-1 below for all the residential area within the project limits where noise impacts have been identified.

### 7.1.3. Activity Category C

This activity category does not qualify for noise abatement under Metro's Retrofit Soundwall Program.

### 7.1.4. Activity Category D

There are two schools where interior noise measurements were conducted. Existing worst-hour noise levels inside classroom (#5105) at the Crescenta Valley High School (located along westbound I-210 between Ramsdale Av. and La Crescenta Av.) yielded 28.4 dBA-Leq(h), which is well below the interior criteria of 52 dBA-Leq(h), and therefore, no traffic noise impacts were identified. The other school, St. Monica Academy (located along eastbound I-210 between Briggs Av. and Ocean View Blvd.), yielded an existing worst-hour noise level of 46.5 dBA-Leq(h) inside the trailer classrooms closest to the freeway. Because the noise level is below the threshold of 52 dBA-Leq(h), it was determined that there are no traffic noise impacts identified at this school.

### 7.1.5. Activity Category E

This activity category does not qualify for noise abatement under Metro's Retrofit Soundwall Program.

### 7.1.6. Activity Category F

This activity category does not qualify for noise abatement under Metro's Retrofit Soundwall Program.

| Table 7-1. Traffic Noise Measurements & Modeling Results - Route 210 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Receiver | Direction | Location | Land Use | Noise Abatement Category | Field-Measured Noise Level | Modeled Noise Level | K-Factor | Existing Worst-Hour Noise Level | Impact Type | Future Worst-Hour Noise Level Based on 1950 vplph dBA-Leq(h) | Noise Increase (Future Vs. Existing) |
| A[24] | WB | 2846 Altura Av. | | | 70.0 | 69.8 | 0.2 | 70.0 | E | 70.2 | 0.2 |
| A1 | WB | 3130 Encinal Av. | R | B (67) | 72.3 | 72.3 | 0.0 | 73.7 | E | 76.2 | 2.5 |
| A2 | WB | 3150 Encinal Av. | | | 69.1 | 68.4 | 0.7 | 70.5 | E | 71.4 | 0.9 |
| A3 | WB | Crescenta Valley High School - Interior | S | D (52) | 27.1 | N/A | | 28.4 | N | 29.3 | 0.9 |
| A4 | WB | 2808 Altura Av. | | | 64.2 | 65.7 | -1.5 | 64.6 | N | 67.0 | 2.4 |
| A5 | EB | 3155 Montross Av. | | | 64.8 | 65.3 | -0.5 | 65.5 | N | 65.7 | 0.2 |
| A6 | EB | Northwood Condos | | | 69.5 | 71.3 | -1.8 | 71.2 | E | 72.8 | 1.6 |
| A7 | EB | 2930 Mayfield Av. | | | 65.7 | 67.5 | -1.8 | 67.3 | E | 70.1 | 2.8 |
| A8 | EB | 2832 Mayfield Av. | | | 63.5 | 64.4 | -0.9 | 65.6 | N | 66.2 | 0.6 |
| Aw | WB | 3037 Altura Av. | | | 56.5 | 58.0 | -1.5 | 57.4 | N | 60.8 | 3.4 |
| Ax | WB | 3002 Evelyn St. | | | 52.5 | 54.4 | -1.9 | 54.0 | N | 57.1 | 3.1 |
| Ay | WB | 2823 Altura Av. | | | 57.1 | 56.0 | 1.1 | 57.9 | N | 57.9 | 0.0 |
| Az | EB | 2832 Mayfield Av. | | | 53.8 | 52.6 | 1.2 | 56.0 | N | 56.0 | 0.0 |
| B[24] | EB | 2639 Mayfield Av. | R | B (67) | 67.3 | 66.5 | 0.8 | 67.3 | E | 67.8 | 0.5 |
| B1 | EB | 2737 Mayfield Av. | | | 60.1 | 60.5 | -0.4 | 61.2 | N | 62.6 | 1.4 |
| B2 | EB | 2559 Mayfield Av. | | | 65.6 | 67.0 | -1.4 | 67.1 | E | 71.0 | 3.9 |
| B3 | EB | 2505 Mayfield Av. | | | 64.5 | 66.0 | -1.5 | 66.0 | N | 68.5 | 2.5 |
| B4 | EB | 2333 Del Mar Rd. | | | 60.0 | 62.0 | -2.0 | 61.9 | N | 64.6 | 2.7 |
| B5 | WB | 2733 Altura Av. | | | 64.7 | 64.6 | 0.1 | 66.3 | N | 67.8 | 1.5 |
| B6 | WB | 2609 Altura Av. | | | 64.7 | 66.0 | -1.3 | 69.4 | E | 69.4 | 0.0 |
| B7 | WB | 2497 Altura Av. | | | 63.2 | 63.6 | -0.4 | 65.7 | N | 65.8 | 0.1 |
| B8 | WB | 4242 Briggs Av. | | | 72.6 | 74.4 | -1.8 | 76.1 | E | 77.3 | 1.2 |
| B9 | WB | 4315 Ocean View Blvd. | | | 63.5 | 64.2 | -0.7 | 65.3 | N | 66.0 | 0.7 |
| B10 | EB | St. Monica Academy - Interior Classroom | S | D (52) | 44.6 | N/A | | 46.5 | N | 49.2 | 2.7 |
| Bv | WB | 2649 Prospect Av. | | | 52.2 | 53.2 | -1.0 | 53.1 | N | 55.8 | 2.7 |
| Bw | WB | 2518 Evelyn St. | | | 51.9 | 52.9 | -1.0 | 54.0 | N | 55.7 | 1.7 |
| Bx | WB | 2344 Bartan Ln. | | | 48.2 | 47.0 | 1.2 | 50.6 | N | 50.8 | 0.2 |
| By | EB | 2643 Fairway Av. | | | 44.8 | 46.1 | -1.3 | 46.3 | N | 47.1 | 0.8 |
| Bz | EB | 2503 Fairway Av. | | | 48.2 | 51.7 | -3.5 | 49.6 | N | 52.8 | 3.2 |
| C[24] | WB | 2846 Altura Av. | | | 61.2 | 61.3 | -0.1 | 61.2 | N | 61.9 | 0.7 |
| C1 | WB | 2126 Waltonia Dr. | | | 69.8 | 70.3 | -0.5 | 71.8 | E | 73.0 | 1.2 |
| C2 | WB | 2101 Crescent Av. | R | B (67) | 67.1 | 66.4 | 0.7 | 69.0 | E | 70.7 | 1.7 |
| Cx | WB | 2283 Waltonia Dr. #107 | | | 68.2 | 68.3 | -0.1 | 70.0 | E | 73.0 | 3.0 |
| Cy | WB | 2215 Waltonia Dr. | | | 57.9 | 60.7 | -2.8 | 60.4 | N | 61.2 | 0.8 |
| D[24] | EB | 2207 Del Mar Rd. | | | 66.6 | 67.8 | -1.2 | 66.6 | E | 70.1 | 3.5 |
| D1 | EB | 2270 Del Mar Rd. | | | 66.6 | 66.4 | 0.2 | 67.8 | E | 69.7 | 1.9 |
| D2 | EB | 1982 Waltonia Dr. | | | 66.3 | 66.3 | 0.0 | 66.7 | E | 70.0 | 3.3 |
| Dx | EB | 4112 Rincon Av. | | | 56.8 | 58.0 | -1.2 | 61.8 | N | 63.6 | 1.8 |
| Dy | EB | 1964 Waltonia Dr. | | | 60.6 | 62.5 | -1.9 | 60.6 | N | 62.5 | 1.9 |

