Magnolia Avenue Bridge Widening From El Camino Avenue to 1,000 Feet east of All-American Way Project

Noise Study Report

Federal Aid Project No. STPL-5104(046)
City of Corona
Riverside County, California
District 08

November 2020

Magnolia Avenue Widening

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November 2020

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Executive Summary

Project Description

The project being considered by Caltrans include improvements on Magnolia Avenue between El Camino Avenue to 1,000 feet east of All American Way, or to approximately the intersection of the eastbound lane to Leeson Lane, approximately 150 feet past Trademark Circle.

The City of Corona is proposing to widen the Magnolia Avenue Bridge over Temescal Wash Channel and Magnolia Avenue from El Camino Avenue to 1,000 feet east of the All American Way generally to increase the number of travel lanes from 2 to 3 and place sidewalk and curb and gutter in missing areas. Improvements will include restriping for three 12-foot-wide lanes in each direction, a 12-foot-wide median, 5-foot-wide shoulders, and 6-foot-wide sidewalks/curb and gutter in locations that currently lack sidewalk/curb and gutter. The total roadway width would be increased to approximately 100 feet, curb to curb, throughout the alignment, and right-of-way will vary but will generally be approximately 112 feet wide throughout the alignment.

Purpose of Report

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

The proposed project is considered a Type 1 project because the proposed project includes widening Magnolia Avenue from two (Existing) to three lanes (Future Build) per city master plan. A noise analysis was conducted in accordance with FHWA and Caltrans guidelines to determine whether the proposed project noise levels would approach or exceed the Noise Abatement Criteria (NAC) or would substantially exceed existing noise levels (23 CFR 772).

Existing Environment

Land uses within the project area were categorized by land use type, FHWA activity category (as defined in Table 4-1), and the anticipated frequency of human use. Accordingly, this noise impact analysis focuses on locations with defined outdoor activity areas of frequent human use. The Project study area includes commercial use categories that were modeled as Activity Categories E for reporting purposes only. Based on Caltrans TeNS (2013) guidance, "Receptors that are located beyond 500 feet from the project area do not need to be considered for analysis unless there is a reasonable expectation that noise impacts would extend beyond that boundary." Therefore, this noise study includes receptors within and close to the 500-foot buffer distance from the project area and excludes those located at greater distances.

To assess the existing ambient noise conditions, one (1) long-term noise level measurement, and six (6) short-term ambient noise level measurements were collected during free flow traffic conditions. The noise level measurement locations were selected to describe and document the existing noise environment within the project area. All of the short-term noise level measurements were used to calibrate the noise prediction model with concurrent traffic counts and observed vehicle speeds.

Future Traffic Noise Conditions

A total of 10 representative receptor locations were modeled and evaluated for potential noise impacts resulting from traffic noise under Existing, Opening Year (2026), and Future Build (2040) conditions based on traffic volumes obtained from the *Magnolia Avenue Bridge Widening from El Camino Avenue to 1,000 Feet East of All American Way Project* (KOA, June 2020). According to 23 CFR 772.11, when traffic noise impacts have been identified, noise abatement measures must be considered. Traffic noise impacts result from one or more of the following occurrences: (1) an increase of 12 decibels (dB) or more over their corresponding existing noise levels, or (2) predicted noise levels approach or exceed the Noise Abatement Criteria (NAC).

As shown in this NSR, the future noise levels at the 10 receptor locations would not approach or exceed the NAC under Activity Categories F for Existing, Opening Year (2026), and Future Build (2040) conditions. Moreover, no substantial noise increase of 12 dB or more over the corresponding existing noise level would result under Future Build (2040) conditions.

Construction Noise Analysis

The closest sensitive receptors (i.e., residences) are located outside 500 feet of the project construction areas suggesting that there are no receptor locations that may be subject to short-term roadway construction noise level impacts approaching 91 dBA L_{max}. Construction noise is regulated by Caltrans' Standard Specifications in Section 14-8.02, "Noise Control". Section 14-8.02 states that "*Do not exceed 86 dBA at 50 feet from the job site activities from 9 p.m. to 6 a.m. Equip an internal combustion engine with the manufacturer-recommended muffler. Do not operate an internal combustion engine on the job site without the appropriate muffler.*" No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans Standard Specifications Section 14.8-02. Construction noise would be short-term, intermittent, and overshadowed by local traffic noise.

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List of Abbreviated Terms

CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	Decibels
FHWA	Federal Highway Administration
Hz	Hertz
kHz	Kilohertz
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
$L_{eq(h)}$	Equivalent Sound Level over one hour
L_{max}	Maximum Sound Level
LOS	Level of Service
L_{xx}	Percentile-Exceeded Sound Level
mPa	micro-Pascals
mph	miles per hour
NAC	noise abatement criteria
NADR	Noise Abatement Decision Report
NEPA	National Environmental Policy Act
NSR	Noise Study Report
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
SPL	sound pressure level
TeNS	Caltrans' Technical Noise Supplement
TNM 2.5	FHWA Traffic Noise Model Version 2.5

Chapter 1. Introduction

The proposed project includes the widening of Magnolia Avenue and is located in the City of Corona, Riverside County, California. The project proposes to widen Magnolia Avenue between El Camino Avenue to 1,000 feet east of All-American Way. This includes additional travel lanes in each direction and the widening of the bridge over Temescal Wash Channel. Existing land uses in the project vicinity include warehousing, commercial uses, and manufacturing uses. The project location is shown on Figure 1-1.

1.1 Purpose of the Noise Study Report

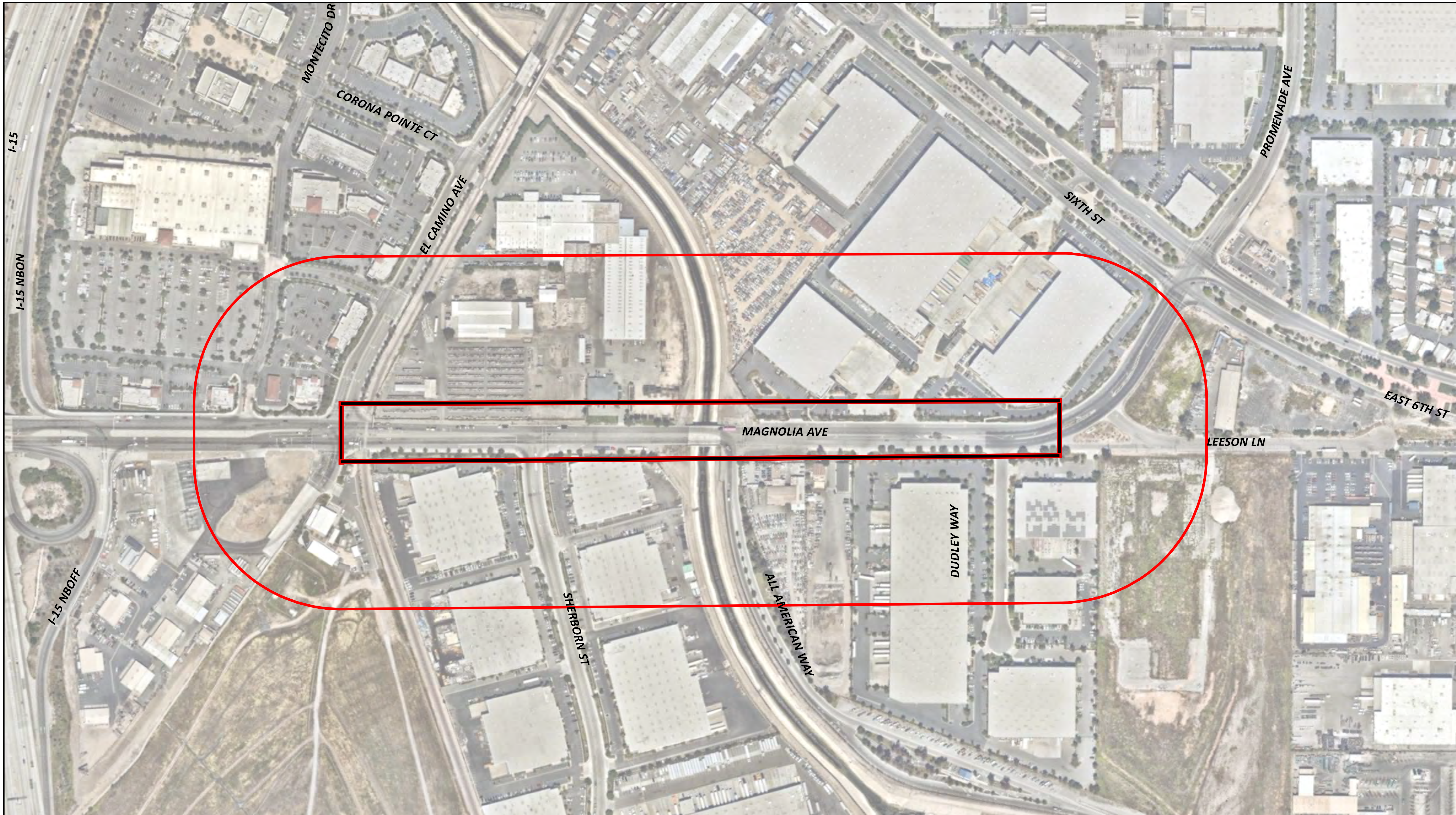
The purpose of this NSR is to evaluate noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) "Procedures for Abatement of Highway Traffic Noise." 23 CFR 772 provides procedures for preparing operational and construction noise studies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

The Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) (Caltrans 2011) provides Caltrans policy for implementing 23 CFR 772 in California. The Protocol outlines the requirements for preparing noise study reports (NSR).

1.2 Project Purpose and Need

The purpose of the Project is to increase existing traffic capacity and comply with the City's General Plan, improving pedestrian and non-motorized travel on Magnolia Avenue between El Camino Avenue to 1,000 feet east of All American Way, which is approximately the intersection of Leeson Lane.

Magnolia Avenue is an east-west Major Arterial in the City of Corona, accessible from Interstate 15 (I-15). It is identified as six lanes in the General Plan, but it is only striped/constructed to accommodate four lanes. The Project improvements will begin at El Camino Avenue, approximately 600 feet east of the I-15. Land uses along the Project alignment include light industrial to heavy industrial on both sides of the road. The heavy industrial uses include a quarry located south of the Project alignment, accessible on the south side of Magnolia Avenue from Sherborn Street and All American Way. Given its proximity to the I-15 and the mix of light and heavy industrial uses, this approximately 2,100 linear foot Project alignment experiences a high volume of heavy truck traffic. Build-out of the roadway to the design as envisioned by the General Plan would improve overall circulation in this section.



Legend

Limits of Construction

500 foot Buffer

Magnolia Avenue Bridge Widening at Temescal Creek Channel

Figure 1-1

Sensitive Receiver Locations

Project No. 11673

City of Corona Project No. ####

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Chapter 2. Project Description

The project being considered by Caltrans include improvements on Magnolia Avenue between El Camino Avenue to 1,000 feet east of All American Way, or to approximately the intersection of the eastbound lane to Leeson Lane, approximately 150 feet past Trademark Circle.

The City of Corona is proposing to widen the Magnolia Avenue Bridge over Temescal Wash Channel and Magnolia Avenue from El Camino Avenue to 1,000 feet east of the All American Way generally to increase the number of travel lanes from 2 to 3 and place sidewalk and curb and gutter in missing areas. Improvements will include restriping for three 12-foot-wide lanes in each direction, a 12-foot-wide median, 5-foot-wide shoulders, and 6-foot-wide sidewalks/curb and gutter in locations that currently lack sidewalk/curb and gutter. The total roadway width would be increased to approximately 100 feet, curb to curb, throughout the alignment, and right-of-way will vary but will generally be approximately 112 feet wide throughout the alignment.

2.1. No-Build

Under the No-Build Alternative, no changes would be made to Magnolia Avenue in the project area.

Chapter 3. Fundamentals of Traffic Noise

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

3.1. Sound, Noise, and Acoustics

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

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

3.1. Frequency

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

3.2. 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.

3.3. 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.

3.4. A-Weighted Decibels

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

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

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

Table 3-1. Typical A-Weighted Noise Levels

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

Source: Caltrans 2013.

3.5. Human Response to Changes in Noise Levels

As discussed above, doubling sound energy results in a 3-dB increase in sound. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels, when exposed to steady, single-frequency (“pure-tone”) signals in the midfrequency (1,000 Hz–8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dB are generally not perceptible. However, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound, would generally be perceived as barely detectable.

3.6. 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.

3.7. 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.

3.7.1. 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.

3.7.2. Ground Absorption

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

3.7.3. 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.

3.7.4. Shielding by Natural or Human-Made Features

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

Chapter 4. Federal Regulations and State Policies

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

4.1. Federal Regulations

4.1.1. 23 CFR 772

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

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

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

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

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

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

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

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

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

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

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

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

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

4.2. State Regulations and Policies

4.2.1. California Environmental Quality Act (CEQA)

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

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

4.2.2. Section 216 of the California Streets and Highways Code

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

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

Chapter 5. Study Methods and Procedures

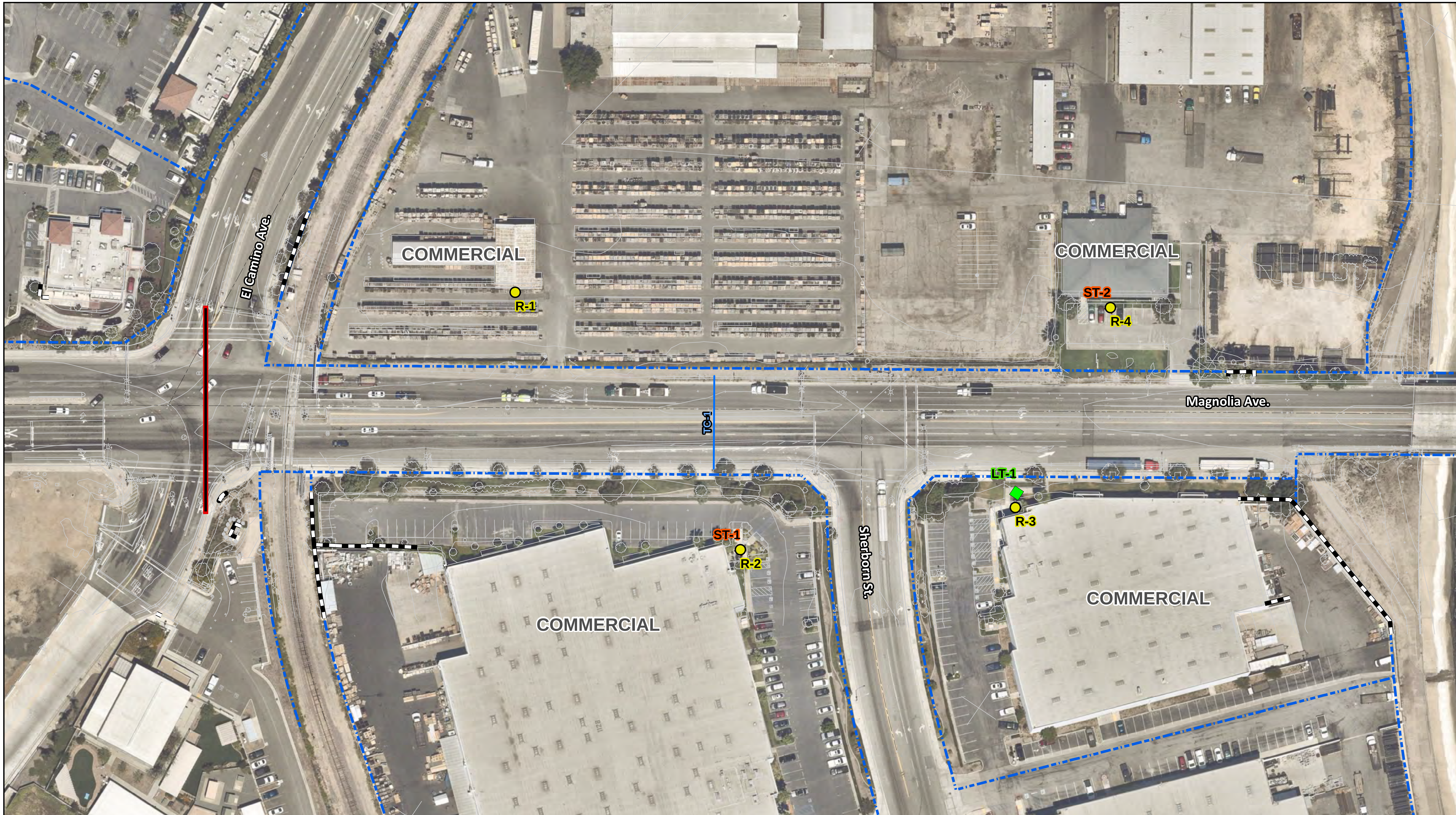
5.1. Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receiver Locations

A preliminary review of the project study area was conducted using Nearmap aerial imagery (May 7, 2020) to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. During the field noise measurements, a detailed survey of the entire project site was performed and field notes were taken regarding land uses; the locations of frequent human use areas; the locations and heights of existing walls, buildings, and any other objects that would affect noise propagation. Additional information including speed limits, pavement type, and other potential noise sources in the surrounding area that could affect the background noise level were also identified.

Land uses within the project area were categorized by land use type, FHWA activity category (as defined in Table 4-1), and the anticipated frequency of human use. As stated in the Protocol, noise abatement is only considered for areas of frequent human use that would benefit from a reduced noise level. Accordingly, this noise impact analysis focuses on locations with defined outdoor activity areas of frequent human use. The Project study area includes commercial use categories that were modeled as Activity Categories E.

Short-term noise level measurements locations (ST-1 to ST6) were selected to represent the primary frequent outdoor use areas for various land uses within the project area. A single long-term measurement site (LT-1) was selected adjacent to Magnolia Avenue to capture the hourly traffic noise level distribution patterns in the project area.

Since it is not practical to place a modeled receptor and/or measurement location at each individual building or residence, each modeled and measured receptor represents a group of buildings that share acoustical equivalence. In other words, the area represented by the receptor shares similar shielding, terrain, and geometric relationship to the highway. A total of 10 receptor locations were modeled to represent Activity Categories E uses in the project area. These modeled receptor and monitoring locations are shown on Figures 5-1 and 5-2.



N

0 90 180

1" = 90' (On 11x17 Sheet)

Legend

- Short-Term Monitoring Location
- Modeled Receptor Location
- Long-Term Locations
- Existing Wall
- Limits of Construction
- Traffic Count Location

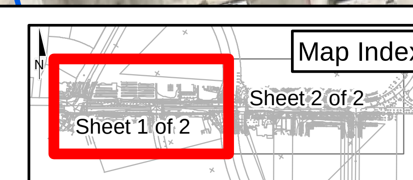


Figure 5-1
Sheet 1 of 2
Magnolia Avenue Bridge Widening at Temescal Creek Channel
Monitoring and Receiver Locations
Project No. 11673
City of Corona Project No. ####

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Figure 5-2
Sheet 2 of 2
Magnolia Avenue Bridge Widening at Temescal Creek Channel
Monitoring and Receiver Locations
Project No. 11673
City of Corona Project No. ####

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5.2. Field Measurement Procedures

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

5.2.1. Short-Term Measurements

Short-term monitoring was conducted at six locations on Wednesday, July 22, 2020, using a Larson Davis LxT Type 1 precision sound level meter (serial number 01146) and a Piccolo 2 (Type 2) integrating sound level meter and datalogger (serial number P0220043003). The calibration of the meter was checked before and after the measurement using a Larson Davis CAL200 calibrator (serial number 4656). Measurements were taken over a 15-minute period at each site. Short-term monitoring was conducted at Activity Category F land uses. The short-term measurement locations are identified in Figure 5-1 and Figure 5-2.

During the short-term measurements, field staff attended each meter. Minute-to-minute L_{eq} values collected during the measurement period (15 minutes in duration) were logged, and dominant noise sources observed during each individual measurement were identified and logged. Using this approach, those minutes when traffic noise was observed to be a dominant contributor to noise levels at a given measurement location could be distinguished from one-minute noise levels where other non-traffic noise sources (such as aircraft and commercial activities) contributed significantly to existing noise levels.

To describe the traffic conditions, traffic volumes on Magnolia Avenue were classified by axle type and counted during the six short-term noise measurements. Vehicles were classified as automobiles, buses, motorcycles, medium trucks, or heavy trucks. Automobiles are vehicles with two axles and four tires that are designed primarily to carry passengers; small vans and light trucks are included in this category. Medium trucks include all cargo vehicles with two axles and six tires. Heavy trucks include all vehicles with three or more axles. The traffic conditions were modeled in TNM 3.0 (a detailed/complete description of TNM 3.0 is provided in Section 5.4.1) and compared to the field measurement results to calibrate the noise prediction model.

Consistent with Caltrans Technical Noise Supplement (TeNS) (Caltrans, November 2009) the following measurement procedures were utilized:

- Calibrate sound level meter (94 dB) before the measurement.

- Set up sound level meter at a height of 5 ft above pad elevation for all locations.
- A windscreen was placed over the microphone.
- Frequency weighting was set on "A" and "FAST" response.
- Commence noise monitoring.
- Collect site-specific data, such as date, time, direction of traffic, vehicle speed, and the location of the sound level meter relative to any existing feature.
- Machine count passing vehicles by direction for a full twenty-four hours. Identify the concurrent vehicle counts for the same 15 minutes period for each of the short-term noise measurements.
- Wind speed, temperature, humidity, and weather conditions were observed and documented.
- During the noise measurements, any excessive noise contamination such as barking dogs, lawn mowers, and/or aircraft flyovers were noted.
- Stop measurement after 15 minutes.
- Calibrate sound level meter.
- Proceed to next monitoring site and repeat.

The 15-minute traffic count samples were expanded to represent hourly volumes (multiplied by four to normalize the results to hourly values) and input into Traffic Noise Model (TNM) 3.0 for each monitoring site. The monitoring results were then used to calibrate the model outputs.

5.2.2. Long-Term Measurements

To describe the typical weekday noise environment, one unattended long-term hourly noise level measurement was collected within the project study area as shown on Figure 5-1. The long-term noise readings were recorded using a Piccolo 2 (Type 2) integrating sound level meter and datalogger (serial number P0220043003). The long-term noise level measurement was taken approximately 15 feet south of the curb of Magnolia Avenue (LT-1). The long-term noise level measurement results are included in Appendix D as supplemental data.

5.3. Traffic Noise Level Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model Version 3.0 (TNM 3.0). TNM 3.0 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). Key inputs to the traffic noise model were the locations of roadways, traffic mix and speed, shielding features (e.g., topography and buildings), noise barriers, ground type, and receptors. Three-dimensional representations of these inputs were developed using the project street improvement AutoCAD drawings and geo-spatial aerial imagery.

5.3.1. TNM Model Validation

To validate the accuracy of the model, TNM 3.0 was used to compare the measured traffic noise levels to the modeled noise levels at the field measurement locations. For each receptor, traffic volumes counted during the short-term measurement periods were normalized to 1-hour volumes. These normalized volumes were assigned to Magnolia Avenue to simulate the noise source strength at the roadways during the actual measurement period. Modeled and measured sound levels were then compared to determine the accuracy of the model and to determine whether additional calibration of the model was necessary.

5.3.2. Conditions for Modeling

Traffic noise was evaluated under Existing (2020), Future Opening Year (2026), and Future Build (2040) conditions based on the *Magnolia Avenue Bridge Widening from El Camino Avenue to 1,000 Feet East of All American Way Project* (KOA, June 2020). The TNM 3.0 program is the traffic noise model used to evaluate traffic noise impacts against the NAC. The traffic noise levels at all 10 receptor locations were modeled using the AM peak hour traffic volumes (consistent with the observed peak morning traffic conditions) obtained from the *Magnolia Avenue Bridge Widening from El Camino Avenue to 1,000 Feet East of All American Way Project* (KOA, June 2020).

While the project area includes two intersections (i.e., Sherborn Street and All American Way), the TNM 3.0 model is based on the AM noisiest hour volume on the roadway segment of Magnolia Avenue between Sherborn Street and All American Way to present a conservative analysis.

TNM 3.0 is sensitive to the volume of trucks on the roadway because trucks contribute disproportionately to traffic noise. To describe the mix of vehicles, a 24-hour vehicle classification count was collected on Magnolia Avenue on Wednesday, July 22, 2020. The 24-hour vehicle classification count is included in Appendix C.

Table 5-1 shows the directional vehicle distribution and vehicle speeds for each vehicle category and roadway within the project area used to calculate traffic noise levels. The modeled future noise levels were compared to the modeled existing noise level (for substantial increases in noise levels) and to the NAC to determine potential noise impacts.

Table 5-1. Vehicle Distribution And Vehicle Speed

Roadway	Vehicle Percentage					Vehicle Speed (mph)				
	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles
Magnolia Avenue Eastbound	75.06%	8.31%	12.53%	3.43%	0.67%	45	40	40	40	45
Magnolia Avenue Westbound	73.68%	6.86%	15.64%	2.70%	1.12%	45	40	40	40	45

Based on a 24-hour vehicle classification count collected on Wednesday, July 22, 2020. Speed is based on posted speed limit.

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

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

Where traffic noise impacts are identified, noise abatement must be considered for reasonableness and feasibility as required by 23 CFR 772 and the Caltrans Traffic Noise Analysis Protocol (Caltrans 2020), abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dB at affected receptor locations is predicted with implementation of the abatement measures. In addition, barriers should be designed to intercept the line of sight from the exhaust stack of a truck (11.5 feet high) to the first tier of receptors, as required by the Highway Design Manual 7th Edition, Chapter 1100 (Caltrans 2020). 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.

Chapter 6. Existing Noise Environment

6.1. Existing Land Uses

Developed land uses in the project vicinity were identified through land use maps, aerial photography, site inspection, and Nearmap. Within each land use category, receptors were identified. Existing land uses in the project area include commercial uses, manufacturing, and warehousing. Existing land uses in the project area are described below and in further detail.

- **East of El Camino Avenue, west of Sherborn Street:** Land uses in this area include Imperial Commercial Cooking Equipment and Pacific States Cast Iron Pipe. Commercial and warehousing uses were classified under Activity Category F for reporting purposes.
- **East of Sherborn Street, West of All American Way:** Land uses in this area include McWane Ductile and Pro Armor. Commercial and manufacturing uses were classified under Activity Category F for reporting purposes.
- **East of All American Way, west of Trademark Circle:** Land uses in this area include Haitbrink Asphalt Paving and AmorePacific Online. Commercial and manufacturing uses were classified under Activity Category F for reporting purposes.
- **East of Trademark Circle, west of Leeson Lane:** Land uses in this area include Vantage LED and Developlus Inc. Commercial uses were classified under Activity Category F for reporting purposes.

6.2. Noise Measurement Results

The existing noise environment in the project area is based on short- and long-term traffic noise level measurements conducted.

6.2.1. Short-Term Monitoring

The primary source of noise in the project area is traffic on Magnolia Avenue and adjacent roadways. Short-term (15-minute) noise measurements were conducted to document existing noise levels at three representative receptor locations along the project alignment during the peak noise hour based on the long-term measurement results. Short-term noise level measurements were conducted using a Larson Davis LxT Type 1 integrating sound level meter and a Piccolo 2 (Type 2) integrating sound level meter and datalogger. Table 6-1 shows the results of the short-term noise level measurements along with the date, start time, duration, location, and noise sources for each site. All of the short-term noise level measurements were used to calibrate the noise model. Predicted noise levels were calculated at the modeled receptor locations in the project area. The short-term monitoring locations are shown on Figure 5-1. The noise monitoring results, and project study area photos are included in Appendix D. Concurrent traffic counts, and measured vehicle speeds are provided in Appendix C.

Table 6-1. Short-Term Noise Monitoring Results and Physical Locations

ID	dBA L_{eq}	Start Time	Duration (Mins.)	Date	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles	Speed (mph) A/MT/HT/B/M
ST-1	66.5	6:22 AM	15	7/22/2020	149	24	60	10	2	45/40/40/40/45
ST-2	63.8	8:00 AM	15		156	19	8	4	0	45/40/40/40/45
ST-3	61.8	7:40 AM	15		85	12	9	0	2	45/40/40/40/45
ST-4	71.2	6:43 AM	15		175	22	52	7	3	45/40/40/40/45
ST-5	62.2	7:22 AM	15		140	15	14	4	4	45/40/40/40/45
ST-6	59.3	7:04 AM	15		122	16	8	4	2	45/40/40/40/45

Based on short-term noise level measurements collect by Urban Crossroads, Inc. using a Larson Davis LxT Type 1 sound level meter. Vehicle speeds are based on the posted speed limit.

ID	Location Description
ST-1	Located near the building façade of Imperial Commercial Cooking Equipment at 1128 Sherborn Street.
ST-2	Located adjacent to building façade of McWane Ductile at 1375 Magnolia Avenue.
ST-3	Located adjacent to building façade of Blower Dempsay Corporation at 1475 Magnolia Avenue.
ST-4	Located in front of Haitbrink Asphalt Paving at 1480 Magnolia Avenue.
ST-5	Located in front of Developlus Inc at 1575 Magnolia Avenue.
ST-6	Located adjacent to building façade of Vantage LED at 1580 Magnolia Avenue

6.2.3. Noise Model Calibration

Three individual calibration model runs were conducted using the vehicle classification counts and vehicle speed data collected concurrent with the ambient noise monitoring. The results of these model runs were compared to the measured short-term ambient noise levels to ensure the accuracy of TNM 3.0. Correction factors known as K-factors were applied to each of the modeled receptor locations so that the monitored and modeled noise levels were the same. Table 6-2 shows the measured short-term ambient noise levels, the modeled noise levels using traffic counts and observed vehicle speeds identified during noise monitoring, and the resulting K-factors adjustments at each of the three locations.

Table 6-2. Short-Term Noise Monitoring Results and Physical Locations

ID	Measured Noise Level (dBA L_{eq})	Modeled Noise Level (dBA L_{eq})	K-Factor (dBA)	Receptors Represented
ST-1	66.5	66.7	-0.2	R1-R2
ST-2	63.8	65.7	-1.9	R3-R4
ST-3	61.8	63.4	-1.6	R6
ST-4	71.2	71.5	-0.3	R5, R7
ST-5	62.2	64.1	-1.9	R9
ST-6	59.3	61.9	-2.6	R8, R10

As shown in Table 6-2, the K-factor for all locations are within 3 dBA. Based on the TeNS, a K-factor within 3dBA does not need any adjustment to the model.

6.2.4. Long-Term Monitoring

One long-term measurement was conducted within the project area. The long-term noise level measurement was recorded using a Piccolo 2 (Type 2) integrating sound level meter and datalogger. The long-term noise level measurement was collected approximately 15 feet south of the curb of Magnolia Avenue (LT-1). The long-term noise level measurements indicate that the daytime (7:00 a.m. to 10:00 p.m.) hourly noise levels range from 66.9 dBA L_{eq} at 9:00 pm to 73.3 dBA L_{eq} at 7:00 a.m. At location LT-1, the peak noise hour generates an exterior noise level of 73.3 dBA L_{eq} at 7:00 a.m. The purpose of the measurements is to describe variations in sound levels throughout the day over a period of several hours. The long-term noise monitoring location is shown on Figure 5-1 and included in Appendix D.

6.3. Existing Noise Levels

As described in Section 5.3, existing noise levels were modeled using existing AM peak-hour traffic volumes. The results of the existing traffic noise modeling are shown in Table 6-3. Of the 10 modeled receptor locations, none of the receptor locations experience Existing traffic noise levels which approaches or exceeds the underlying NAC for the given Activity Category. Figure 5-1 shows the locations of the modeled receptors.

Table 6-3. Existing Traffic Noise Levels, dBA L_{eq}

Receptor	Location	Type of Land Use	Noise Abatement Criteria (NAC)	Existing Noise Level (dBA L_{eq})
R1	Magnolia Ave.	Commercial	F[1]	64
R2	Sherborn St.	Commercial	F[1]	65
R3	Sherborn St.	Commercial	F[1]	67
R4	Magnolia Ave.	Commercial	F[1]	66
R5	Magnolia Ave.	Commercial	F[1]	68
R6	Magnolia Ave.	Commercial	F[1]	66
R7	Magnolia Ave.	Commercial	F[1]	68
R8	Magnolia Ave.	Commercial	F[1]	65
R9	Magnolia Ave.	Commercial	F[1]	65
R10	Magnolia Ave.	Commercial	F[1]	63

[1] There is no NAC for land uses associated with Activity Category F or G. The highest expected noise level is provided for reporting purposes based on a receptor at the closest building façade to Magnolia Avenue.

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

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

7.1. Future Noise Environment and Impacts

The future traffic noise levels at the 10 receptor locations are based on the projected future AM peak-hour traffic volumes obtained from the *Magnolia Avenue Bridge Widening from El Camino Avenue to 1,000 Feet East of All American Way Project* (KOA, June 2020). Predicted design year traffic noise levels with the project are compared to existing conditions and to design-year no-project conditions. The comparison to existing conditions is included in the analysis to identify traffic noise impacts under 23 CFR 772. The comparison to no project conditions indicates the direct effect of the project. Table 7-1 shows the adjusted Existing, the Opening Year (2026), and the Future Build (2040) traffic noise level results. The modeled future noise levels with the project were compared to the modeled existing noise levels (after calibration) from TNM 3.0 to determine whether a substantial noise increase would occur. The modeled future noise levels for Future Build (2040) condition was compared to the NAC under Activity Category F to determine whether a traffic noise impact would occur.

A traffic noise impact occurs when: (1) the traffic noise level at a sensitive receptor location is predicted to “approach or exceed” its NAC, or (2) the predicted traffic noise level is 12 dBA or more over its corresponding modeled existing noise level at the sensitive receptor locations analyzed. When traffic noise impacts occur, noise abatement measures must be considered. As shown in Table 7-1, none of the future noise levels at the 10 receptor locations would approach or exceed the NAC under Activity Category F for Future Build (2040) traffic conditions. No substantial noise increase of 12 dB or more over the corresponding existing noise level would result under Future Build (2040) conditions. The traffic noise model results for the Existing, Opening Year (2026), and Future Build (2040) conditions are included in Appendix B.

Table 7-1. Predicted Traffic Noise Levels, dBA L_{eq}

Receptor	Location	Type of Land Use	NAC	Existing Noise Level (dBA L_{eq})	Opening Year Noise Level (dBA L_{eq})	Future Build Noise Level (dBA L_{eq})	Change from Existing Noise Level
R1	Magnolia Ave.	Commercial	F[1]	64	69	70	6
R2	Sherborn St.	Commercial	F[1]	65	70	70	5
R3	Sherborn St.	Commercial	F[1]	67	71	72	5
R4	Magnolia Ave.	Commercial	F[1]	66	69	70	4
R5	Magnolia Ave.	Commercial	F[1]	68	71	72	5
R6	Magnolia Ave.	Commercial	F[1]	66	69	70	5
R7	Magnolia Ave.	Commercial	F[1]	68	71	72	4
R8	Magnolia Ave.	Commercial	F[1]	65	68	69	5
R9	Magnolia Ave.	Commercial	F[1]	65	68	68	4
R10	Magnolia Ave.	Commercial	F[1]	63	66	67	4

[1] There is no NAC for land uses associated with Activity Category F. The highest expected noise level is provided for reporting purposes based on a receptor at the closest building façade to Magnolia Avenue.

Chapter 8. Construction Noise

8.1. Purpose

During construction of the proposed project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Noise from project construction would be regulated through Caltrans Standard Specifications. To minimize the construction noise impacts for sensitive land adjacent to the project site, construction noise is regulated by Caltrans Standard Specifications in Section 14-8.02, “Noise Control.” These provisions shall be adhered to during project construction.

8.2. Typical Construction Noise Levels

Table 8-1 summarizes noise levels produced by construction equipment that are commonly used on roadway construction projects. Construction equipment is expected to generate noise levels ranging from 80 to 95 dBA L_{max} at a distance of 50 ft, and noise produced by construction equipment would be reduced over distance at a rate of approximately 6 dB per doubling of distance. Two types of short-term noise impacts would occur during project construction. The first type would be from construction crew commutes and the transport of construction equipment and materials to the project site and would incrementally raise noise levels on access roads leading to the site. The pieces of heavy equipment for grading and construction activities will be moved on site, will remain for the duration of each construction phase, and will not add to the daily traffic volume in the project vicinity. A high single-event noise exposure potential at a maximum level of 87 dBA L_{max} from trucks passing at 50 ft from the noise receptor will exist. However, the projected construction traffic will be short-term and its associated long-term noise level change will not be perceptible. Therefore, short-term construction-related worker commutes and equipment transport would result in insubstantial noise impacts.

Table 8-1. Typical Construction Equipment Noise Levels

Type of Equipment	Range of Maximum Sound Levels (dBA Lmax at 50 ft)	Suggested Maximum Sound Levels for Analysis (dBA Lmax at 50 ft)
Pile drivers	81–96	93
Rock drills	83–99	96
Jackhammers	75–85	82
Pneumatic tools	78–88	85
Pumps	74–84	80
Scrapers	83–91	87
Haul trucks	83–94	88
Cranes	79–86	82
Portable generators	71–87	80
Rollers	75–82	80
Dozers	77–90	85
Tractors	77–82	80
Front-end loaders	77–90	86
Hydraulic backhoe	81–90	86
Hydraulic excavators	81–90	86
Graders	79–89	86
Air compressors	76–89	86
Trucks	81–87	86

Source: Noise Control for Buildings and Manufacturing Plants, Bolt, Beranek & Newman, 1987.
dBA = A-weighted decibels
ft = feet
Lmax = maximum instantaneous sound level

The second type of short-term noise impact is related to noise generated during roadway construction. Construction is performed in discrete steps, each of which has its own mix of equipment and consequently its own noise characteristics. These various sequential phases would change the character of the noise generated and the noise levels along the project alignment as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table 8-1 lists typical construction equipment noise levels (L_{max}) recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receptor.

Potential roadway construction areas are expected to require the use of scrapers, bulldozers, water trucks, and pickup trucks. Noise associated with the use of construction equipment is estimated between 79 and 89 dBA L_{max} at a distance of 50 ft from the active construction area for the grading phase. As seen in Table 8-1, the maximum noise level generated by each scraper is assumed to be approximately 87 dBA L_{max} at 50 ft from the scraper in operation. Each bulldozer would generate approximately 85 dBA L_{max} at 50 ft. The maximum noise level generated by water trucks and pickup trucks is approximately

86 dBA L_{max} at 50 ft from these vehicles. Each doubling of the sound source with equal strength increases the noise level by 3 dBA. Each piece of construction equipment operates as an individual point source. The worst-case composite noise level at the nearest residence during this phase of construction would be 91 dBA L_{max} (at a distance of 50 ft from an active construction area). The closest sensitive receptor locations are located approximately 50 ft from the project construction areas. Therefore, these receptor locations may be subject to short-term noise reaching 91 dBA L_{max} generated by construction activities along the project alignment.