Note: All noise levels are expressed in dBA-Leq(h)

__[24] 24-Hour noise measurement site

Impact Type: N=No Impact; E=Exceed

Land uses: R = Residential; S = School

N/A = Not Applicable

## 7.2. Preliminary Noise Abatement Analysis

In accordance with 23CFR772, noise abatement is considered where noise impacts are predicted in areas of frequent human use that would benefit from a lowered noise level. Potential noise abatement measures identified in the Protocol include the following:

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

All of these abatement options have been considered. However, because of the configuration and location of the project, abatement in the form of noise barriers is the only abatement that is considered to be feasible, reasonable, and practical. There are no impacts identified for public-use or nonprofit institutional structures that qualify to be considered for acoustical insulation.

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 based on the figure of $107,000 per benefited residence. For any noise barrier to be considered reasonable from a cost perspective the estimated cost of the noise barrier should be equal to or less than the total cost allowance calculated for the barrier. The cost calculations of the noise barrier should include all items appropriate and necessary for construction of the barrier, such as traffic control, drainage modification, and retaining walls.

Construction cost estimates are not provided in this Noise Study Report, but are presented in the Noise Abatement Decision Report (NADR). The NADR is a design responsibility and is prepared to compile information from the NSR, other relevant environmental studies, and design considerations into a single, comprehensive document before public review of the project. The project engineer prepares the NADR after completion of the NSR and prior to publication of the draft environmental document. Noise abatement measures that are determined feasible and reasonable and likely to be incorporated into the project must be identified before adoption of the CE, FONSI, or ROD.

The purpose and goal of a NADR is to document noise abatement measures to be implemented as part of the proposed project, based upon an "overall reasonableness" analysis approach. The overall reasonableness is determined by these factors: noise reduction design goal, the cost of abatement, and viewpoints of benefited receptors (including property owners and residents of the benefited receptors). In order for a sound barrier to be considered reasonable, the 7 dBA design goal must be achieved at one or more benefited receptors. However, according to the 23CFR772, if the project has no federal funding, then, the 7 dB design goal may not apply.

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, range of heights of noise barriers, and cost allowance is provided in this report. If pertinent parameters change substantially during the final project design, preliminary noise barrier designs may be modified or eliminated from the final project. A final decision on the construction of the noise abatement will be made upon completion of the project design.

For acoustically feasible noise abatement measures outside the state right of way (i.e. on the private property line), all owners of property where barriers would be placed must support the proposed abatement measure, location, and material to be used for construction. A permanent easement for the affected property needs to be secured to construct and maintain the soundwall outside the state right of way. Additionally, each property owner must enter into a contract with the project sponsor the agreements as listed in the Protocol.

If any noise barrier blocks the view of commercial property in order to provide sufficient noise reduction to the adjacent impacted residents, then, an agreement must be reached with the affected residents and the commercial property owners as to the length, the limits, and the height of that wall(s).

In accordance with state and federal policies, noise barriers are not required to reduce noise levels to below the 67 dBA threshold (or other NAC). A noise barrier, however, must be acoustically feasible (provide at least 5 dBA noise reduction at impacted receivers) and reasonable (7 dBA noise reduction to at least one receiver). Please note that a 5 dBA noise reduction is considered to be readily perceptible while a 3 dBA change is considered barely noticeable. A difference in 10 dBA is considered doubling or halving of noise.

The following section discusses the acoustically feasible sound barriers for this project. In all, there are 15 noise barriers that are considered acoustically feasible and one that is not considered acoustically feasible.

## 7.3. Description of Acoustically Feasible Sound Barriers

**Eastbound I-210:**

Soundwalls SW-200 + SW-202: This is a combination of sound barriers located between Pennsylvania Av. and Ramsdell Av. SW-200 has been proposed along the freeway edge of shoulder while SW-202 would be located along the state right of way, replacing the existing 6-7 ft. high property wall for the Northwood Village Condos. Both of these walls with varying heights of 10 – 16 feet would combine to reduce noise levels in the range of 6 – 10 dBA, providing acoustic benefit to 17 – 27 residential units.

Soundwall SW-204 would be located along the state right of way to benefit the residential area located between Ramsdell Av. and La Crescenta Av. Acoustically feasible height range for SW-204 is from 8 to 16 feet. This wall would provide noise reduction in the range of 7 - 12 dBA, providing benefit to 12 – 20 residences. It must be noted that a portion (about 300 ft.) of this wall would have to be constructed on top of the existing retaining wall. The cost to remove and replace the existing retaining wall, if necessary to construct the proposed noise barrier, would be part of the construction cost used to determine cost-reasonableness of this barrier.

Soundwall SW-206 would be located along the state right of way to benefit the residential area located between La Crescenta Av. and Rosemont Av. Acoustically feasible height range for SW-204 is from 8 to 16 feet. This wall would provide noise reduction in the range of 6 - 7 dBA, providing benefit to 10 – 22 residences.

Soundwalls SW-208A + SW-208B: These sound barriers would be located between Rosemont Av. and Briggs Av. They would be located along the state right of way and separated by a narrow concrete water channel maintained by Los Angeles County. Both of these walls with varying heights of 8 – 16 feet would combine to reduce noise levels in the range of 9 – 12 dBA, providing acoustic benefit to 19 – 24 residential units.

Soundwalls SW-210 + SW-212: This is a combination of sound barriers located between Ocean View Blvd. and Waltonia Dr. SW-210 has been proposed along the state right of way while SW-212 would be located along the freeway edge of shoulder of the connector from EB-210 to SB-2. Both of these walls with varying heights of 12 – 16 feet would combine to reduce noise levels in the range of 5 – 7 dBA, providing acoustic benefit to 26 – 46 residential units.

**Westbound I-210:**

Soundwalls SW-201 + SW-203: This is a combination of sound barriers located between Pennsylvania Av. and Ramsdell Av. SW-201 has been proposed along the freeway edge of shoulder while SW-202 would be located along the state right of way. Please note that a small part (about 100 ft.) of SW-203 would have to be constructed on top of an existing retaining wall. The cost to remove and replace the existing retaining wall, if necessary to construct the proposed noise barrier, would be part of the construction cost used to determine cost-reasonableness of this barrier. Both of these walls with varying heights of 8 – 16 feet would combine to reduce noise levels in the range of 5 – 11 dBA, providing acoustic benefit to 8 – 20 homes.

Soundwall SW-205 would be located along the state right of way to benefit the residential area located between La Crescenta Valley High School and La Crescenta Av. Acoustically feasible height range for SW-205 is from 8 to 16 feet. This wall would provide noise reduction in the range of 6 - 9 dBA, providing benefit to 7 – 12 residences.

Soundwall SW-207 would be located along the state right of way/along local street, Altura Av., to benefit the residential area located between La Crescenta Av. and Rosemont Av. Acoustically feasible height range for SW-207 is from 8 to 16 feet. This wall would provide noise reduction in the range of 6 – 8 dBA, providing benefit to 22 homes. It must be noted that the majority (about 1000 ft.) of this wall would have to be constructed on top of the existing retaining wall. The cost to remove and replace the existing retaining wall, if necessary to construct the proposed noise barrier, would be part of the construction cost used to determine cost-reasonableness of this barrier.

Soundwall SW-209 would be located along the state right of way/along local street, Altura Av., to benefit the residential area located between Rosemont Av. and Briggs Av. Acoustically feasible height range for SW-209 is from 10 to 16 feet. This wall would provide noise reduction in the range of 5 – 7 dBA, providing benefit to 12 – 24 homes. It must be noted that most (about 1300 ft.) of this wall would have to be constructed on top of the existing retaining wall. The cost to remove and replace the existing retaining wall, if necessary to construct the proposed noise barrier, would be part of the construction cost used to determine cost-reasonableness of this barrier.

Soundwall SW-211 would be located along the state right of way near the apartments on Waltonia Dr., and then transition onto the edge of shoulder of the off-ramp @ Ocean View Blvd. to benefit the residential area located along Waltonia Dr. Acoustically feasible height range for SW-211 is from 10 to 16 feet. This wall would provide noise reduction in the range of 5 – 8 dBA, providing benefit to 8 residences.