8.3. Construction Noise Level Reduction Measures

Construction of the proposed project is anticipated to generate high noise levels at certain areas in the proximity of construction activity areas. Construction noise is regulated by Caltrans' Standard Specifications in Section 14-8.02, "Noise Control". Section 14-8.02 states that "*Do not exceed 86 dBA at 50 feet from the job site activities from 9 p.m. to 6 a.m. Equip an internal combustion engine with the manufacturer-recommended muffler. Do not operate an internal combustion engine on the job site without the appropriate muffler.*"

Chapter 9. References

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Appendix A Magnolia Avenue Bridge Widening From El Camino Avenue to 1,000 Feet East of All American Way Project (KOA, June 2020)

City of Corona

MAGNOLIA AVENUE BRIDGE WIDENING FROM EL CAMINO AVENUE TO 1,000 FEET EAST OF ALL AMERICAN WAY PROJECT

FEDERAL AID PROJECT NO. STPL-5104(046)

CITY PROJECT NO. 2015-15

SEPTEMBER 2020

Prepared for:
The City of Corona
Public Works Department
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1.0 INTRODUCTION

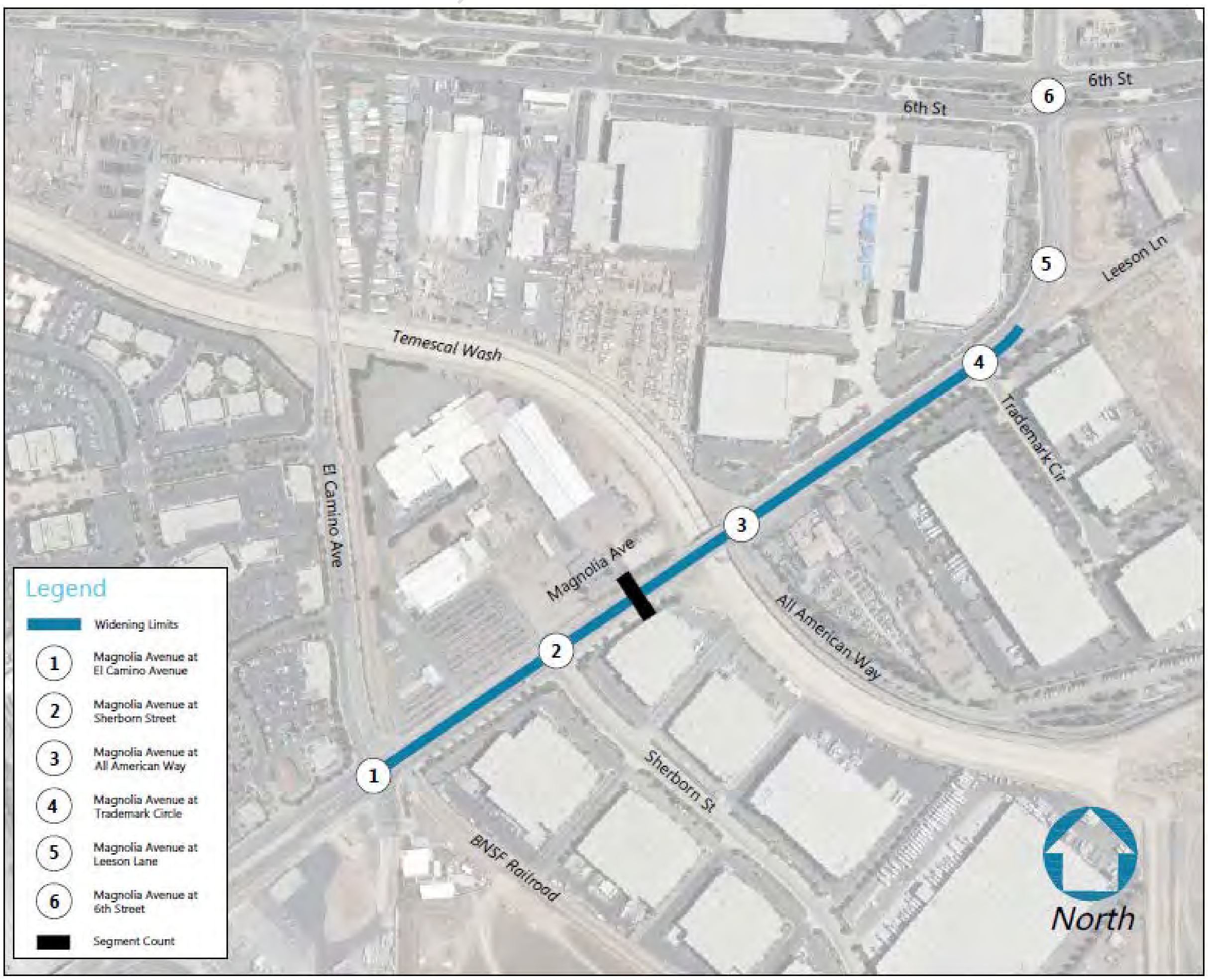
The City of Corona, population of about 168,000, is located approximately 40 miles southeast of downtown Los Angeles. Municipal boundaries encompass approximately 38 square miles of land in Riverside County. The City is served by the San Diego/Barstow Freeway (I-15), which runs from San Diego north through Barstow to Nevada and beyond, and the Riverside Freeway (CA-91), which runs from the I-110 Freeway in Long Beach east to the I-215 Freeway in the County of Riverside.

In an effort to address existing traffic deficiencies and additional traffic flow associated with existing and future commercial and residential developments, the City of Corona intends to improve traffic operations by widening and modifying the roadway lane configuration on Magnolia Avenue from El Camino Avenue to 1,000 feet east of All American Way.

The project study area limits include the intersections of Magnolia Avenue at El Camino Avenue, Sherborn Street, All American Way, Trademark Circle, Lesson Lane, and 6th Street.

One build alternative has been developed to address the local area needs in order to minimize the impacts to existing or future developments. This alternative is discussed in detail within Chapter 4: Methodology. Figure 1.1 shows the project boundaries and study intersections.

FIGURE 1.1 – VICINITY MAP



EXISTING (2019) CONDITIONS

LOS calculations were performed using the federally required Highway Capacity Manual procedures that indicates LOS based upon delay per vehicle. All calculations were made using the SYNCHRO computer program and based upon existing or probable future signal timing constraints.

Table 3.1 summarizes the LOS results for the Existing conditions. Analysis worksheets are located in Appendix B.

TABLE 3.1 – EXISTING (2019) TRAFFIC CONDITIONS

Intersection	AM Peak Hour		PM Peak hour	
	Delay	LOS	Delay	LOS
Signalized Intersections				
Magnolia Avenue at El Camino Ave	28.8	C	28.0	C
Magnolia Avenue at Sherborn Street	4.0	A	10.0	A
Magnolia Avenue at All American Way	8.0	A	8.8	A
Magnolia Avenue at 6th Street	36.7	D	82.0	D
Unsignalized Intersections				
Magnolia Avenue at Trademark Circle	0.7	A	1.2	D
Magnolia Avenue at Leeson Lane	0.4	A	0.7	D

Note: Delay based on seconds per vehicle average. LOS = Level of Service

As shown in Table 3.1, all signalized intersections currently operate at acceptable LOS during the AM and PM peak hours for Existing conditions. The unsignalized intersection of Magnolia Avenue at Trademark Circle and Magnolia Avenue at Lesson Lane operates at LOS A during the AM and PM peak hours for Existing conditions.

Table 3.2 summarizes the Existing conditions ADT volumes for the roadway segment. Analysis worksheets are located in Appendix B.

TABLE 3.2 – EXISTING (2019) VOLUMES

Segment	Existing				
	Classification	LOS E Capacity	ADT	V/C	LOS
Magnolia Avenue					
Between All America Way and Sherborn Street	4L Arterial	35,900	21,740	0.61	B

Under existing conditions of Magnolia Avenue, between All American Way and Sherborn Street, the segment operates at a LOS of B.

ROADWAY SEGMENT CONDITIONS 2026

Table 4.5 summarizes the roadway segment analysis results for 2026 Conditions with cumulative projects.

TABLE 4.5 – OPENING YEAR (2026) SEGMENT LOS, V/C RESULTS

Segment	2026 No Build					2026 With Project			
	ADT	LOS E Capacity	Classification	V/C	LOS	LOS E Capacity	Classification	V/C	LOS
Magnolia Avenue									
Between All America Way and Sherborn Street	24,972	35,900	4L Arterial	0.70	C	53,900	6L Arterial	0.46	B

Under the **No Build** scenario, the segment Magnolia Avenue, Between All America Way and Sherborn Street, operate at LOS C.

Under the **Widening** scenario, the segment Magnolia Avenue, Between All America Way and Sherborn Street, operate at LOS B.

Under the **Widening** scenario the following signalized intersection operate at a **LOS Lower than D**:

- Magnolia Avenue at 6th Street (PM Peak Hour)

Under the **Widening** scenario the following unsignalized intersection operate at a **LOS Lower than D**:

- Magnolia Avenue at Trademark Circle (PM Peak Hour)
- Magnolia Avenue at Leeson Lane (AM & PM Peak Hour)

ROADWAY SEGMENT CONDITIONS 2040

Table 5.3 summarizes the roadway segment analysis results for 2040 Conditions with cumulative projects.

TABLE 5.3 – BUILDOUT YEAR (2040) SEGMENT LOS, V/C RESULTS

Segment	2040 No Build					2040 With Project			
	ADT	LOS E Capacity	Classification	V/C	LOS	LOS E Capacity	Classification	V/C	LOS
Magnolia Avenue									
Between All America Way and Sherborn Street	37,850	35,900	4L Arterial	1.05	F	53,900	6L Arterial	0.70	C

Under the **No Build** scenario the segment Magnolia Avenue, Between All America Way and Sherborn Street, operate at LOS F.

Under the **Widening** scenario the segment Magnolia Avenue, Between All America Way and Sherborn Street, operate at LOS C.

Appendix E
Opening Year (2026) and Buildout Year (2040) Peak Hour Volume Development

Intersection			
1	6th St	4	All American Way
2	Leeson Ln	5	Sherborn St
3	Trademark Cir	6	El Camino Ave

**Magnolia Ave (North/South bound)*

Existing 2019 AM/PM Peak Volumes

Exisiting AM												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	19	258	411	65	291	220	74	203	26	443	719	101
2	0	683	16	14	742	0	0	0	0	5	0	5
3	0	686	45	29	717	0	0	0	0	11	0	16
4	0	697	85	32	717	0	0	0	0	72	0	15
5	0	779	141	27	745	0	0	0	0	64	0	9
6	370	879	4	12	795	11	31	19	118	42	1	10

Exisiting PM												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	9	368	757	122	220	99	196	879	29	290	455	53
2	0	1,108	5	9	533	0	0	0	0	17	0	21
3	0	1,079	8	9	538	0	0	0	0	32	0	25
4	0	1,057	57	11	605	0	0	0	0	68	0	35
5	0	1,080	82	16	646	0	0	0	0	124	0	34
6	228	1,067	3	2	733	18	45	2	214	51	8	22

Cumulative Projects AM/PM Peak Volumes

Cumulative Projects AM Peak												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	16	28	5	0	57	0	0	0	16	7	0	0
2	0	16	31	39	40	0	0	0	0	31	0	33
3	0	47	0	0	71	0	0	0	0	0	0	0
4	0	42	0	5	66	0	0	0	0	0	0	0
5	0	37	0	5	60	0	0	0	0	0	0	5
6	21	23	33	10	38	13	13	8	11	24	7	7

Cumulative Projects PM Peak												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	14	40	11	0	36	0	0	0	14	10	0	0
2	0	33	29	31	27	0	0	0	0	28	0	32
3	0	61	0	0	56	0	0	0	0	0	0	0
4	0	57	0	5	51	0	0	0	0	0	0	5
5	0	52	0	5	46	0	0	0	0	0	0	5
6	12	27	53	17	22	7	7	13	25	53	15	17

Growth 0.63%

Cumulative Projects 2026 AM Peak												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	33	59	11	0	106	0	0	0	33	15	0	0
2	0	33	66	78	73	0	0	0	0	66	0	69
3	0	98	0	0	138	0	0	0	0	0	0	0
4	0	88	0	11	127	0	0	0	0	0	0	0
5	0	77	0	11	116	0	0	0	0	0	0	11
6	45	48	69	21	72	24	24	17	23	50	16	16

Cumulative Projects 2026 PM Peak												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	30	77	23	0	73	0	0	0	30	22	0	0
2	0	64	61	65	55	0	0	0	0	60	0	66
3	0	123	0	0	115	0	0	0	0	0	0	0
4	0	114	0	10	104	0	0	0	0	0	0	10
5	0	103	0	10	95	0	0	0	0	0	0	10
6	26	52	111	36	45	15	15	27	52	111	31	36

Growth 2%

2026 AM/PM Peak Volumes

**Existing + 2% Growth + Cumulative Projects 2026 AM/PM Peak*

Opening Year (2026) AM												
	NL	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**
1	37	299	436	68	350	230	77	212	44	470	751	106
2	0	730	50	52	807	0	0	0	0	39	0	40
3	0	766	47	30	813	0	0	0	0	11	0	17
4	0	772	89	40	808	0	0	0	0	75	0	16
5	0	853	147	34	832	0	0	0	0	67	0	16
6	410	943	39	23	863	22	43	28	135	69	9	19

Opening Year (2026) PM												
	NL	**NT**	**NR**	**SL**	**ST**	**SR**	**EL**	**ET**	**ER**	**WL**	**WT**	**WR**
1	25	420	803	127	265	103	205	919	46	315	475	55
2	0	1,187	36	42	584	0	0	0	0	48	0	54
3	0	1,187	8	9	619	0	0	0	0	33	0	26
4	0	1,159	60	17	683	0	0	0	0	71	0	42
5	0	1,178	86	22	722	0	0	0	0	130	0	41
6	252	1,139	59	20	788	26	54	16	250	109	24	41

Intersection		
1 6th St	4	All American Way
2 Leeson Ln	5	Sherborn St
3 Trademark Cir	6	El Camino Ave

**Magnolia Ave (North/South bound)*

Existing 2019 AM/PM Peak Volumes

Exisiting AM												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	19	258	411	65	291	220	74	203	26	443	719	101
2	0	683	16	14	742	0	0	0	0	5	0	5
3	0	686	45	29	717	0	0	0	0	11	0	16
4	0	697	85	32	717	0	0	0	0	72	0	15
5	0	779	141	27	745	0	0	0	0	64	0	9
6	370	879	4	12	795	11	31	19	118	42	1	10

Exisiting PM												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	9	368	757	122	220	99	196	879	29	290	455	53
2	0	1,108	5	9	533	0	0	0	0	17	0	21
3	0	1,079	8	9	538	0	0	0	0	32	0	25
4	0	1,057	57	11	605	0	0	0	0	68	0	35
5	0	1,080	82	16	646	0	0	0	0	124	0	34
6	228	1,067	3	2	733	18	45	2	214	51	8	22

Cumulative Projects AM/PM Peak Volumes

Cumulative Projects AM Peak												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	16	28	5	0	57	0	0	0	16	7	0	0
2	0	16	31	39	40	0	0	0	0	31	0	33
3	0	47	0	0	71	0	0	0	0	0	0	0
4	0	42	0	5	66	0	0	0	0	0	0	0
5	0	37	0	5	60	0	0	0	0	0	0	5
6	21	23	33	10	38	13	13	8	11	24	7	7

Cumulative Projects PM Peak												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	14	40	11	0	36	0	0	0	14	10	0	0
2	0	33	29	31	27	0	0	0	0	28	0	32
3	0	61	0	0	56	0	0	0	0	0	0	0
4	0	57	0	5	51	0	0	0	0	0	0	5
5	0	52	0	5	46	0	0	0	0	0	0	5
6	12	27	53	17	22	7	7	13	25	53	15	17

Growth 0.63%

Cumulative Projects 2040 AM Peak												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	22	294	469	74	332	251	84	232	30	505	820	115
2	0	779	18	16	847	0	0	0	0	6	0	6
3	0	783	51	33	818	0	0	0	0	13	0	18
4	0	795	97	37	818	0	0	0	0	82	0	17
5	0	889	161	31	850	0	0	0	0	73	0	10
6	422	1,003	5	14	907	13	35	22	135	48	1	11

Cumulative Projects 2040 PM Peak												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	10	420	864	139	251	113	224	1,003	33	331	519	60
2	0	1,264	6	10	608	0	0	0	0	19	0	24
3	0	1,231	9	10	614	0	0	0	0	37	0	29
4	0	1,206	65	13	690	0	0	0	0	78	0	40
5	0	1,232	94	18	737	0	0	0	0	141	0	39
6	260	1,217	3	2	836	21	51	2	244	58	9	25

Growth 2%

2040 AM/PM Peak Volumes **Existing + 2% Growth + Cumulative Projects 2040 AM/PM Peak*

Opening Year (2040) AM												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	40	326	476	74	382	251	84	232	48	513	820	115
2	0	798	55	57	881	0	0	0	0	42	0	43
3	0	836	51	33	888	0	0	0	0	13	0	18
4	0	843	97	43	882	0	0	0	0	82	0	17
5	0	931	161	38	908	0	0	0	0	73	0	17
6	447	1,029	42	25	942	24	47	31	147	75	10	21

Opening Year (2040) PM												
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
1	27	459	876	139	290	113	224	1,003	50	343	519	60
2	0	1,296	39	46	638	0	0	0	0	52	0	59
3	0	1,296	9	10	675	0	0	0	0	37	0	29
4	0	1,265	65	18	746	0	0	0	0	78	0	46
5	0	1,286	94	24	788	0	0	0	0	141	0	44
6	275	1,244	64	22	860	29	59	17	273	119	26	44

Appendix B TNM Results

This appendix contains a table (or tables) that summarizes the traffic noise modeling results for existing and design-year conditions with and without the project.

REPORT:	**Results: Sound Levels - No Barrier Objects**		
TNM VERSION	3.0.7.60002	REPORT DATE:	18 August 2020
CALCULATED WITH:	3.0.7.60002	CALCULATION DATE:	8/18/2020 4:38:17 PM
CASE:	Magnolia Existing Conditions	ORGANIZATION:	
UNITS:	English	ANALYSIS BY:	pmara
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	68°F, 50%	Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.	
PAVEMENT TYPE(S) USED:	Average		

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
Receiver-1	1	1	---	64.3	0.0	---	---	Sound Level
Receiver-2	2	1	---	65.0	0.0	---	---	Sound Level
Receiver-3	3	1	---	67.4	0.0	---	---	Sound Level
Receiver-4	4	1	---	66.3	0.0	---	---	Sound Level
Receiver-5	5	1	---	67.6	0.0	---	---	Sound Level
Receiver-6	6	1	---	65.9	0.0	---	---	Sound Level
Receiver-7	7	1	---	68.1	0.0	---	---	Sound Level
Receiver-8	8	1	---	64.9	0.0	---	---	Sound Level
Receiver-9	9	1	---	64.8	0.0	---	---	Sound Level
Receiver-10	10	1	---	63.3	0.0	---	---	Sound Level

REPORT:	**Results: Sound Levels - No Barrier Objects**		
TNM VERSION	3.0.7.60002	REPORT DATE:	21 August 2020
CALCULATED WITH:	3.0.7.60002	CALCULATION DATE:	8/21/2020 9:59:46 AM
CASE:	Opening Year	ORGANIZATION:	
UNITS:	English	ANALYSIS BY:	pmara
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	68°F, 50%	Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.	
PAVEMENT TYPE(S) USED:	Average		

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
Receiver-1	0	0	64.3	68.3	0.0	4.0	0.0	Both
Receiver-2	0	0	65.0	69.4	0.0	4.4	0.0	Both
Receiver-3	0	0	67.4	71.0	0.0	3.6	0.0	Both
Receiver-4	0	0	66.3	69.0	0.0	2.7	0.0	Both
Receiver-5	0	0	67.6	70.4	0.0	2.8	0.0	Both
Receiver-6	0	0	65.9	68.7	0.0	2.8	0.0	Both
Receiver-7	0	0	68.1	70.8	0.0	2.7	0.0	Both
Receiver-8	0	0	64.9	67.5	0.0	2.6	0.0	Both
Receiver-9	0	0	64.8	67.6	0.0	2.8	0.0	Both
Receiver-10	0	0	63.3	65.6	0.0	2.3	0.0	Both

REPORT:	**Results: Sound Levels - No Barrier Objects**		
TNM VERSION	3.0.7.60002	REPORT DATE:	19 August 2020
CALCULATED WITH:	3.0.7.60002	CALCULATION DATE:	8/19/2020 9:56:13 AM
CASE:	Future Build	ORGANIZATION:	
UNITS:	English	ANALYSIS BY:	pmara
DEFAULT GROUND TYPE:	HardSoil	PROJECT/CONTRACT	
ATMOSPHERICS:	68°F, 50%		
PAVEMENT TYPE(S) USED:	Average		

Average pavement type shall be used unless a state highway agency substantiates the use of a different type with approval FHWA.