Soundwall SW-213 would be located along the freeway edge of shoulder of the connector from the NB SR-2 to WB I-210. SW-213 would replace the existing 8-10 ft. high sound barrier that is underneath the structure (off-ramp to Ocean View Blvd.). Acoustically feasible height range for SW-213 is from 12 to 16 feet. This wall would provide noise reduction in the range of 5 – 6 dBA, providing benefit to 10 – 25 homes.

Please see the following charts 7-3-1 and 7-3-2 for a summary of reasonable allowance for all acoustically feasible sound barriers.

**Table 7-3-1 Summary of Reasonable Allowance For Soundwalls On I-210**

| Soundwall No. | Existing Worst-Hour Noise Level dBA Leq(h) | Noise Increase (dBA) | Height (Feet) | Approximate Length (Feet) | Noise Attenuation (dBA) | Number of Benefited Receivers | Reasonable Allowance Per Benefited Receiver | Total Reasonable Allowance Per Barrier |
|---|---|---|---|---|---|---|---|---|
| SW-200 + SW-202 | 73 | 2 | 8 | 855 + 1066 | 3 | 0 | $107,000 | $0 |
| | | | 10 | | 6 | 17 | $107,000 | $1,819,000 |
| | | | 12 | | 7 | 17 | $107,000 | $1,819,000 |
| | | | 14 | | 8 | 27 | $107,000 | $2,889,000 |
| | | | 16 | | 10 | 27 | $107,000 | $2,889,000 |
| SW-202 | 73 | 2 | 8 | 1066 | 3 | 0 | $107,000 | $0 |
| | | | 10 | | 5 | 17 | $107,000 | $1,819,000 |
| | | | 12 | | 7 | 17 | $107,000 | $1,819,000 |
| | | | 14 | | 7 | 17 | $107,000 | $1,819,000 |
| | | | 16 | | 9 | 17 | $107,000 | $1,819,000 |
| SW-201 + SW-203 | 76 | 2 | 8 | 1202 + 821 | 5 | 8 | $107,000 | $856,000 |
| | | | 10 | | 6 | 20 | $107,000 | $2,140,000 |
| | | | 12 | | 9 | 20 | $107,000 | $2,140,000 |
| | | | 14 | | 10 | 20 | $107,000 | $2,140,000 |
| | | | 16 | | 11 | 20 | $107,000 | $2,140,000 |
| SW-203 | 76 | 2 | 8 | 821 | 2 | 0 | $107,000 | $0 |
| | | | 10 | | 3 | 0 | $107,000 | $0 |
| | | | 12 | | 6 | 11 | $107,000 | $1,177,000 |
| | | | 14 | | 8 | 15 | $107,000 | $1,605,000 |
| | | | 16 | | 10 | 15 | $107,000 | $1,605,000 |
| SW-204 | 70 | 3 | 8 | 1258 | 7 | 12 | $107,000 | $1,284,000 |
| | | | 10 | | 8 | 20 | $107,000 | $2,140,000 |
| | | | 12 | | 10 | 20 | $107,000 | $2,140,000 |
| | | | 14 | | 11 | 20 | $107,000 | $2,140,000 |
| | | | 16 | | 12 | 20 | $107,000 | $2,140,000 |
| SW-205 | 73 | 3 | 8 | 802 | 6 | 7 | $107,000 | $749,000 |
| | | | 10 | | 7 | 7 | $107,000 | $749,000 |
| | | | 12 | | 8 | 12 | $107,000 | $1,284,000 |
| | | | 14 | | 8 | 12 | $107,000 | $1,284,000 |
| | | | 16 | | 9 | 12 | $107,000 | $1,284,000 |
| SW-206 | 70 | 1 | 8 | 1652 | 6 | 10 | $107,000 | $1,070,000 |
| | | | 10 | | 6 | 10 | $107,000 | $1,070,000 |
| | | | 12 | | 7 | 22 | $107,000 | $2,354,000 |
| | | | 14 | | 7 | 22 | $107,000 | $2,354,000 |
| | | | 16 | | 7 | 22 | $107,000 | $2,354,000 |

Feasibility Requirement: Soundwall must provide at least 5 dB noise reduction at impacted receiver
Reasonableness Requirement: Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors

**Table 7-3-2 Summary of Reasonable Allowance For Soundwalls On I-210**

| Soundwall No. | Existing Worst-Hour Noise Level dBA Leq(h) | Noise Increase (dBA) | Height (Feet) | Approximate Length (Feet) | Noise Attenuation (dBA) | Number of Benefited Receivers | Reasonable Allowance Per Benefited Receiver | Total Reasonable Allowance Per Barrier |
|---|---|---|---|---|---|---|---|---|
| SW-207 | 72 | 2 | 8 | 1686 | 6 | 22 | $107,000 | $2,354,000 |
| | | | 10 | | 6 | 22 | $107,000 | $2,354,000 |
| | | | 12 | | 7 | 22 | $107,000 | $2,354,000 |
| | | | 14 | | 8 | 22 | $107,000 | $2,354,000 |
| | | | 16 | | 8 | 22 | $107,000 | $2,354,000 |
| SW-208A + SW-208B | 71 | 4 | 8 | 221 + 1262 | 9 | 19 | $107,000 | $2,033,000 |
| | | | 10 | | 10 | 19 | $107,000 | $2,033,000 |
| | | | 12 | | 11 | 24 | $107,000 | $2,568,000 |
| | | | 14 | | 11 | 24 | $107,000 | $2,568,000 |
| | | | 16 | | 12 | 24 | $107,000 | $2,568,000 |
| SW-209 | 69 | 2 | 8 | 1490 | 4 | 0 | $107,000 | $0 |
| | | | 10 | | 5 | 12 | $107,000 | $1,284,000 |
| | | | 12 | | 5 | 12 | $107,000 | $1,284,000 |
| | | | 14 | | 6 | 19 | $107,000 | $2,033,000 |
| | | | 16 | | 7 | 24 | $107,000 | $2,568,000 |
| SW-209A* | 77 | 1 | 8 | N/A | 0 | 0 | $107,000 | $0 |
| | | | 10 | | 0 | 0 | $107,000 | $0 |
| | | | 12 | | 1 | 0 | $107,000 | $0 |
| | | | 14 | | 1 | 0 | $107,000 | $0 |
| | | | 16 | | 3 | 0 | $107,000 | $0 |
| SW-210 + SW-212 | 70 | 3 | 8 | 624 + 1479 | 4 | 0 | $107,000 | $0 |
| | | | 10 | | 4 | 0 | $107,000 | $0 |
| | | | 12 | | 5 | 26 | $107,000 | $2,782,000 |
| | | | 14 | | 6 | 46 | $107,000 | $4,922,000 |
| | | | 16 | | 7 | 46 | $107,000 | $4,922,000 |
| SW-211 | 73 | 3 | 8 | 974 | 2 | 0 | $107,000 | $0 |
| | | | 10 | | 5 | 8 | $107,000 | $856,000 |
| | | | 12 | | 6 | 8 | $107,000 | $856,000 |
| | | | 14 | | 7 | 8 | $107,000 | $856,000 |
| | | | 16 | | 8 | 8 | $107,000 | $856,000 |
| SW-213 | 73 | 2 | 8 | 1047 | 3 | 0 | $107,000 | $0 |
| | | | 10 | | 4 | 0 | $107,000 | $0 |
| | | | 12 | | 5 | 10 | $107,000 | $1,070,000 |
| | | | 14 | | 6 | 25 | $107,000 | $2,675,000 |
| | | | 16 | | 6 | 25 | $107,000 | $2,675,000 |

* SW-209A was analyzed along the state right of way for Receptor B8, however, it was determined to be not acoustically feasible.

Feasibility Requirement: Soundwall must provide at least 5 dB noise reduction at impacted receiver

Reasonableness Requirement: Soundwall must provide at least 7 dB noise reduction at one or more benefited receptors

## 7.4. Description of Acoustically NOT Feasible Sound Barriers

This discussion pertains to sound barrier that has been analyzed as acoustically not feasible – i.e. it doesn't provide the minimum required 5 dBA noise reduction. In general, there are several reasons for a barrier to be not acoustically feasible: the vicinity of receivers from the freeway, any existing natural or man-made shielding, topography, predominant local traffic noise, etc.

Soundwall SW-209A was analyzed along the state right of way along WB-210 just east of Briggs Avenue for the three homes that are located well above the freeway elevation. A noise site represented by Site #B8 was used to identify freeway traffic noise impacts to these homes. However, because these homes are situated well above the freeway elevation and that the state right of way fence runs below the elevation of the homes, a noise barrier at this site provided very little noise reduction. Based on the TNM modeling, a 16 ft. high sound wall provided only 3 dB noise reduction, which is considered acoustically not feasible.

# **Chapter 8.** Construction Noise

23 CFR 772 requires that construction noise impacts be identified but does not specify specific methods or abatement criteria for evaluating construction noise. However, the FHWA Roadway Construction Noise Model (Federal Highway Administration 2006) can be used to determine if construction would result in adverse construction noise impacts on land uses or activities in the project area.

During the construction phases of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Construction noise is regulated by Caltrans standard specifications, Section 14-8.02, Sound Control Requirements. These requirements state that noise levels generated during construction shall comply with applicable local, state, and federal regulations.

Figure 8-1 summarizes typical noise levels produced by construction equipment commonly used on roadway construction projects. As indicated, equipment involved in construction is expected to generate noise levels ranging from 70 to 90 dBA at a distance of 50 feet. Noise produced by construction equipment would be reduced over distance at a rate of about 6 dBA per doubling of distance. Normally, construction noise levels should not exceed 86 dBA (Lmax) at a distance of 50 feet. No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans standard specifications and would be short-term, intermittent, and dominated by local traffic noise. Implementing the following measures would minimize temporary construction noise impacts:

1. Equipment Noise Control should be applied to revising old equipment and designing new equipment to meet specified noise levels.
2. In-Use Noise Control where existing equipment is not permitted to produce noise levels in excess of specified limits.
3. Site Restrictions is an attempt to achieve noise reduction through modifying the time, place, or method of operation of a particular source.
4. Personal Training of operators and supervisors is needed to become more aware of the construction site noise problems.