Receiver				Modeled Traffic Noise Levels				
				LAeq		Increase over Existing		
Name	No.	Nb. R.R.	Existing LAeq	Calc.	Absolute Criterion	Calc.	Relative Criterion	Type of Impact
			dBA	dBA	dBA	dBA	dBA	
Receiver-1	1	1	64.3	69.1	0.0	4.8	0.0	Both
Receiver-2	2	1	65.0	69.7	0.0	4.7	0.0	Both
Receiver-3	3	1	67.4	71.7	0.0	4.3	0.0	Both
Receiver-4	4	1	66.3	69.4	0.0	3.1	0.0	Both
Receiver-5	5	1	67.6	71.1	0.0	3.5	0.0	Both
Receiver-6	6	1	65.9	69.1	0.0	3.2	0.0	Both
Receiver-7	7	1	68.1	71.8	0.0	3.7	0.0	Both
Receiver-8	8	1	64.9	68.5	0.0	3.6	0.0	Both
Receiver-9	9	1	64.8	67.9	0.0	3.1	0.0	Both
Receiver-10	10	1	63.3	66.4	0.0	3.1	0.0	Both

Appendix C Traffic Data

TNM Inputs for Calibration Files

Count data from Counts Unlimited

CAL ST-1

	All Lanes @ 15 mins		All Lanes @ 1 Hour		Lane Split (/2)	
ST-2	EB	WB	EB	WB	EB	WB
Auto	85	64	340	256	170	128
MT	14	10	56	40	28	20
HT	11	49	44	196	22	98
Buses	5	5	20	20	10	10
Motorcyc	1	1	4	4	2	2

CAL ST-2

	All Lanes @ 15 mins		All Lanes @ 1 Hour		Lane Split (/2)	
ST-3	EB	WB	EB	WB	EB	WB
Auto	71	85	284	340	142	170
MT	9	10	36	40	18	20
HT	5	3	20	12	10	6
Buses	2	2	8	8	4	4
Motorcyc	0	0	0	0	0	0

CAL ST-3

	All Lanes @ 15 mins		All Lanes @ 1 Hour		Lane Split (/2)	
ST-3	EB	WB	EB	WB	EB	WB
Auto	84	1	336	4	168	2
MT	5	7	20	28	10	14
HT	4	5	16	20	8	10
Buses	0	0	0	0	0	0
Motorcyc	1	1	4	4	2	2

CAL ST-4

	All Lanes @ 15 mins		All Lanes @ 1 Hour		Lane Split (/2)	
ST-3	EB	WB	EB	WB	EB	WB
Auto	90	85	360	340	180	170
MT	13	9	52	36	26	18
HT	22	30	88	120	44	60
Buses	4	3	16	12	8	6
Motorcyc	0	3	0	12	0	6

CAL ST-5

	All Lanes @ 15 mins		All Lanes @ 1 Hour		Lane Split (/2)	
ST-3	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**
Auto	76	64	304	256	152	128
MT	6	9	24	36	12	18
HT	6	8	24	32	12	16
Buses	1	3	4	12	2	6
Motorcyc	1	3	4	12	2	6

CAL ST-6

	All Lanes @ 15 mins		All Lanes @ 1 Hour		Lane Split (/2)	
ST-3	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**
Auto	65	57	260	228	130	114
MT	5	11	20	44	10	22
HT	2	6	8	24	4	12
Buses	2	2	8	8	4	4
Motorcyc	0	2	0	8	0	4

Count Data Collected on Magnolia Ave

Vehicle Classification Counts															
Direction	Date	Bikes	Cars &	2 Axle	Buses	2 Axle 6	3 Axle	4 Axle	<5 Axl	5 Axle	>6 Axl	<6 Axl	6 Axle	>6 Axl	Total All Types
Eastbound	7/22/2020	79	6,622	2,166	401	973	393	46	211	410	13	372	7	15	11,708
Westbound	7/23/2020	110	5,610	1,625	265	674	238	94	360	417	21	388	4	14	9,820
														Total:	21,528

TNM Vehicle Counts by Axle Type							
Direction	Peak Hour	Motor-cyle	Autos	Buses	Medium Trucks	Heavy Trucks	Totals
Eastbound	AM	79	8,788	401	973	1,467	11,708
Westbound	AM	110	7,235	265	674	1,536	9,820

TNM Vehicle Mix							
Direction	Peak Hour	Motor-cyle	Autos	Buses	Medium Trucks	Heavy Trucks	Totals
Eastbound	AM	0.67%	75.06%	3.43%	8.31%	12.53%	100.00%
Westbound	AM	1.12%	73.68%	2.70%	6.86%	15.64%	100.00%

Sherborn Road Traffic Volumes

Roadway	Segment	Scenario	TIA AM Peak Hour Volume[1]	Direction	Lanes	Directional Split[2]	Directional Volume[3]	Per Lane Volume[4]	Peak Hour Total Volume	Autos[2]		Medium Trucks[2]		Heavy Trucks[2]		Buses[2]		Motorcycles[2]	
										%	Volume	%	Volume	%	Volume	%	Volume	%	Volume
Sherborn St./All American Way	East of Magnolia Ave.	Existing	923	WB	2	54.38%	502	251	923	75.06%	188	8.31%	21	12.53%	31	3.43%	9	0.67%	2
				EB	2	45.62%	421	211		73.68%	155	6.86%	14	15.64%	33	2.70%	6	1.12%	2
		Future No Build	1,735	WB	3	54.38%	944	315	1,735	75.06%	236	8.31%	26	12.53%	39	3.43%	11	0.67%	2
				EB	3	45.62%	791	264		73.68%	194	6.86%	18	15.64%	41	2.70%	7	1.12%	3
		Future Build	1,894	WB	3	54.38%	1,030	343	1,894	75.06%	258	8.31%	29	12.53%	43	3.43%	12	0.67%	2
				EB	3	45.62%	864	288		73.68%	212	6.86%	20	15.64%	45	2.70%	8	1.12%	3
	West of Magnolia Ave.	Existing	678	WB	2	54.38%	369	184	678	75.06%	138	8.31%	15	12.53%	23	3.43%	6	0.67%	1
				EB	2	45.62%	309	155		73.68%	114	6.86%	11	15.64%	24	2.70%	4	1.12%	2
		Future No Build	1,899	WB	3	54.38%	1,033	344	1,899	75.06%	258	8.31%	29	12.53%	43	3.43%	12	0.67%	2
				EB	3	45.62%	866	289		73.68%	213	6.86%	20	15.64%	45	2.70%	8	1.12%	3
		Future Build	2,073	WB	3	54.38%	1,127	376	2,073	75.06%	282	8.31%	31	12.53%	47	3.43%	13	0.67%	3
				EB	3	45.62%	946	315		73.68%	232	6.86%	22	15.64%	49	2.70%	9	1.12%	4

[1] AM Peak Hour volume based on traffic counts counts from Counts Unlimited and Traffic Study Prepared by KOA.

[2] Based on 24-hour vehicle classification count data collected on July 22, 2020.

[3] Traffic volume multiplied by the directional split.

[4] Directional volume divided by the number of lanes to arrive at a peak hour volume, by direction, by lane, for each scenario

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878
(951) 268-6268
email: counts@countsunlimited.com

City of Corona
Magnolia Avenue
B/ El Camino Avenue - Sherborn Street
24 Hour Directional Classification Count

COR001
Site Code: 051-20266

Eastbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
07/21/20	1	77	10	7	5	6	0	0	2	1	7	0	0	116
01:00	0	50	10	10	1	1	0	2	2	0	5	0	0	81
02:00	2	52	22	12	7	2	0	4	3	0	7	0	0	111
03:00	0	94	27	11	17	4	0	0	18	0	12	0	1	184
04:00	2	172	79	6	32	6	0	5	25	**3**	10	1	0	341
05:00	5	260	**120**	11	60	11	0	5	37	0	20	0	**3**	532
06:00	3	279	97	13	45	12	1	6	28	0	16	1	2	503
07:00	5	255	89	13	46	22	**23**	12	48	0	27	0	2	542
08:00	5	245	99	27	**68**	25	20	6	45	1	**29**	1	1	572
09:00	4	226	85	32	49	26	18	**18**	47	0	19	1	1	526
10:00	**9**	304	120	28	59	27	4	14	**70**	0	27	1	1	664
11:00	4	**366**	107	**38**	59	**31**	5	11	42	2	25	**2**	2	**694**
12 PM	7	453	**167**	**35**	69	24	**7**	**23**	**43**	0	27	**1**	1	**857**
13:00	4	427	139	33	**76**	23	5	12	39	1	29	0	1	789
14:00	**8**	378	130	19	61	13	4	20	23	**2**	**36**	0	1	695
15:00	5	484	163	28	76	17	1	20	17	0	32	0	**3**	846
16:00	3	**515**	161	17	65	23	1	21	12	0	29	0	0	847
17:00	5	490	146	20	56	**27**	2	15	9	0	14	0	2	786
18:00	4	378	109	6	40	21	2	5	0	0	14	0	0	579
19:00	1	262	77	6	23	8	2	3	2	0	9	0	1	394
20:00	2	250	52	0	14	2	0	0	2	0	1	0	0	323
21:00	1	189	40	3	11	1	0	2	4	0	6	0	0	257
22:00	1	163	33	6	5	3	0	3	4	0	7	0	0	225
23:00	2	99	19	9	2	6	0	2	2	0	2	0	0	143
Total	83	6468	2101	390	946	341	95	209	524	10	410	8	22	11607
Percent	0.7%	55.7%	18.1%	3.4%	8.2%	2.9%	0.8%	1.8%	4.5%	0.1%	3.5%	0.1%	0.2%	
AM Peak	10:00	11:00	05:00	11:00	08:00	11:00	07:00	09:00	10:00	04:00	08:00	11:00	05:00	11:00
Vol.	9	366	120	38	68	31	23	18	70	3	29	2	3	694
PM Peak	14:00	16:00	12:00	12:00	13:00	17:00	12:00	12:00	12:00	14:00	14:00	12:00	15:00	12:00
Vol.	8	515	167	35	76	27	7	23	43	2	36	1	3	857

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City of Corona
Magnolia Avenue
B/ El Camino Avenue - Sherborn Street
24 Hour Directional Classification Count

COR001
Site Code: 051-20266

Eastbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
07/22/20	0	64	3	3	4	3	0	1	2	0	5	0	0	85
01:00	0	39	5	8	1	5	0	2	3	0	7	0	0	70
02:00	1	39	16	11	8	4	0	2	2	0	5	0	0	88
03:00	0	78	34	5	10	0	0	0	16	0	12	0	1	156
04:00	3	171	77	5	31	8	0	2	19	1	11	0	1	329
05:00	4	248	104	7	53	10	0	10	36	0	11	**1**	1	485
06:00	1	226	90	11	42	15	2	5	29	0	19	0	0	440
07:00	**7**	271	104	14	62	30	6	9	38	0	21	1	**2**	565
08:00	3	253	116	33	61	18	3	**15**	29	0	**22**	0	0	553
09:00	7	252	92	29	62	34	**11**	10	**40**	2	20	0	0	559
10:00	2	313	**130**	36	**67**	28	2	9	25	0	20	0	1	633
11:00	3	**331**	109	**40**	62	**37**	6	14	34	**4**	19	1	2	**662**
12 PM	3	417	146	33	65	**33**	4	17	21	**1**	22	0	1	763
13:00	5	476	144	38	75	31	**6**	20	**35**	1	**30**	1	**4**	866
14:00	**11**	505	164	**52**	**78**	25	3	25	20	1	27	**3**	2	916
15:00	3	**547**	164	25	78	24	1	**31**	20	0	30	0	0	**923**
16:00	7	527	**189**	11	71	19	1	20	13	0	16	0	0	874
17:00	6	508	151	10	43	27	0	8	5	1	16	0	0	775
18:00	3	368	103	5	31	14	1	6	8	1	21	0	0	561
19:00	2	321	75	1	24	15	0	2	1	1	9	0	0	451
20:00	3	264	57	9	18	2	0	3	5	0	8	0	0	369
21:00	2	173	42	4	12	3	0	0	5	0	8	0	0	249
22:00	2	144	30	7	13	5	0	0	4	0	5	0	0	210
23:00	1	87	21	4	2	3	0	0	0	0	8	0	0	126
Total	79	6622	2166	401	973	393	46	211	410	13	372	7	15	11708
Percent	0.7%	56.6%	18.5%	3.4%	8.3%	3.4%	0.4%	1.8%	3.5%	0.1%	3.2%	0.1%	0.1%	
AM Peak	07:00	11:00	10:00	11:00	10:00	11:00	09:00	08:00	09:00	11:00	08:00	05:00	07:00	11:00
Vol.	7	331	130	40	67	37	11	15	40	4	22	1	2	662
PM Peak	14:00	15:00	16:00	14:00	14:00	12:00	13:00	15:00	13:00	12:00	13:00	14:00	13:00	15:00
Vol.	11	547	189	52	78	33	6	31	35	1	30	3	4	923
Grand Total	162	13090	4267	791	1919	734	141	420	934	23	782	15	37	23315
Percent	0.7%	56.1%	18.3%	3.4%	8.2%	3.1%	0.6%	1.8%	4.0%	0.1%	3.4%	0.1%	0.2%	

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24 Hour Directional Classification Count

COR001
Site Code: 051-20266

Westbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
07/21/20	2	58	7	7	1	1	1	5	7	1	8	0	0	98
01:00	0	61	11	6	0	0	2	6	7	0	5	0	1	99
02:00	0	54	17	7	9	2	0	5	3	0	12	0	0	109
03:00	0	86	18	3	7	3	0	7	12	0	13	0	0	149
04:00	4	123	50	8	36	8	1	11	42	0	35	1	0	319
05:00	7	131	65	23	**69**	35	4	**32**	35	**3**	**44**	1	3	452
06:00	8	215	87	32	59	**47**	**16**	32	36	3	33	1	1	570
07:00	9	239	84	30	41	22	7	31	35	0	19	**3**	1	521
08:00	9	227	90	**36**	48	17	11	27	45	0	25	2	**4**	541
09:00	7	267	**101**	32	58	13	9	22	45	2	20	0	3	579
10:00	**13**	288	97	23	58	13	9	20	46	3	22	0	1	593
11:00	12	**320**	95	22	47	14	9	19	**47**	0	11	2	3	**601**
12 PM	12	340	116	**27**	**54**	11	**8**	15	**42**	**4**	11	**1**	0	641
13:00	13	409	131	22	50	11	6	**17**	24	1	11	0	**1**	696
14:00	**14**	445	**134**	17	52	**12**	3	17	17	1	6	1	1	**720**
15:00	11	441	133	4	38	9	1	14	14	1	17	0	0	683
16:00	5	**456**	117	6	26	2	2	6	8	0	**31**	0	0	659
17:00	5	414	117	3	33	6	0	12	8	1	29	0	1	629
18:00	4	308	85	4	24	4	0	7	3	0	14	0	0	453
19:00	1	259	66	9	21	10	3	4	3	0	9	0	0	385
20:00	0	207	39	2	9	4	0	4	3	0	3	0	0	271
21:00	1	149	32	7	4	1	0	1	4	0	6	0	0	205
22:00	0	157	37	8	3	1	3	3	1	0	7	0	0	220
23:00	0	82	17	7	5	3	2	5	1	0	2	0	0	124
Total	137	5736	1746	345	752	249	97	322	488	20	393	12	20	10317
Percent	1.3%	55.6%	16.9%	3.3%	7.3%	2.4%	0.9%	3.1%	4.7%	0.2%	3.8%	0.1%	0.2%	
AM Peak	10:00	11:00	09:00	08:00	05:00	06:00	06:00	05:00	11:00	05:00	05:00	07:00	08:00	11:00
Vol.	13	320	101	36	69	47	16	32	47	3	44	3	4	601
PM Peak	14:00	16:00	14:00	12:00	12:00	14:00	12:00	13:00	12:00	12:00	16:00	12:00	13:00	14:00
Vol.	14	456	134	27	54	12	8	17	42	4	31	1	1	720

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COR001
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Westbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
07/22/20	1	42	2	4	0	2	0	3	4	0	1	0	0	59
01:00	0	47	8	1	5	0	0	2	3	0	4	0	0	70
02:00	1	47	10	5	6	2	1	0	2	0	6	0	0	80
03:00	1	77	19	2	8	0	0	9	8	0	13	0	0	137
04:00	1	115	39	7	14	7	1	21	29	0	**44**	0	1	279
05:00	7	182	60	15	**73**	27	4	31	36	1	39	**1**	1	477
06:00	8	201	80	18	40	**46**	6	30	33	1	23	0	1	487
07:00	11	240	84	**28**	43	24	**13**	**33**	40	0	22	0	1	539
08:00	5	253	102	25	42	18	5	29	**43**	3	20	0	1	546
09:00	6	244	89	21	53	14	13	30	41	**5**	18	0	1	535
10:00	**13**	**308**	93	17	48	12	9	25	36	2	15	1	1	580
11:00	8	301	**106**	24	47	17	10	33	27	1	21	1	**3**	**599**
12 PM	5	343	108	16	**55**	**15**	**8**	**20**	25	0	12	0	**1**	608
13:00	12	416	110	**17**	48	12	2	17	**28**	**2**	9	0	1	674
14:00	**14**	422	**127**	12	45	15	5	12	14	2	9	0	1	**678**
15:00	4	435	125	8	46	7	1	13	11	0	15	**1**	1	667
16:00	4	**443**	124	9	23	1	3	12	11	0	25	0	0	655
17:00	2	410	101	1	26	2	0	6	6	1	**26**	0	0	581
18:00	2	298	70	3	16	5	1	8	5	0	25	0	0	433
19:00	2	231	58	9	12	4	8	10	5	1	8	0	0	348
20:00	1	206	47	7	11	3	2	5	3	1	14	0	0	300
21:00	1	134	28	3	7	2	0	1	2	0	7	0	0	185
22:00	1	136	20	7	4	1	0	5	2	1	5	0	0	182
23:00	0	79	15	6	2	2	2	5	3	0	7	0	0	121
Total	110	5610	1625	265	674	238	94	360	417	21	388	4	14	9820
Percent	1.1%	57.1%	16.5%	2.7%	6.9%	2.4%	1.0%	3.7%	4.2%	0.2%	4.0%	0.0%	0.1%	
AM Peak	10:00	10:00	11:00	07:00	05:00	06:00	07:00	07:00	08:00	09:00	04:00	05:00	11:00	11:00
Vol.	13	308	106	28	73	46	13	33	43	5	44	1	3	599
PM Peak	14:00	16:00	14:00	13:00	12:00	12:00	12:00	12:00	13:00	13:00	17:00	15:00	12:00	14:00
Vol.	14	443	127	17	55	15	8	20	28	2	26	1	1	678
Grand Total	247	11346	3371	610	1426	487	191	682	905	41	781	16	34	20137
Percent	1.2%	56.3%	16.7%	3.0%	7.1%	2.4%	0.9%	3.4%	4.5%	0.2%	3.9%	0.1%	0.2%	

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24 Hour Directional Classification Count

COR001
Site Code: 051-20266

Eastbound, Westbound

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
07/21/20	3	135	17	14	6	7	1	5	9	2	15	0	0	214
01:00	0	111	21	16	1	1	2	8	9	0	10	0	1	180
02:00	2	106	39	19	16	4	0	9	6	0	19	0	0	220
03:00	0	180	45	14	24	7	0	7	30	0	25	0	1	333
04:00	6	295	129	14	68	14	1	16	67	**3**	45	2	0	660
05:00	12	391	185	34	**129**	46	4	37	72	3	**64**	1	**6**	984
06:00	11	494	184	45	104	**59**	17	38	64	3	49	2	3	1073
07:00	14	494	173	43	87	44	30	**43**	83	0	46	3	3	1063
08:00	14	472	189	63	116	42	**31**	33	90	1	54	3	5	1113
09:00	11	493	186	**64**	107	39	27	40	92	2	39	1	4	1105
10:00	**22**	592	**217**	51	117	40	13	34	**116**	3	49	1	2	1257
11:00	16	**686**	202	60	106	45	14	30	89	2	36	**4**	5	**1295**
12 PM	19	793	283	**62**	123	**35**	**15**	**38**	**85**	**4**	38	**2**	1	1498
13:00	17	836	270	55	**126**	34	11	29	63	2	40	0	2	1485
14:00	**22**	823	264	36	113	25	7	37	40	3	42	1	2	1415
15:00	16	925	**296**	32	114	26	2	34	31	1	49	0	**3**	**1529**
16:00	8	**971**	278	23	91	25	3	27	20	0	**60**	0	0	1506
17:00	10	904	263	23	89	33	2	27	17	1	43	0	3	1415
18:00	8	686	194	10	64	25	2	12	3	0	28	0	0	1032
19:00	2	521	143	15	44	18	5	7	5	0	18	0	1	779
20:00	2	457	91	2	23	6	0	4	5	0	4	0	0	594
21:00	2	338	72	10	15	2	0	3	8	0	12	0	0	462
22:00	1	320	70	14	8	4	3	6	5	0	14	0	0	445
23:00	2	181	36	16	7	9	2	7	3	0	4	0	0	267
Total	220	12204	3847	735	1698	590	192	531	1012	30	803	20	42	21924
Percent	1.0%	55.7%	17.5%	3.4%	7.7%	2.7%	0.9%	2.4%	4.6%	0.1%	3.7%	0.1%	0.2%	
AM Peak	10:00	11:00	10:00	09:00	05:00	06:00	08:00	07:00	10:00	04:00	05:00	11:00	05:00	11:00
Vol.	22	686	217	64	129	59	31	43	116	3	64	4	6	1295
PM Peak	14:00	16:00	15:00	12:00	13:00	12:00	12:00	12:00	12:00	12:00	16:00	12:00	15:00	15:00
Vol.	22	971	296	62	126	35	15	38	85	4	60	2	3	1529

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07/22/20	1	106	5	7	4	5	0	4	6	0	6	0	0	144
01:00	0	86	13	9	6	5	0	4	6	0	11	0	0	140
02:00	2	86	26	16	14	6	1	2	4	0	11	0	0	168
03:00	1	155	53	7	18	0	0	9	24	0	25	0	1	293
04:00	4	286	116	12	45	15	1	23	48	1	**55**	0	2	608
05:00	11	430	164	22	**126**	37	4	41	72	1	50	**2**	2	962
06:00	9	427	170	29	82	**61**	8	35	62	1	42	0	1	927
07:00	**18**	511	188	42	105	54	19	42	78	0	43	1	3	1104
08:00	8	506	218	58	103	36	8	44	72	3	42	0	1	1099
09:00	13	496	181	50	115	48	**24**	40	**81**	**7**	38	0	1	1094
10:00	15	621	**223**	53	115	40	11	34	61	2	35	1	2	1213
11:00	11	**632**	215	**64**	109	54	16	**47**	61	5	40	2	**5**	**1261**
12 PM	8	760	254	49	120	**48**	**12**	37	46	1	34	0	2	1371
13:00	17	892	254	55	123	43	8	37	**63**	**3**	39	1	**5**	1540
14:00	**25**	927	291	**64**	123	40	8	37	34	3	36	**3**	3	**1594**
15:00	7	**982**	289	33	**124**	31	2	**44**	31	0	45	1	1	1590
16:00	11	970	**313**	20	94	20	4	32	24	0	41	0	0	1529
17:00	8	918	252	11	69	29	0	14	11	2	42	0	0	1356
18:00	5	666	173	8	47	19	2	14	13	1	**46**	0	0	994
19:00	4	552	133	10	36	19	8	12	6	2	17	0	0	799
20:00	4	470	104	16	29	5	2	8	8	1	22	0	0	669
21:00	3	307	70	7	19	5	0	1	7	0	15	0	0	434
22:00	3	280	50	14	17	6	0	5	6	1	10	0	0	392
23:00	1	166	36	10	4	5	2	5	3	0	15	0	0	247
Total	189	12232	3791	666	1647	631	140	571	827	34	760	11	29	21528
Percent	0.9%	56.8%	17.6%	3.1%	7.7%	2.9%	0.7%	2.7%	3.8%	0.2%	3.5%	0.1%	0.1%	
AM Peak	07:00	11:00	10:00	11:00	05:00	06:00	09:00	11:00	09:00	09:00	04:00	05:00	11:00	11:00
Vol.	18	632	223	64	126	61	24	47	81	7	55	2	5	1261
PM Peak	14:00	15:00	16:00	14:00	15:00	12:00	12:00	15:00	13:00	13:00	18:00	14:00	13:00	14:00
Vol.	25	982	313	64	124	48	12	44	63	3	46	3	5	1594
Grand Total	409	24436	7638	1401	3345	1221	332	1102	1839	64	1563	31	71	43452
Percent	0.9%	56.2%	17.6%	3.2%	7.7%	2.8%	0.8%	2.5%	4.2%	0.1%	3.6%	0.1%	0.2%	

Appendix D Supplemental Data

Supplemental data includes short-term measurement field notes, photographs, and long-term noise monitoring data.