1. Equipment noise control is needed to reduce the noise emissions from construction sites by mandating a specified noise levels for design of new equipment, and updating old equipment with new noise control devices and techniques presented below:
   - Mufflers are very effective devices which reduce the noise emanating from the intake or exhaust of an engine, compressor, or pump. The fitting of effective

- mufflers on all new equipment and retrofitting of mufflers on existing equipment is necessary to yield an immediate noise reduction at all types of road construction sites.
- Sealed and lubricated tracks for crawler mounted equipment will lessen the sound radiated from the track assembly resulting from metal to soil and metal to metal contact. Contractors, site engineers, and inspectors should ensure that the tracks are kept in excellent condition by periodic maintenance and lubrication.
- Lowering exhaust pipe exit height closer to the ground can result in an off-site noise reduction. Barriers are more effective in attenuating noise when the noise source is closer to ground level.
- General noise control technology can have substantially quieter construction equipment when manufacturers apply state-of-the-art technology to new equipment or repair old equipment to maintain original equipment noise levels.

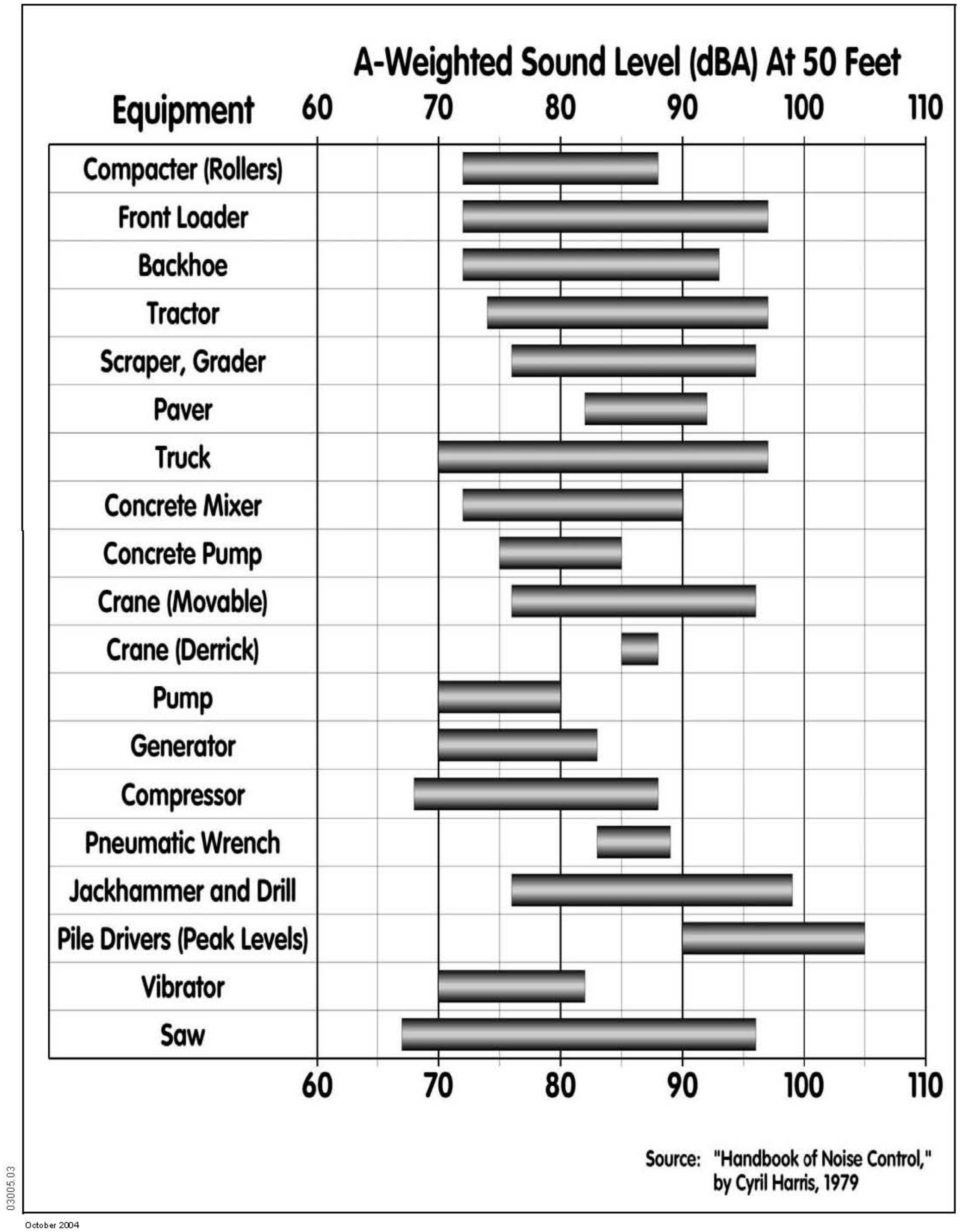
2. In–use site noise control is necessary to prevent existing equipment from producing noise levels in excess of specified limits. Any equipment that produces noise levels less than the specified limits would not be affected. However, those exceeding the limit would be required to meet compliance by repair, retrofit, or replacement. New equipment with the latest noise sensitive components and noise control devices are generally quieter than older equipment, if properly maintained and inspected regularly. They should be repaired or replaced if necessary to maintain the in-use noise limit. All equipment applying the in-use noise limit would achieve an immediate noise reduction if properly enforced.