Short Term Noise Measurement Survey

Project Number: 11673 Test Personnel: P. Mara
Project Name: Magnolia Avenue Widening Equipment: LxT

Site Number: 1 Date: 07/22/2020 Time: From 6:22 AM To 6:38 AM

Site Location: Located in the north parking lot of Imperial Commercial Cooking Equipment at 1128 Sherborn Street.

Primary Noise Sources: Traffic noise on Magnolia Avenue and Sherborn Street as well as parking lot vehicle movements.

Measurement Results	
	dBA
L_{eq}	66.5
L_{max}	79.7
L_{min}	51.4
L_{peak}	92.3
L_2	73.5
L_8	69.7
L_{25}	67.3
L_{50}	64.7
L_{90}	60.5
L_{99}	59.8

Atmospheric Conditions	
Average Wind Velocity (mph)	5
Temperature (F)	68
Relative Humidity (%)	60

Comments:

Z:\Shared\UcJobs\11673\Fieldwork\Measurements\ST\ST-1.docx

Short Term Noise Measurement Survey

Project Number: 11673 Test Personnel: P. Mara
Project Name: Magnolia Avenue Widening Equipment: LxT

Site Number: 2 Date: 07/22/2020 Time: From 8:00 AM To 8:15 AM

Site Location: Located in the parking lot of McWane Ductile at 1375 Magnolia Avenue.

Primary Noise Sources: Traffic noise on Magnolia Avenue and cars exiting McWane Ductile.

Measurement Results	
	dBA
L_{eq}	63.8
L_{max}	78.9
L_{min}	49.1
L_{peak}	93.4
L_2	73.1
L_8	66.8
L_{25}	63.3
L_{50}	60.0
L_{90}	55.3
L_{99}	53.5

Atmospheric Conditions	
Average Wind Velocity (mph)	5
Temperature (F)	68
Relative Humidity (%)	60

Comments:

Short Term Noise Measurement Survey

Project Number: 11673 Test Personnel: P. Mara
Project Name: Magnolia Avenue Widening Equipment: LxT

Site Number: 3 Date: 07/22/2020 Time: From 7:40 AM To 7:55 AM

Site Location: Located in the parking lot adjacent to the Blower Dempsay Corporation building at 1475 Magnolia Avenue.

Primary Noise Sources: Traffic noise on Magnolia Avenue.

Measurement Results	
	dBA
L_{eq}	61.8
L_{max}	69.2
L_{min}	47.1
L_{peak}	84.0
L_2	67.7
L_8	66.0
L_{25}	63.4
L_{50}	59.6
L_{90}	55.5
L_{99}	54.1

Atmospheric Conditions	
Average Wind Velocity (mph)	5
Temperature (F)	68
Relative Humidity (%)	60

Comments:

Short Term Noise Measurement Survey

Project Number: 11673　　Test Personnel: P. Mara
Project Name: Magnolia Avenue Widening　　Equipment: LxT

Site Number: 4　Date: 07/22/2020　　Time: From 6:43 AM To 6:59 AM

Site Location: Located in front of Haitbrink Asphalt Paving inc at 1480 Magnolia Avenue.

Primary Noise Sources: Traffic noise on Magnolia Avenue and cars exiting Haitbrink Asphalt Paving inc.

Measurement Results	
	dBA
L_{eq}	71.2
L_{max}	81.8
L_{min}	67.3
L_{peak}	105.3
L_{2}	81.2
L_{8}	79.5
L_{25}	76.9
L_{50}	73.6
L_{90}	69.5
L_{99}	67.7

Atmospheric Conditions	
Average Wind Velocity (mph)	5
Temperature (F)	68
Relative Humidity (%)	60

Comments:

Z:\Shared\UcJobs\11673\Fieldwork\Measurements\ST\ST-4.docx

Short Term Noise Measurement Survey

Project Number: 11673 Test Personnel: P. Mara
Project Name: Magnolia Avenue Widening Equipment: Piccolo 2

Site Number: 5 Date: 07/22/2020 Time: From 7:22 AM To 7:37 AM

Site Location: Located in the parking lot of Developlus Inc at 1575 Magnolia Avenue.

Primary Noise Sources: Traffic noise on Magnolia Avenue and parking lot car movements.

Measurement Results	
	dBA
L_{eq}	62.2
L_{max}	70.3
L_{min}	51.2
L_{peak}	85.6
L_2	69.3
L_8	66.9
L_{25}	63.8
L_{50}	59.6
L_{90}	53.4
L_{99}	51.4

Atmospheric Conditions	
Average Wind Velocity (mph)	5
Temperature (F)	68
Relative Humidity (%)	60

Comments:

Short Term Noise Measurement Survey

Project Number: 11673 Test Personnel: P. Mara
Project Name: Magnolia Avenue Widening Equipment: LxT

Site Number: 6 Date: 07/22/2020 Time: From 7:04 AM To 7:19 AM

Site Location: Located in the parking lot of Vantage LED at 1580 Magnolia Avenue.

Primary Noise Sources: Traffic noise on Magnolia Avenue and parking lot car vehicle movements.

Measurement Results	
	dBA
L_{eq}	59.3
L_{max}	72.0
L_{min}	46.8
L_{peak}	89.6
L_2	65.8
L_8	63.3
L_{25}	60.4
L_{50}	57.2
L_{90}	53.1
L_{99}	51.4

Atmospheric Conditions	
Average Wind Velocity (mph)	5
Temperature (F)	68
Relative Humidity (%)	60

Comments:

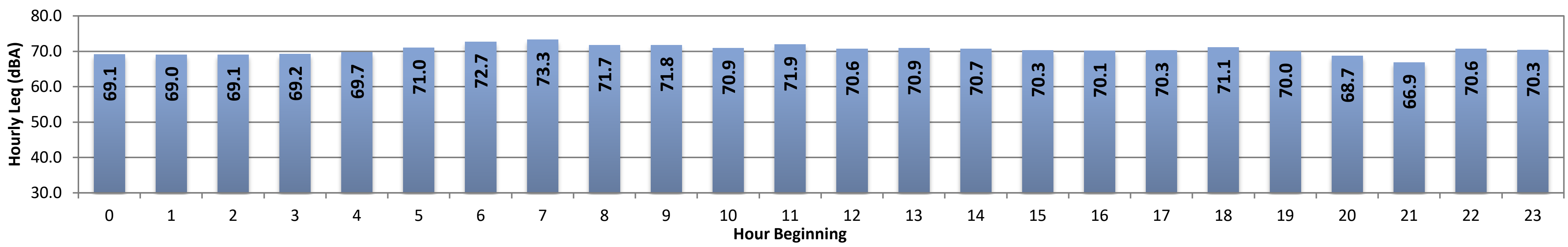
24-Hour Noise Level Measurement Summary

Project Name: Magnolia Avenue Widening *JN:* 11673 *Meter:* Piccolo 2 *Date:* 7/20/2020

Location: LT-1 *GPS:* 33.868854, -117.536653

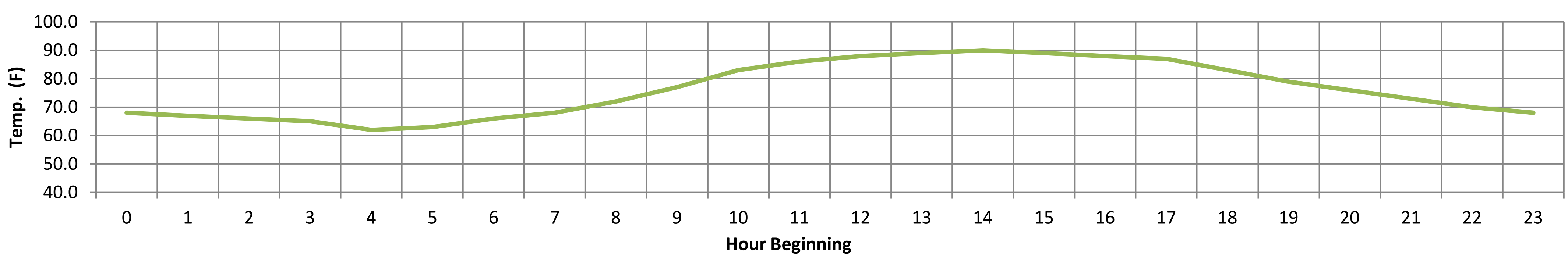
Weather Data: *wunderground.com*

Hourly L_{eq} dB(A) Readings (Slow)

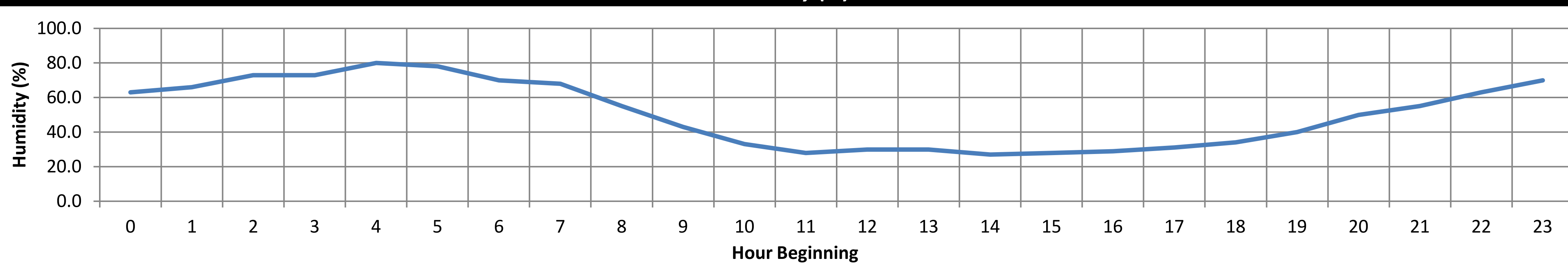


Wind Speed (mph)

Temperature (°F)



Humidity (%)



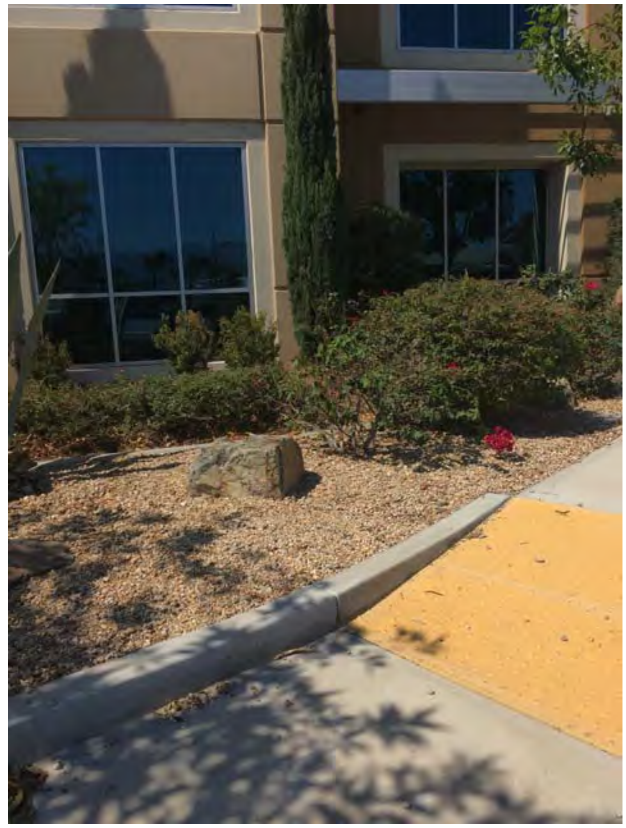
LT1_E
33, 52' 7.440000", 117, 32' 12.520000"

LT1_N
33, 52' 7.200000", 117, 32' 11.750000"

LT1_S
33, 52' 7.550000", 117, 32' 12.660000"

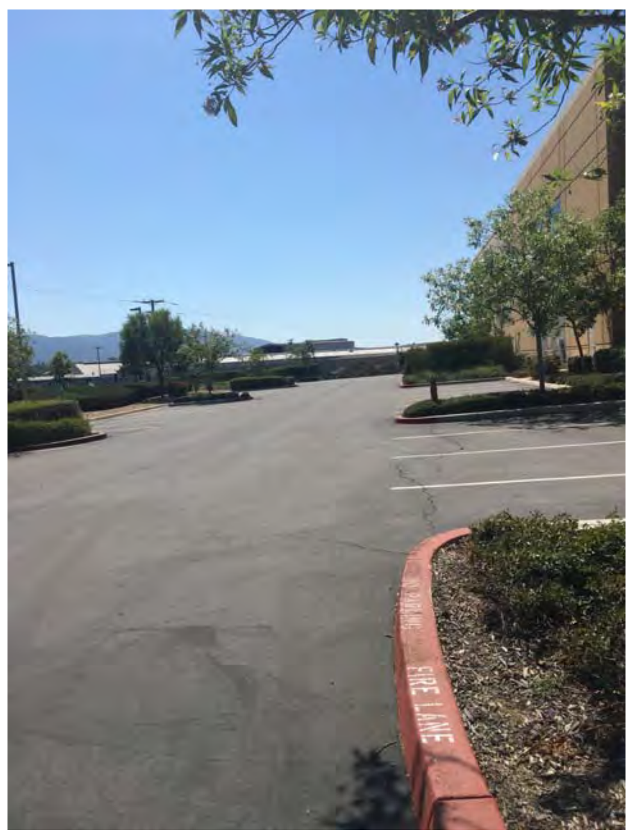
LT1_W
33, 52' 7.550000", 117, 32' 12.660000"

LT2_E
33, 52' 12.850000", 117, 32' 4.970000"



LT2_N
33, 52' 12.830000", 117, 32' 4.830000"

LT2_S
33, 52' 13.810000", 117, 32' 4.940000"



LT2_W
33, 52' 13.840000", 117, 32' 5.020000"

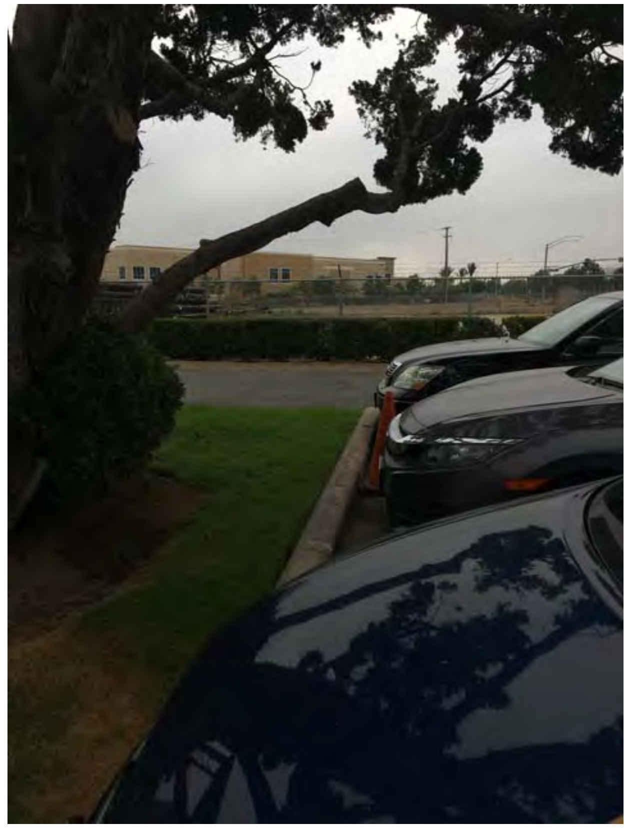
ST1_E
33, 52' 5.980000", 117, 32' 13.950000"

ST1_N
33, 52' 5.780000", 117, 32' 13.920000"

ST1_S
33, 52' 6.060000", 117, 32' 13.900000"

ST1_W
33, 52' 6.060000", 117, 32' 13.900000"

ST2_E
33, 52' 10.130000", 117, 32' 11.700000"



ST2_N
33, 52' 10.170000", 117, 32' 11.860000"

ST2_S
33, 52' 10.130000", 117, 32' 11.700000"

ST2_W
33, 52' 10.130000", 117, 32' 11.700000"

ST3_E
33, 52' 14.010000", 117, 32' 5.130000"

ST3_N
33, 52' 14.070000", 117, 32' 5.190000"

ST3_S
33, 52' 14.000000", 117, 32' 5.130000"

ST3_W
33, 52' 13.990000", 117, 32' 5.160000"

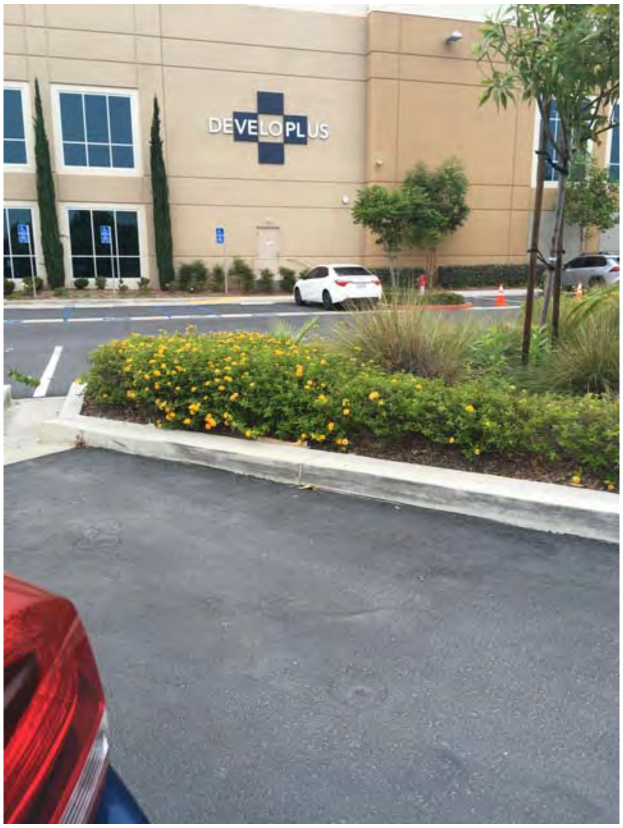
ST4_E
33, 52' 12.380000", 117, 32' 3.930000"

ST4_N
33, 52' 13.880000", 117, 32' 3.600000"

ST4_S
33, 52' 12.440000", 117, 32' 3.840000"

ST4_W
33, 52' 12.500000", 117, 32' 3.820000"

ST5_E
33, 52' 16.950000", 117, 32' 0.110000"



ST5_N
33, 52' 16.950000", 117, 32' 0.110000"

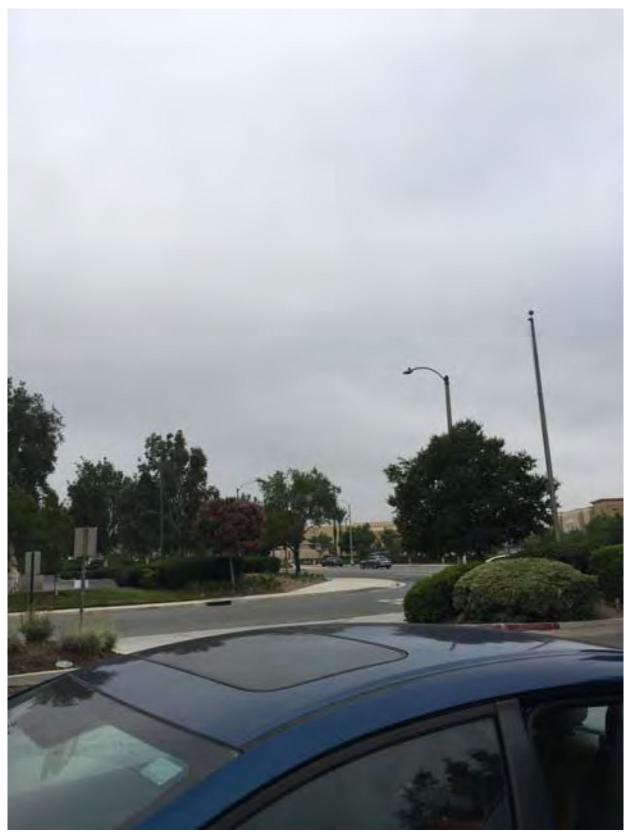
ST5_S
33, 52' 16.950000", 117, 32' 0.110000"

ST5_W
33, 52' 16.950000", 117, 32' 0.160000"

ST6_E
33, 52' 16.140000", 117, 31' 56.260000"

ST6_N
33, 52' 16.160000", 117, 31' 56.260000"

ST6_S
33, 52' 16.130000", 117, 31' 56.290000"



ST6_W
33, 52' 16.130000", 117, 31' 56.290000"

Appendix E Sound Level Meter Calibration Certifications

Calibration Certificate

Certificate Number 2019012938

Customer:

Urban Crossroads Inc
260 East Baker Street
Costa Mesa, CA 92626, United States

Model Number	LxT1	***Procedure Number***	D0001.8384		
Serial Number	0001146	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	17 Oct 2019		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	17 Oct 2021		
		Temperature	23.79	°C	± 0.25 °C
Description	SoundTrack LxT Class 1 Class 1 Sound Level Meter Firmware Revision: 2.402	***Humidity***	50.3	%RH	± 2.0 %RH
		Static Pressure	85.51	kPa	± 0.13 kPa

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

Larson Davis PRMLxT1. S/N 0173
PCB 377B02. S/N 106819
Larson Davis CAL200. S/N 9079
Larson Davis CAL291. S/N 0108

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

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

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

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

The quality system is registered to ISO 9001:2015.

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

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

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

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

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

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

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

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

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis CAL291 Residual Intensity Calibrator	2019-09-18	2020-09-18	001250
SRS DS360 Ultra Low Distortion Generator	2019-06-14	2020-06-14	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	2019-07-18	2020-07-18	006946
Larson Davis CAL200 Acoustic Calibrator	2019-07-22	2020-07-22	007027
Larson Davis Model 831	2019-02-22	2020-02-22	007182
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2019-03-06	2020-03-06	007185

Acoustic Calibration

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

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

As Received Level: 114.41
Adjusted Level: 114.01

-- End of measurement results--

Acoustic Signal Tests, C-weighting

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

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.13	-0.20	-1.20	0.80	0.23	Pass
1000	0.10	0.00	-0.70	0.70	0.23	Pass
8000	-3.70	-3.00	-5.50	-1.50	0.32	Pass

-- End of measurement results--

Self-generated Noise

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

Measurement	Test Result [dB]
A-weighted	40.60

-- End of measurement results--

-- End of Report--

Signatory: *Ron Harris*

Calibration Certificate

Certificate Number 2019012926
Customer:
Urban Crossroads Inc
260 East Baker Street
Costa Mesa, CA 92626, United States

Model Number	PRMLxT1
Serial Number	0173
Test Results	**Pass**
Initial Condition	AS RECEIVED same as shipped
Description	Larson Davis 1/2" Preamplifier for LxT Class 1 -23 dB

Procedure Number	D0001.8383		
Technician	Ron Harris		
Calibration Date	17 Oct 2019		
Calibration Due	17 Oct 2021		
Temperature	23.39	°C	± 0.01 °C
Humidity	49.7	%RH	± 0.5 %RH
Static Pressure	85.58	kPa	± 0.03 kPa

Evaluation Method Tested electrically using a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 μPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications

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

The quality system is registered to ISO 9001:2015.

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

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

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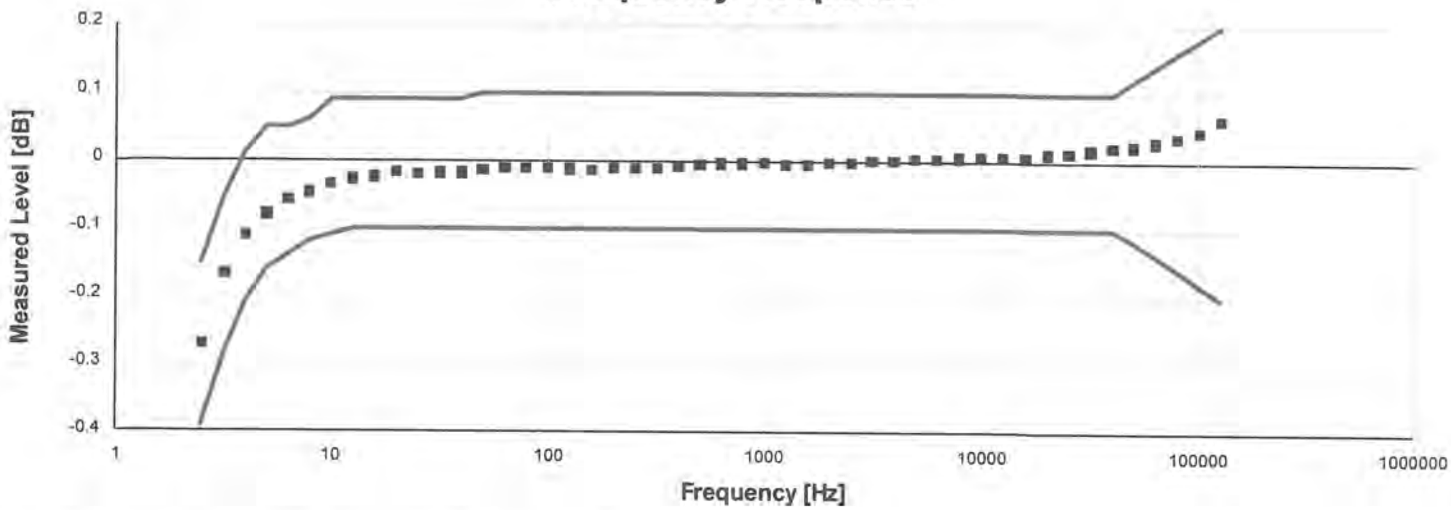
Standards Used

Description	Cal Date	Cal Due	Cal Standard
Larson Davis Model 2900 Real Time Analyzer	11/05/2018	11/05/2019	001150
Agilent 34401A DMM	07/11/2019	07/11/2020	002588
SRS DS360 Ultra Low Distortion Generator	06/14/2019	06/14/2020	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	07/18/2019	07/18/2020	006946

Frequency Response



Frequency response electrically tested at 120.0 dB re 1 μV

Frequency [Hz]	Test Result [dB re 1 kHz]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
2.50	-0.27	-0.39	-0.15	0.15	Pass
3.20	-0.17	-0.28	-0.05	0.15	Pass
4.00	-0.11	-0.21	0.01	0.15	Pass
5.00	-0.08	-0.16	0.05	0.15	Pass
6.30	-0.06	-0.14	0.05	0.15	Pass
7.90	-0.05	-0.12	0.06	0.15	Pass
10.00	-0.04	-0.11	0.09	0.15	Pass
12.60	-0.03	-0.10	0.09	0.15	Pass
15.80	-0.02	-0.10	0.09	0.15	Pass
20.00	-0.02	-0.10	0.09	0.15	Pass
25.10	-0.02	-0.10	0.09	0.15	Pass
31.60	-0.02	-0.10	0.09	0.15	Pass
39.80	-0.02	-0.10	0.09	0.15	Pass
50.10	-0.01	-0.10	0.10	0.15	Pass
63.10	-0.01	-0.10	0.10	0.15	Pass
79.40	-0.01	-0.10	0.10	0.15	Pass
100.00	-0.01	-0.10	0.10	0.15	Pass
125.90	-0.01	-0.10	0.10	0.15	Pass
158.50	-0.01	-0.10	0.10	0.15	Pass
199.50	-0.01	-0.10	0.10	0.15	Pass
251.20	-0.01	-0.10	0.10	0.15	Pass
316.20	-0.01	-0.10	0.10	0.15	Pass
398.10	-0.01	-0.10	0.10	0.15	Pass
501.20	-0.01	-0.10	0.10	0.15	Pass
631.00	0.00	-0.10	0.10	0.15	Pass
794.30	0.00	-0.10	0.10	0.15	Pass
1,000.00	0.00	-0.10	0.10	0.15	Pass
1,258.90	0.00	-0.10	0.10	0.15	Pass
1,584.90	-0.01	-0.10	0.10	0.15	Pass
1,995.30	0.00	-0.10	0.10	0.15	Pass
2,511.90	0.00	-0.10	0.10	0.15	Pass
3,162.30	0.00	-0.10	0.10	0.15	Pass

Frequency [Hz]	Test Result [dB re 1 kHz]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
3,981.10	0.00	-0.10	0.10	0.15	Pass
5,011.90	0.00	-0.10	0.10	0.15	Pass
6,309.60	0.00	-0.10	0.10	0.15	Pass
7,943.30	0.00	-0.10	0.10	0.15	Pass
10,000.00	0.01	-0.10	0.10	0.15	Pass
12,589.30	0.01	-0.10	0.10	0.15	Pass
15,848.90	0.01	-0.10	0.10	0.15	Pass
19,952.60	0.01	-0.10	0.10	0.15	Pass
25,118.90	0.01	-0.10	0.10	0.15	Pass
31,622.80	0.02	-0.10	0.10	0.15	Pass
39,810.70	0.02	-0.10	0.10	0.15	Pass
50,118.70	0.02	-0.12	0.12	0.15	Pass
63,095.70	0.03	-0.14	0.14	0.15	Pass
79,432.80	0.04	-0.16	0.16	0.15	Pass
100,000.00	0.05	-0.18	0.18	0.15	Pass
125,892.50	0.06	-0.20	0.20	0.15	Pass

Gain Measurement

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Output Gain @ 1 kHz	-24.41	-24.80	-23.20	0.15	Pass

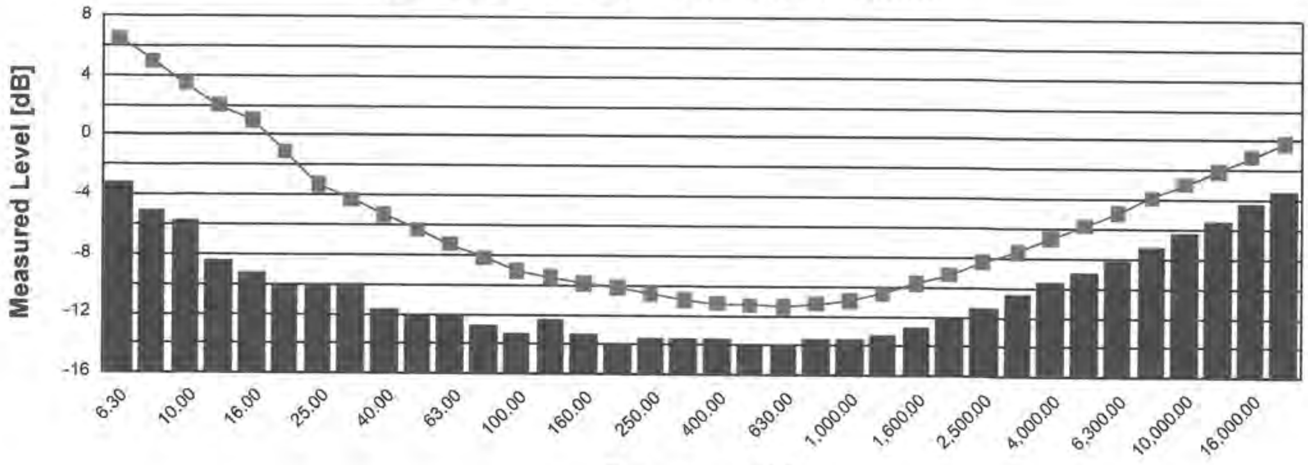
-- End of measurement results--

DC Bias Measurement

Measurement	Test Result [V]	Lower limit [V]	Upper limit [V]	Expanded Uncertainty [V]	Result
DC Voltage	3.55	2.90	3.80	0.01	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



Frequency [Hz]	Test Result [dB re 1 µV]	Upper limit [dB re 1 µV]	Result
6.30	-3.20	6.50	Pass
8.00	-5.00	5.00	Pass
10.00	-5.70	3.50	Pass
12.50	-8.40	2.00	Pass
16.00	-9.20	1.00	Pass
20.00	-10.10	-1.10	Pass
25.00	-10.00	-3.30	Pass
31.50	-10.10	-4.30	Pass
40.00	-11.70	-5.30	Pass
50.00	-12.10	-6.30	Pass
63.00	-12.10	-7.30	Pass
80.00	-12.70	-8.20	Pass
100.00	-13.30	-9.10	Pass
125.00	-12.30	-9.50	Pass
160.00	-13.30	-9.90	Pass
200.00	-13.90	-10.20	Pass
250.00	-13.50	-10.60	Pass
315.00	-13.60	-11.00	Pass
400.00	-13.50	-11.20	Pass
500.00	-13.90	-11.30	Pass
630.00	-14.10	-11.40	Pass
800.00	-13.60	-11.20	Pass
1,000.00	-13.50	-11.00	Pass
1,250.00	-13.30	-10.50	Pass
1,600.00	-12.70	-9.80	Pass
2,000.00	-12.10	-9.20	Pass
2,500.00	-11.40	-8.30	Pass
3,150.00	-10.50	-7.60	Pass
4,000.00	-9.70	-6.70	Pass
5,000.00	-8.90	-5.80	Pass
6,300.00	-8.10	-4.90	Pass
8,000.00	-7.20	-3.90	Pass
10,000.00	-6.30	-3.00	Pass
12,500.00	-5.40	-2.10	Pass
16,000.00	-4.30	-1.10	Pass
20,000.00	-3.40	-0.20	Pass

-- End of measurement results--

Self-generated Noise

Bandwidth	Test Result [µV]	Test Result [dB re 1 µV]	Upper limit [dB re 1 µV]	Result
A-weighted (1 Hz - 20 kHz)	1.24	1.90	3.00	Pass
Broadband (1 Hz - 20 kHz)	1.80	5.10	6.50	Pass

-- End of measurement results--

Signatory: *Ron Harris*

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

ACCREDITED
Cert. #3622.01

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Calibration Certificate

Certificate Number 2019012928

Customer:

Urban Crossroads Inc
260 East Baker Street
Costa Mesa, CA 92626, United States

Model Number	LxT1	***Procedure Number***	D0001.8378		
Serial Number	0001146	***Technician***	Ron Harris		
Test Results	**Pass**	***Calibration Date***	17 Oct 2019		
Initial Condition	AS RECEIVED same as shipped	***Calibration Due***	17 Oct 2021		
		Temperature	23.42	°C	± 0.25 °C
Description	SoundTrack LxT Class 1 Class 1 Sound Level Meter Firmware Revision: 2.402	***Humidity***	49.6	%RH	± 2.0 %RH
		Static Pressure	85.59	kPa	± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRMLxT1 S/N 0173 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 μPa assuming a microphone sensitivity of 50.0 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

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

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

The quality system is registered to ISO 9001:2015.

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

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

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

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

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

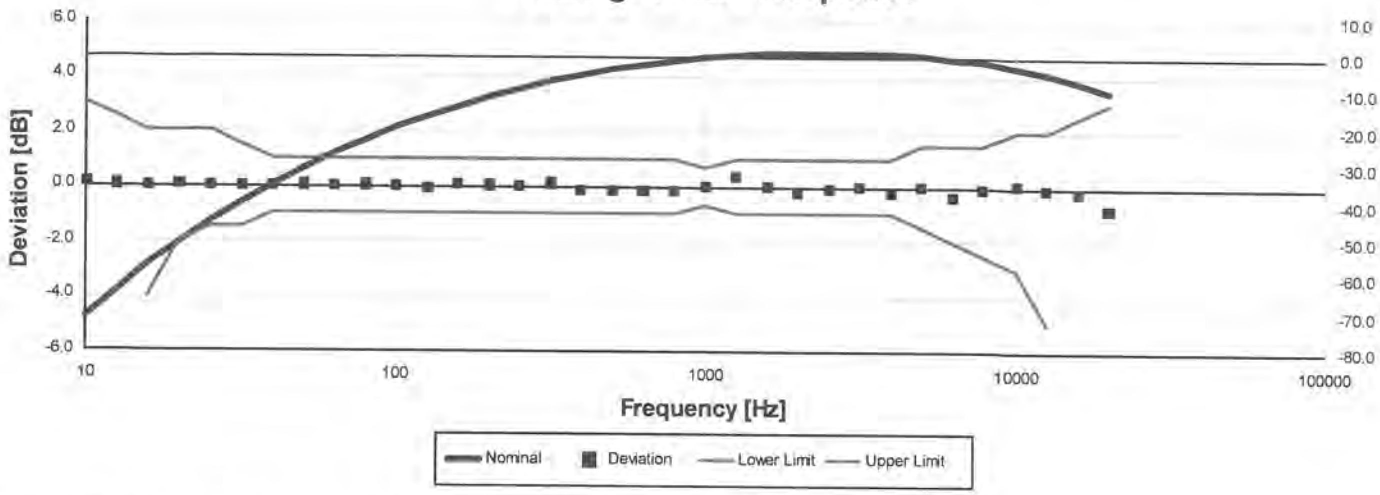
Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 successfully completed by Physikalisch-Technische Bundesanstalt (PTB) on 2007-10-09 reference number PTB-1.72-4034218.