3. Site restrictions should be applied to achieve noise reduction through different methods, resulting in an immediate reduction of noise emitted to the community without requiring any modification to the source noise emissions. The methods include shielding with barriers for equipment and site, truck rerouting and traffic control, time scheduling, and equipment relocation. The effectiveness of each method depends on the type of construction involved and the site characteristics.
   - Shielding with barriers should be implemented at an early stage of a project to reduce construction equipment noise. The placement of barriers must be carefully considered to reduce limitation of site access. Barriers may be natural or man-made, such as excess land fill used as a temporary berm strategically placed to act as a barrier.
   - Efficient rerouting of trucks and control of traffic activity on construction site will reduce noise due to vehicle idling, gear shifting and accelerating under load. Planning proper traffic control will result in efficient workflow and reduce noise levels. In addition, rerouting trucks does not reduce noise levels but transfers noise to other areas that are less sensitive to noise.

- Time scheduling of activities should be implemented to minimize noise impact on exposed areas. Local activity patterns and surrounding land uses must be considered in establishing site curfews. However, limiting working hours can decrease productivity. Sequencing the use of equipment with relatively low noise levels versus equipment with relatively high noise levels during noise sensitive periods is an effective noise control measure.
- Equipment location should be as far from noise sensitive land use areas as possible. The contractor should substitute quieter equipment or use quieter construction processes at or near noise sensitive areas.

4. Educating contractors and their employees to be sensitive to noise impact problems and noise control methods. This may be one of the most cost-effective ways to help operators and supervisors become more aware of the construction site noise problem and to implement the various methods of improving the conditions. A training program for equipment operators is recommended to instruct them in methods of operating their equipment to minimize environmental noise. Many training programs are presently given on the subject of job safety. This can be extended to include the impact due to noise and methods of abatement.

**Figure 8-1. Construction Equipment Noise Levels**



# Chapter 9. References

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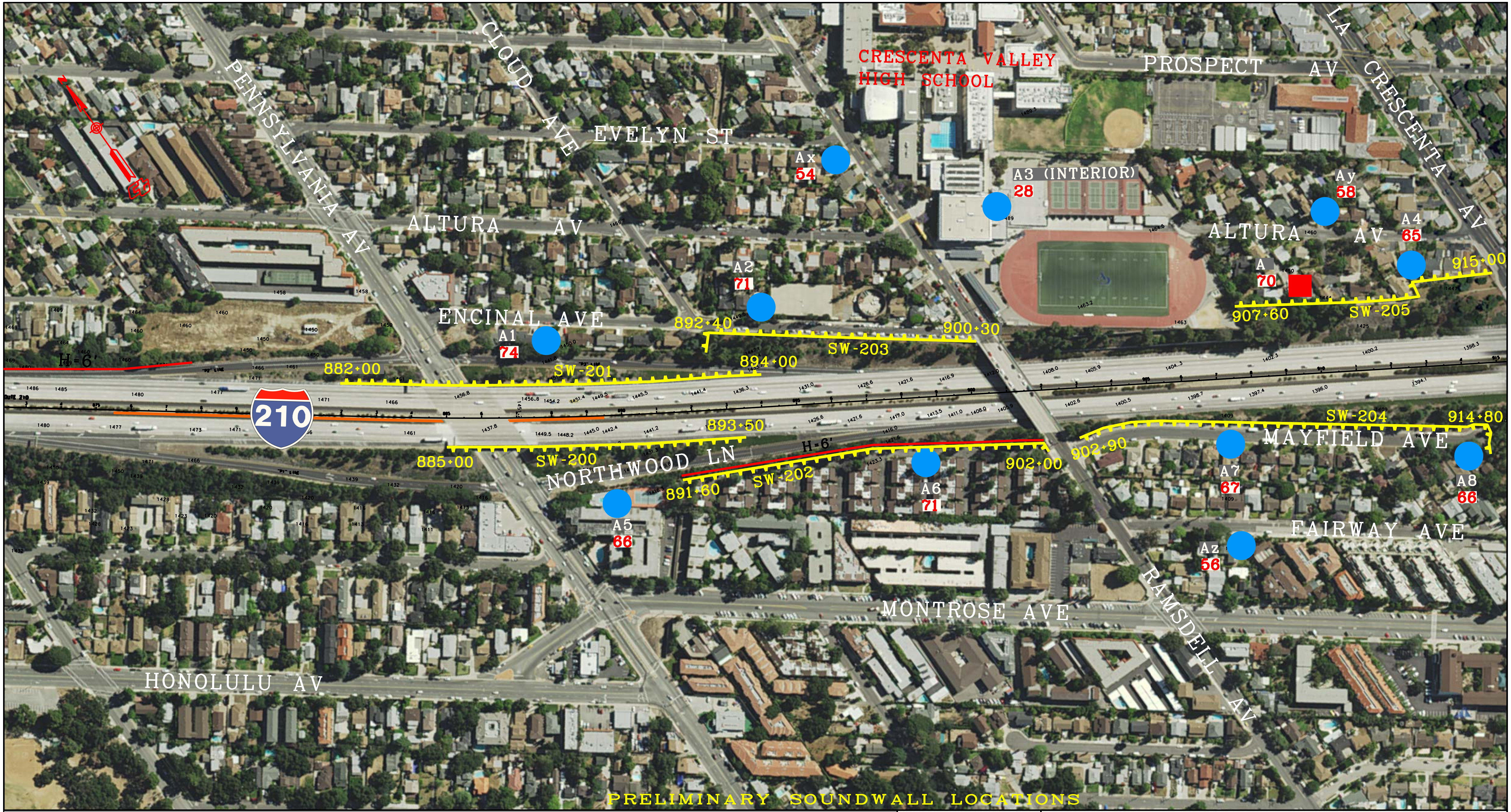