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

Standards Used

Description	Cal Date	Cal Due	Cal Standard
SRS DS360 Ultra Low Distortion Generator	2019-06-14	2020-06-14	006311
Hart Scientific 2626-S Humidity/Temperature Sensor	2019-07-18	2020-07-18	006946

A-weight Filter Response

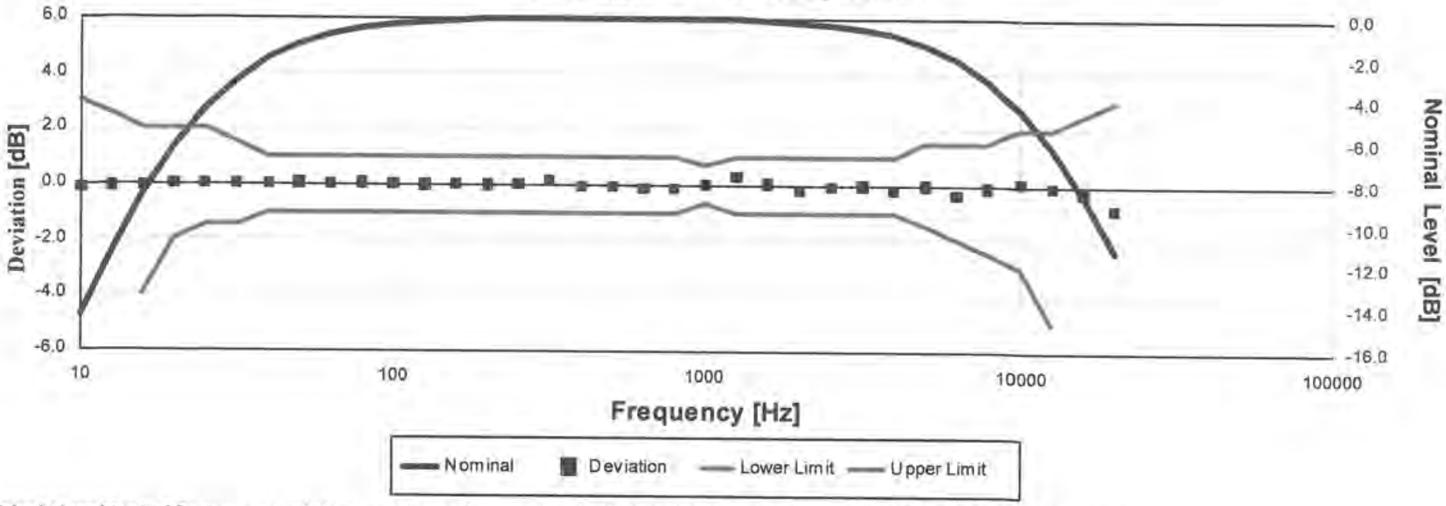


Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-70.27	0.13	-inf	3.00	0.25	Pass
12.59	-63.36	0.04	-inf	2.50	0.25	Pass
15.85	-56.68	0.02	-4.00	2.00	0.25	Pass
19.95	-50.40	0.10	-2.00	2.00	0.25	Pass
25.12	-44.67	0.03	-1.50	2.00	0.25	Pass
31.62	-39.40	0.00	-1.50	1.50	0.25	Pass
39.81	-34.61	-0.01	-1.00	1.00	0.25	Pass
50.12	-30.16	0.04	-1.00	1.00	0.25	Pass
63.10	-26.19	0.01	-1.00	1.00	0.25	Pass
79.43	-22.46	0.04	-1.00	1.00	0.25	Pass
100.00	-19.11	-0.01	-1.00	1.00	0.25	Pass
125.89	-16.16	-0.06	-1.00	1.00	0.25	Pass
158.49	-13.33	0.07	-1.00	1.00	0.25	Pass
199.53	-10.86	0.04	-1.00	1.00	0.25	Pass
251.19	-8.61	-0.01	-1.00	1.00	0.25	Pass
316.23	-6.48	0.12	-1.00	1.00	0.25	Pass
398.11	-4.92	-0.12	-1.00	1.00	0.25	Pass
501.19	-3.35	-0.15	-1.00	1.00	0.25	Pass
630.96	-2.06	-0.16	-1.00	1.00	0.25	Pass
794.33	-0.95	-0.15	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.95	0.35	-1.00	1.00	0.25	Pass
1,584.89	1.02	0.02	-1.00	1.00	0.25	Pass
1,995.26	0.96	-0.24	-1.00	1.00	0.25	Pass
2,511.89	1.22	-0.08	-1.00	1.00	0.25	Pass
3,162.28	1.19	-0.01	-1.00	1.00	0.25	Pass
3,981.07	0.80	-0.20	-1.00	1.00	0.25	Pass
5,011.87	0.53	0.03	-1.50	1.50	0.25	Pass
6,309.57	-0.47	-0.37	-2.00	1.50	0.25	Pass
7,943.28	-1.19	-0.09	-2.50	1.50	0.25	Pass
10,000.00	-2.39	0.11	-3.00	2.00	0.25	Pass
12,589.25	-4.34	-0.04	-5.00	2.00	0.25	Pass
15,848.93	-6.83	-0.23	-16.00	2.50	0.25	Pass
19,952.62	-10.11	-0.81	-inf	3.00	0.25	Pass

-- End of measurement results--

C-weight Filter Response



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-14.43	-0.13	-inf	3.00	0.25	Pass
12.59	-11.30	-0.10	-inf	2.50	0.25	Pass
15.85	-8.53	-0.03	-4.00	2.00	0.25	Pass
19.95	-6.19	0.01	-2.00	2.00	0.25	Pass
25.12	-4.38	0.02	-1.50	2.00	0.25	Pass
31.62	-2.97	0.03	-1.50	1.50	0.25	Pass
39.81	-1.98	0.02	-1.00	1.00	0.25	Pass
50.12	-1.25	0.05	-1.00	1.00	0.25	Pass
63.10	-0.81	-0.01	-1.00	1.00	0.25	Pass
79.43	-0.46	0.04	-1.00	1.00	0.25	Pass
100.00	-0.27	0.03	-1.00	1.00	0.25	Pass
125.89	-0.23	-0.03	-1.00	1.00	0.25	Pass
158.49	-0.07	0.03	-1.00	1.00	0.25	Pass
199.53	-0.03	-0.03	-1.00	1.00	0.25	Pass
251.19	0.02	0.02	-1.00	1.00	0.25	Pass
316.23	0.15	0.15	-1.00	1.00	0.25	Pass
398.11	-0.07	-0.07	-1.00	1.00	0.25	Pass
501.19	-0.08	-0.08	-1.00	1.00	0.25	Pass
630.96	-0.13	-0.13	-1.00	1.00	0.25	Pass
794.33	-0.11	-0.11	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.33	0.33	-1.00	1.00	0.25	Pass
1,584.89	-0.05	0.05	-1.00	1.00	0.25	Pass
1,995.26	-0.40	-0.20	-1.00	1.00	0.25	Pass
2,511.89	-0.34	-0.04	-1.00	1.00	0.25	Pass
3,162.28	-0.52	-0.02	-1.00	1.00	0.25	Pass
3,981.07	-0.99	-0.19	-1.00	1.00	0.25	Pass
5,011.87	-1.32	-0.02	-1.50	1.50	0.25	Pass
6,309.57	-2.35	-0.35	-2.00	1.50	0.25	Pass
7,943.28	-3.08	-0.08	-2.50	1.50	0.25	Pass
10,000.00	-4.31	0.09	-3.00	2.00	0.25	Pass
12,589.25	-6.26	-0.06	-5.00	2.00	0.25	Pass
15,848.93	-8.76	-0.26	-16.00	2.50	0.25	Pass
19,952.62	-12.03	-0.83	-inf	3.00	0.25	Pass

-- End of measurement results--

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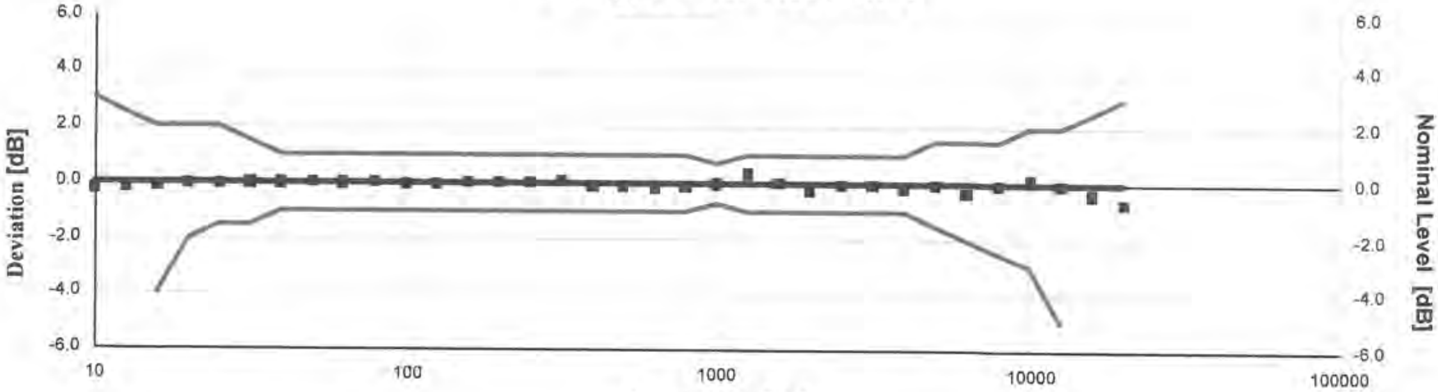
Z-weight Filter Response



Electrical signal test of frequency weighting performed according to IEC 61672-3:2013 13 and ANSI S1.4-2014 Part 3: 13 for compliance to IEC 61672-1:2013 5.5; IEC 60651:2001 6.1 and 9.2.2; IEC 60804:2000 5; ANSI S1.4:1983 (R2006) 5.1 and 8.2.1; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Deviation [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
10.00	-0.22	-0.22	-inf	3.00	0.25	Pass
12.59	-0.14	-0.14	-inf	2.50	0.25	Pass
15.85	-0.11	-0.11	-4.00	2.00	0.25	Pass
19.95	-0.02	-0.02	-2.00	2.00	0.25	Pass
25.12	-0.03	-0.03	-1.50	2.00	0.25	Pass
31.62	0.00	0.00	-1.50	1.50	0.25	Pass
39.81	-0.01	-0.01	-1.00	1.00	0.25	Pass
50.12	0.03	0.04	-1.00	1.00	0.25	Pass
63.10	0.00	0.00	-1.00	1.00	0.25	Pass
79.43	0.04	0.04	-1.00	1.00	0.25	Pass
100.00	-0.02	-0.02	-1.00	1.00	0.25	Pass
125.89	-0.06	-0.06	-1.00	1.00	0.25	Pass
158.49	0.02	0.02	-1.00	1.00	0.25	Pass
199.53	0.01	0.01	-1.00	1.00	0.25	Pass
251.19	0.02	0.02	-1.00	1.00	0.25	Pass
316.23	0.13	0.13	-1.00	1.00	0.25	Pass
398.11	-0.10	-0.10	-1.00	1.00	0.25	Pass
501.19	-0.11	-0.11	-1.00	1.00	0.25	Pass
630.96	-0.16	-0.16	-1.00	1.00	0.25	Pass
794.33	-0.13	-0.13	-1.00	1.00	0.25	Pass
1,000.00	0.00	0.00	-0.70	0.70	0.25	Pass
1,258.93	0.36	0.36	-1.00	1.00	0.25	Pass
1,584.89	0.04	0.04	-1.00	1.00	0.25	Pass
1,995.26	-0.24	-0.24	-1.00	1.00	0.25	Pass
2,511.89	-0.05	-0.05	-1.00	1.00	0.25	Pass
3,162.28	-0.03	-0.03	-1.00	1.00	0.25	Pass
3,981.07	-0.19	-0.19	-1.00	1.00	0.25	Pass
5,011.87	-0.04	-0.04	-1.50	1.50	0.25	Pass
6,309.57	-0.35	-0.35	-2.00	1.50	0.25	Pass
7,943.28	-0.05	-0.05	-2.50	1.50	0.25	Pass
10,000.00	0.16	0.16	-3.00	2.00	0.25	Pass
12,589.25	-0.02	-0.02	-5.00	2.00	0.25	Pass
15,848.93	-0.36	-0.36	-16.00	2.50	0.25	Pass
19,952.62	-0.70	-0.70	-inf	3.00	0.25	Pass

-- End of measurement results--

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High Level Stability

Electrical signal test of high level stability performed according to IEC 61672-3:2013 21 and ANSI S1.4-2014 Part 3: 21 for compliance to IEC 61672-1:2013 5.15 and ANSI S1.4-2014 Part 1: 5.15

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
High Level Stability	0.00	-0.10	0.10	0.01 ‡	Pass

-- End of measurement results--

Long-Term Stability

Electrical signal test of long term stability performed according to IEC 61672-3:2013 15 and ANSI S1.4-2014 Part 3: 15 for compliance to ISC 61672-1:2013 5.14 and ANSI S1.4-2014 Part 1: 5.14

Test Duration [min]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
34	0.00	-0.10	0.10	0.01 ‡	Pass

-- End of measurement results--

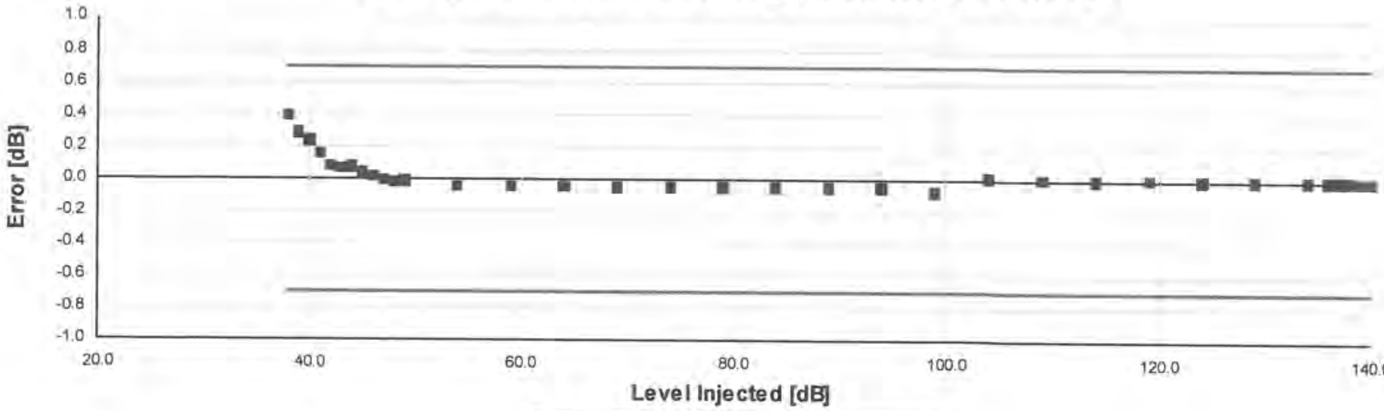
1 kHz Reference Levels

Frequency weightings and time weightings at 1 kHz (reference is A weighted Fast) performed according to IEC 61672-3:2013 14 and ANSI S1.4-2014 Part 3: 14 for compliance to IEC 61672-1:2013 5.5.9 and 5.8.3 and ANSI S1.4-2014 Part 1: 5.5.9 and 5.8.3

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
C weight	115.15	114.95	115.35	0.15	Pass
Z weight	115.14	114.95	115.35	0.15	Pass
Slow	115.15	115.05	115.25	0.15	Pass
Impulse	115.15	115.05	115.25	0.15	Pass

-- End of measurement results--

A-weighted Broadband Log Linearity: 8,000.00 Hz

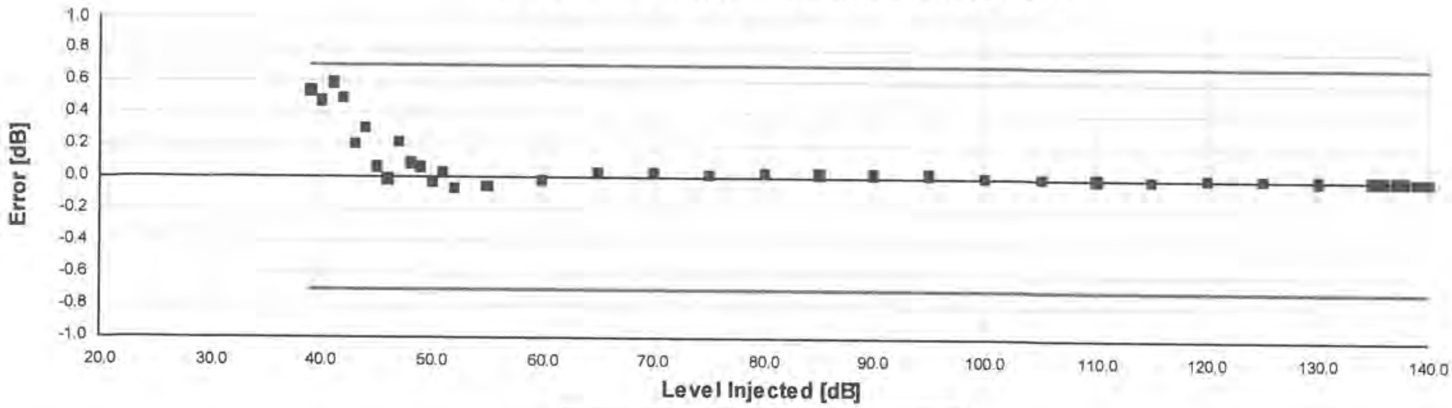


Broadband level linearity performed according to IEC 61672-3:2013 16 and ANSI S1.4-2014 Part 3: 16 for compliance to IEC 61672-1:2013 5.6, IEC 60804:2000 6.2, IEC 61252:2002 8, ANSI S1.4 (R2006) 6.9, ANSI S1.4-2014 Part 1: 5.6, ANSI S1.43 (R2007) 6.2

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
38.00	0.39	-0.70	0.70	0.16	Pass
39.00	0.29	-0.70	0.70	0.16	Pass
40.00	0.23	-0.70	0.70	0.16	Pass
41.00	0.16	-0.70	0.70	0.16	Pass
42.00	0.08	-0.70	0.70	0.16	Pass
43.00	0.07	-0.70	0.70	0.17	Pass
44.00	0.07	-0.70	0.70	0.17	Pass
45.00	0.04	-0.70	0.70	0.16	Pass
46.00	0.01	-0.70	0.70	0.16	Pass
47.00	-0.01	-0.70	0.70	0.16	Pass
48.00	-0.02	-0.70	0.70	0.16	Pass
49.00	-0.01	-0.70	0.70	0.16	Pass
54.00	-0.05	-0.70	0.70	0.16	Pass
59.00	-0.04	-0.70	0.70	0.16	Pass
64.00	-0.05	-0.70	0.70	0.16	Pass
69.00	-0.05	-0.70	0.70	0.16	Pass
74.00	-0.05	-0.70	0.70	0.16	Pass
79.00	-0.05	-0.70	0.70	0.16	Pass
84.00	-0.05	-0.70	0.70	0.16	Pass
89.00	-0.05	-0.70	0.70	0.16	Pass
94.00	-0.05	-0.70	0.70	0.16	Pass
99.00	-0.07	-0.70	0.70	0.16	Pass
104.00	0.01	-0.70	0.70	0.15	Pass
109.00	0.00	-0.70	0.70	0.15	Pass
114.00	0.00	-0.70	0.70	0.15	Pass
119.00	0.00	-0.70	0.70	0.15	Pass
124.00	0.00	-0.70	0.70	0.15	Pass
129.00	0.00	-0.70	0.70	0.15	Pass
134.00	0.00	-0.70	0.70	0.15	Pass
136.00	0.00	-0.70	0.70	0.15	Pass
137.00	0.00	-0.70	0.70	0.15	Pass
138.00	0.00	-0.70	0.70	0.15	Pass
139.00	-0.01	-0.70	0.70	0.15	Pass
140.00	-0.01	-0.70	0.70	0.15	Pass

-- End of measurement results--

1/1 Octave Log Linearity: 1,000.00 Hz



1/1 octave level linearity at normal range performed according to IEC 61260:2001 4.6, ANSI S.11 (R2009) 4.6

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
39.00	0.54	-0.70	0.70	0.16	Pass
40.00	0.48	-0.70	0.70	0.16	Pass
41.00	0.59	-0.70	0.70	0.16	Pass
42.00	0.49	-0.70	0.70	0.16	Pass
43.00	0.21	-0.70	0.70	0.16	Pass
44.00	0.31	-0.70	0.70	0.16	Pass
45.00	0.06	-0.70	0.70	0.16	Pass
46.00	-0.01	-0.70	0.70	0.16	Pass
47.00	0.22	-0.70	0.70	0.16	Pass
48.00	0.09	-0.70	0.70	0.16	Pass
49.00	0.06	-0.70	0.70	0.16	Pass
50.00	-0.03	-0.70	0.70	0.16	Pass
51.00	0.03	-0.70	0.70	0.16	Pass
52.00	-0.07	-0.70	0.70	0.16	Pass
55.00	-0.06	-0.70	0.70	0.16	Pass
60.00	-0.02	-0.70	0.70	0.16	Pass
65.00	0.03	-0.70	0.70	0.16	Pass
70.00	0.03	-0.70	0.70	0.16	Pass
75.00	0.02	-0.70	0.70	0.16	Pass
80.00	0.03	-0.70	0.70	0.16	Pass
85.00	0.02	-0.70	0.70	0.16	Pass
90.00	0.02	-0.70	0.70	0.16	Pass
95.00	0.03	-0.70	0.70	0.16	Pass
100.00	0.00	-0.70	0.70	0.15	Pass
105.00	0.01	-0.70	0.70	0.15	Pass
110.00	0.00	-0.70	0.70	0.15	Pass
115.00	0.00	-0.70	0.70	0.15	Pass
120.00	0.01	-0.70	0.70	0.15	Pass
125.00	0.00	-0.70	0.70	0.15	Pass
130.00	0.00	-0.70	0.70	0.15	Pass
135.00	0.00	-0.70	0.70	0.15	Pass
136.00	0.00	-0.70	0.70	0.15	Pass
137.00	0.00	-0.70	0.70	0.15	Pass
138.00	0.00	-0.70	0.70	0.15	Pass
139.00	0.00	-0.70	0.70	0.15	Pass
140.00	0.00	-0.70	0.70	0.15	Pass