## LEGEND

- 10-MINUTE NOISE SITE
- 24-HOUR NOISE SITE
- Leq EXISTING WORST-HOUR NOISE LEVEL (dBA)
- EXISTING SOUNDWALL
- ACOUSTICALLY FEASIBLE SW LOCATION

Caltrans

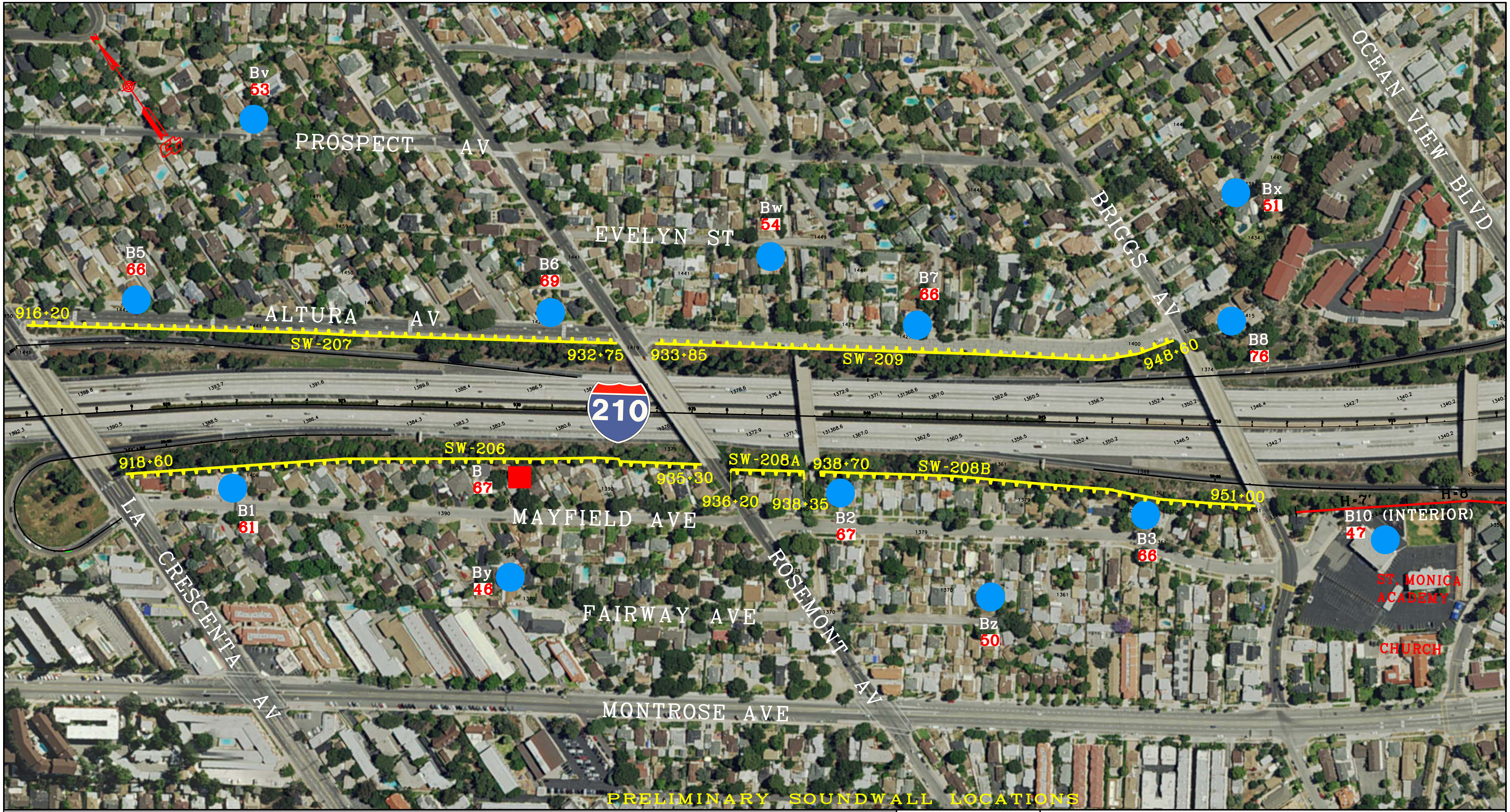
NOT TO SCALE
ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN

PROJECT EA-0716000192
LA-210-PM 16.8R/18.8R
In the county of Los Angeles,
La Crescenta Soundwall Project

OCTOBER, 2018

**LAYOUT**

**L-1**




## LEGEND

- 10-MINUTE NOISE SITE
- 24-HOUR NOISE SITE
- Leq EXISTING WORST-HOUR NOISE LEVEL (dBA)
- EXISTING SOUNDWALL
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NOT TO SCALE
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LA-210-PM 16.8R/18.8R
In the county of Los Angeles,
La Crescenta Soundwall Project

OCTOBER, 2018

**LAYOUT**

**L-2**


LEGEND

- 10-MINUTE NOISE SITE
- 24-HOUR NOISE SITE
- Leq EXISTING WORST-HOUR NOISE LEVEL (dBA)
- EXISTING SOUNDWALL
- ACOUSTICALLY FEASIBLE SW LOCATION

Caltrans

NOT TO SCALE
ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN

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**LAYOUT**

**L-3**