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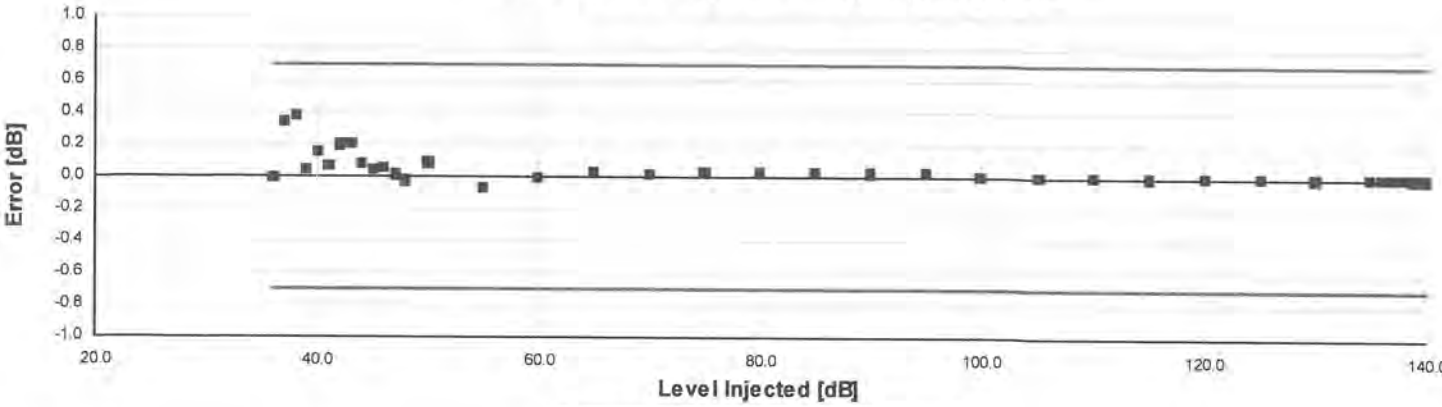
-- End of measurement results--

1/3 Octave Log Linearity: 1,000.00 Hz



1/3 octave level linearity at normal range performed according to IEC 61260:2001 4.6, ANSI S.11 (R2009) 4.6

Level [dB]	Error [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
36.00	-0.01	-0.70	0.70	0.16	Pass
37.00	0.34	-0.70	0.70	0.16	Pass
38.00	0.38	-0.70	0.70	0.16	Pass
39.00	0.04	-0.70	0.70	0.16	Pass
40.00	0.16	-0.70	0.70	0.16	Pass
41.00	0.06	-0.70	0.70	0.16	Pass
42.00	0.20	-0.70	0.70	0.16	Pass
43.00	0.20	-0.70	0.70	0.16	Pass
44.00	0.08	-0.70	0.70	0.17	Pass
45.00	0.04	-0.70	0.70	0.16	Pass
46.00	0.05	-0.70	0.70	0.16	Pass
47.00	0.01	-0.70	0.70	0.16	Pass
48.00	-0.03	-0.70	0.70	0.16	Pass
50.00	0.08	-0.70	0.70	0.16	Pass
55.00	-0.07	-0.70	0.70	0.16	Pass
60.00	-0.01	-0.70	0.70	0.16	Pass
65.00	0.03	-0.70	0.70	0.16	Pass
70.00	0.02	-0.70	0.70	0.16	Pass
75.00	0.03	-0.70	0.70	0.16	Pass
80.00	0.03	-0.70	0.70	0.16	Pass
85.00	0.03	-0.70	0.70	0.16	Pass
90.00	0.02	-0.70	0.70	0.16	Pass
95.00	0.03	-0.70	0.70	0.16	Pass
100.00	0.00	-0.70	0.70	0.15	Pass
105.00	0.01	-0.70	0.70	0.15	Pass
110.00	0.00	-0.70	0.70	0.15	Pass
115.00	0.00	-0.70	0.70	0.15	Pass
120.00	0.01	-0.70	0.70	0.15	Pass
125.00	0.00	-0.70	0.70	0.15	Pass
130.00	0.00	-0.70	0.70	0.15	Pass
135.00	0.00	-0.70	0.70	0.15	Pass
136.00	0.00	-0.70	0.70	0.15	Pass
137.00	0.00	-0.70	0.70	0.15	Pass
138.00	0.00	-0.70	0.70	0.15	Pass
139.00	0.00	-0.70	0.70	0.15	Pass
140.00	0.00	-0.70	0.70	0.15	Pass

-- End of measurement results--

Slow Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200	-7.56	-7.92	-6.92	0.15	Pass
	2	-27.18	-29.99	-25.99	0.15	Pass

-- End of measurement results--

Fast Detector

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-1.10	-1.48	-0.48	0.26	Pass
	2.00	-18.14	-19.49	-16.99	0.15	Pass
	0.25	-27.23	-29.99	-25.99	0.15	Pass

-- End of measurement results--

Sound Exposure Level

Toneburst response performed according to IEC 61672-3:2013 18 and ANSI S1.4-2014 Part 3: 18 for compliance to IEC 61672-1:2013 5.9, IEC 60651:2001 9.4.2, ANSI S1.4:1983 (R2006) 8.4.2 and ANSI S1.4-2014 Part 1: 5.9

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.00	200.00	-7.02	-7.49	-6.49	0.15	Pass
	2.00	-27.05	-28.49	-25.99	0.15	Pass
	0.25	-36.16	-39.02	-35.02	0.15	Pass

-- End of measurement results--

Peak C-weight

C-weighted peak sound level performed according to IEC 61672-3:2013 19 and ANSI S1.4-2014 Part 3: 19 for compliance to IEC 61672-1:2013 5.13 and ANSI S1.4-2014 Part 1: 5.13

Level [dB]	Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
135.00	31.50	138.19	135.50	139.50	0.15	Pass
135.00	500.00	138.55	137.50	139.50	0.15	Pass
135.00	8,000.00	137.75	136.40	140.40	0.15	Pass
135.00, Negative	500.00	137.17	136.40	138.40	0.15	Pass
135.00, Positive	500.00	137.16	136.40	138.40	0.15	Pass

-- End of measurement results--

Peak Z-weight

Z-weighted peak sound level performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration[µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
134.85	100	Negative Pulse	136.35	134.01	138.01	0.15	Pass
	100	Positive Pulse	136.16	134.00	138.00	0.15	Pass
124.85	100	Negative Pulse	126.15	124.00	128.00	0.15	Pass
	100	Positive Pulse	126.32	124.01	128.01	0.15	Pass
114.85	100	Negative Pulse	116.26	114.02	118.02	0.15	Pass
	100	Positive Pulse	116.37	114.02	118.02	0.15	Pass
104.85	100	Negative Pulse	106.33	104.01	108.01	0.15	Pass
	100	Positive Pulse	106.10	104.01	108.01	0.15	Pass

-- End of measurement results--

Overload Detector

Overload indication performed according to IEC 61672-3:2013 20 and ANSI S1.4-2014 Part 3: 20 for compliance to IEC 61672-1:2013 5.11, IEC 60804:2000 9.3.5, IEC 61252:2002 11, ANSI S1.4 (R2006) 5.8, and ANSI S1.4-2014 Part 1: 5.11, ANSI S1.25 (R2007) 7.6, ANSI S1.43 (R2007) 7

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
Positive	141.55	141.15	143.15	0.15	Pass
Negative	141.55	141.15	143.15	0.15	Pass
Difference	0.00	-1.50	1.50	0.15	Pass

-- End of measurement results--

Peak Rise Time

Peak rise time performed according to IEC 60651:2001 9.4.4 and ANSI S1.4:1983 (R2006) 8.4.4

Amplitude [dB]	Duration [µs]		Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
137.85	40	Negative Pulse	138.49	137.01	139.01	0.15	Pass
		Positive Pulse	138.48	137.00	139.00	0.15	Pass
	30	Negative Pulse	137.55	137.01	139.01	0.15	Pass
		Positive Pulse	137.57	137.00	139.00	0.15	Pass

-- End of measurement results--

Positive Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
136.85	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
126.85	3	-0.12	± 0.50	0.15 ‡	Pass
	5	-0.13	± 1.00	0.16 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
116.85	3	-0.12	± 0.50	0.15 ‡	Pass
	5	-0.12	± 1.00	0.15 ‡	Pass
	10	-0.25	± 1.50	0.15 ‡	Pass
106.85	3	-0.13	± 0.50	0.15 ‡	Pass
	5	-0.12	± 1.00	0.15 ‡	Pass
	10	-0.25	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Negative Pulse Crest Factor

200 µs pulse tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Crest Factor measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
136.85	3	OVLD	± 0.50	0.15 ‡	Pass
	5	OVLD	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
126.85	3	-0.12	± 0.50	0.15 ‡	Pass
	5	-0.11	± 1.00	0.15 ‡	Pass
	10	OVLD	± 1.50	0.15 ‡	Pass
116.85	3	-0.12	± 0.50	0.15 ‡	Pass
	5	-0.12	± 1.00	0.15 ‡	Pass
	10	-0.25	± 1.50	0.15 ‡	Pass
106.85	3	-0.14	± 0.50	0.15 ‡	Pass
	5	-0.13	± 1.00	0.15 ‡	Pass
	10	-0.25	± 1.50	0.15 ‡	Pass

-- End of measurement results--

Tone Burst

2kHz tone burst tests at 2.0, 12.0, 22.0, 32.0 dB below Overload Limit

Tone burst response measured according to IEC 60651:2001 9.4.2 and ANSI S1.4:1983 (R2006) 8.4.2

Amplitude [dB]	Crest Factor	Test Result [dB]	Limits [dB]	Expanded Uncertainty [dB]	Result
136.85	3	OVLD	± 0.50	0.15	Pass
	5	OVLD	± 1.00	0.15	Pass
126.85	3	-0.07	± 0.50	0.15	Pass
	5	0.01	± 1.00	0.15	Pass
116.85	3	-0.07	± 0.50	0.15	Pass
	5	0.00	± 1.00	0.15	Pass
106.85	3	-0.08	± 0.50	0.15	Pass
	5	-0.09	± 1.00	0.15	Pass

-- End of measurement results--

Impulse Detector - Repeat

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Repitition Rate [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	100.00	-2.89	-3.71	-1.71	0.15	Pass
	20.00	-7.59	-9.57	-5.57	0.20	Pass
	2.00	-8.78	-10.76	-6.76	0.15	Pass
Step	2.00	4.95	4.00	6.00	0.15	Pass

-- End of measurement results--

Impulse Detector - Single

Impulse Detector measured according to IEC 60651:2001 9.4.3 and ANSI S1.4:1983 (R2006) 8.4.3

Amplitude [dB]	Duration [ms]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
140	20.00	-3.74	-5.11	-2.11	0.15	Pass
	5.00	-8.91	-10.76	-6.76	0.16	Pass
	2.00	-12.62	-14.55	-10.55	0.16	Pass
Step	2.00	10.14	9.00	11.00	0.16	Pass

-- End of measurement results--

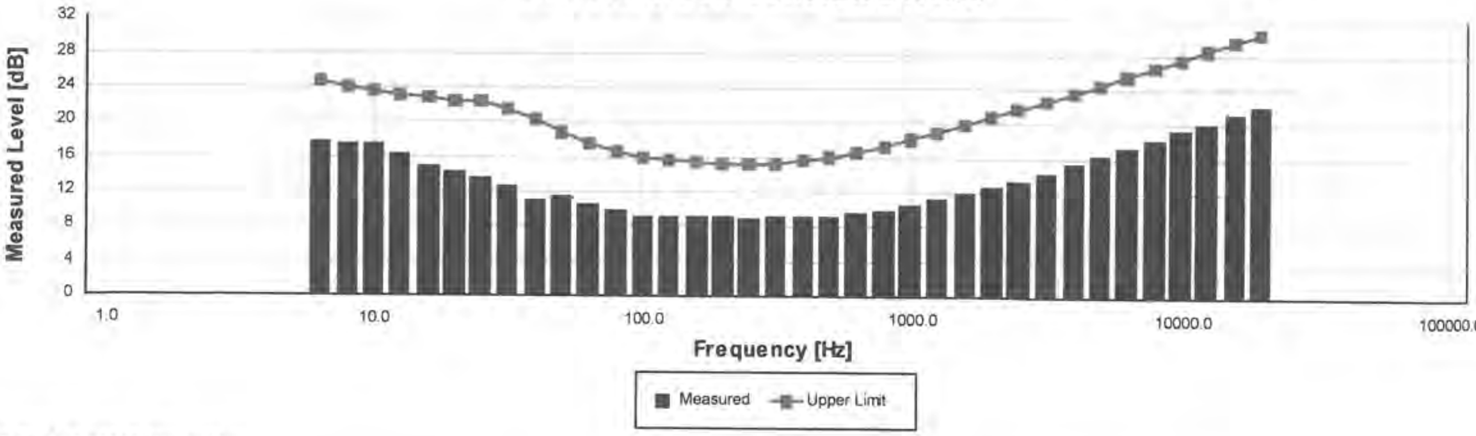
Gain

Gain measured according to IEC 61672-3:2013 17.3 and 17.4 and ANSI S1.4-2014 Part 3: 17.3 and 17.4

Measurement	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0 dB Gain	93.95	93.91	94.11	0.15	Pass
0 dB Gain, Linearity	41.14	40.31	41.71	0.16	Pass
OBA Low Range	94.01	93.91	94.11	0.15	Pass
OBA Normal Range	94.01	93.20	94.80	0.15	Pass

-- End of measurement results--

1/3-Octave Self-Generated Noise



The SLM is set to low range.

Frequency [Hz]	Test Result [dB]	Upper limit [dB]	Result
6.30	17.78	24.60	Pass
8.00	17.53	24.00	Pass
10.00	17.63	23.50	Pass
12.50	16.26	23.00	Pass
16.00	14.88	22.90	Pass
20.00	14.18	22.40	Pass
25.00	13.55	22.30	Pass
31.50	12.72	21.50	Pass
40.00	11.02	20.20	Pass
50.00	11.49	18.80	Pass
63.00	10.61	17.60	Pass
80.00	9.97	16.60	Pass
100.00	9.31	15.90	Pass
125.00	9.28	15.70	Pass
160.00	9.24	15.50	Pass
200.00	9.18	15.20	Pass
250.00	9.07	15.20	Pass
315.00	9.12	15.20	Pass
400.00	9.25	15.70	Pass
500.00	9.32	16.00	Pass
630.00	9.72	16.60	Pass
800.00	10.02	17.30	Pass
1,000.00	10.59	18.10	Pass
1,250.00	11.21	18.90	Pass
1,600.00	11.87	19.80	Pass
2,000.00	12.62	20.80	Pass
2,500.00	13.46	21.70	Pass
3,150.00	14.37	22.60	Pass
4,000.00	15.40	23.50	Pass
5,000.00	16.39	24.50	Pass
6,300.00	17.24	25.50	Pass
8,000.00	18.18	26.50	Pass
10,000.00	19.26	27.40	Pass
12,500.00	20.15	28.50	Pass
16,000.00	21.17	29.50	Pass
20,000.00	22.20	30.40	Pass

-- End of measurement results--

Broadband Noise Floor

Self-generated noise measured according to IEC 61672-3:2013 11.2 and ANSI S1.4-2014 Part 3: 11.2

Measurement	Test Result [dB]	Upper limit [dB]	Result
A-weight Noise Floor	26.86	36.00	Pass
C-weight Noise Floor	26.64	35.00	Pass
Z-weight Noise Floor	32.30	39.00	Pass

-- End of measurement results--

Total Harmonic Distortion

Measured using 1/3-Octave filters

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
10 Hz Signal	135.28	135.05	136.65	0.15	Pass
THD	-64.55		-58.00	0.01 ‡	Pass
THD+N	-61.08		-58.00	0.01 ‡	Pass

-- End of measurement results--

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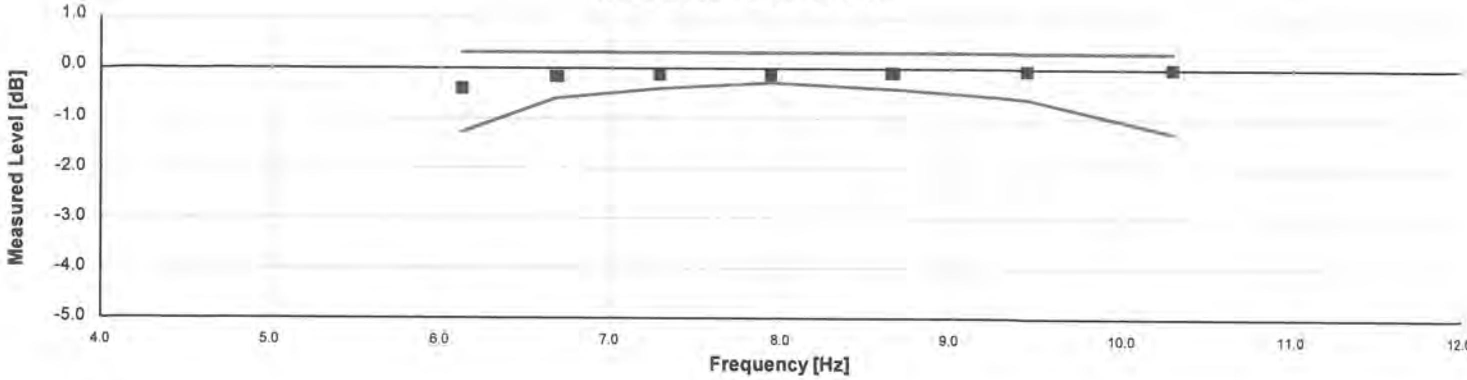
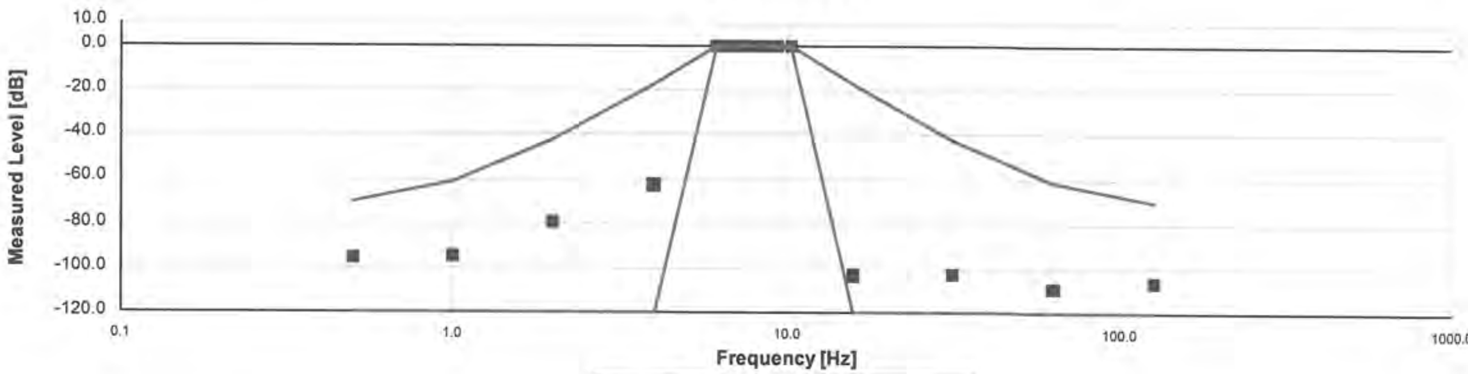
1681 West 820 North
Provo, UT 84601, United States
716-684-0001

1/1 Octave Filter: 8.0 Hz



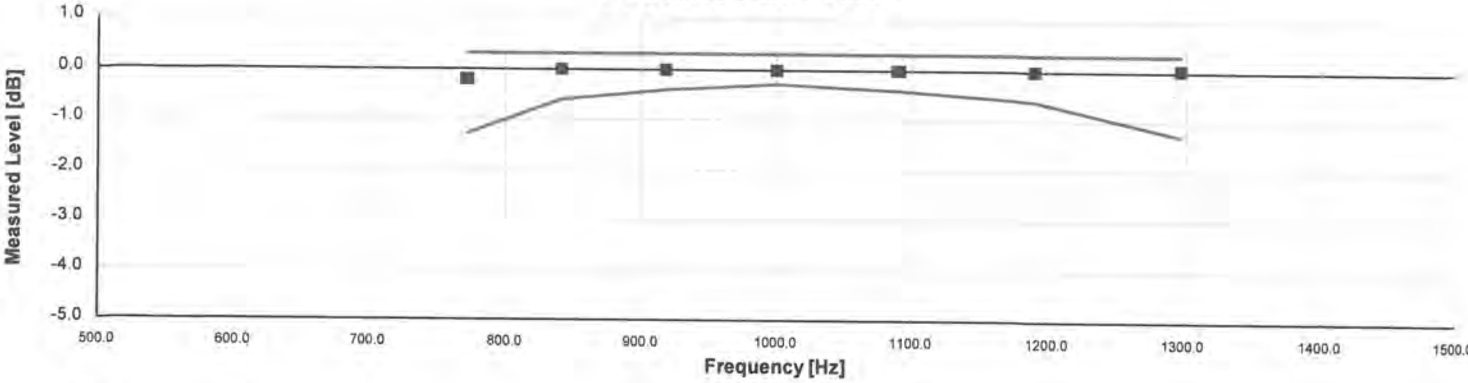


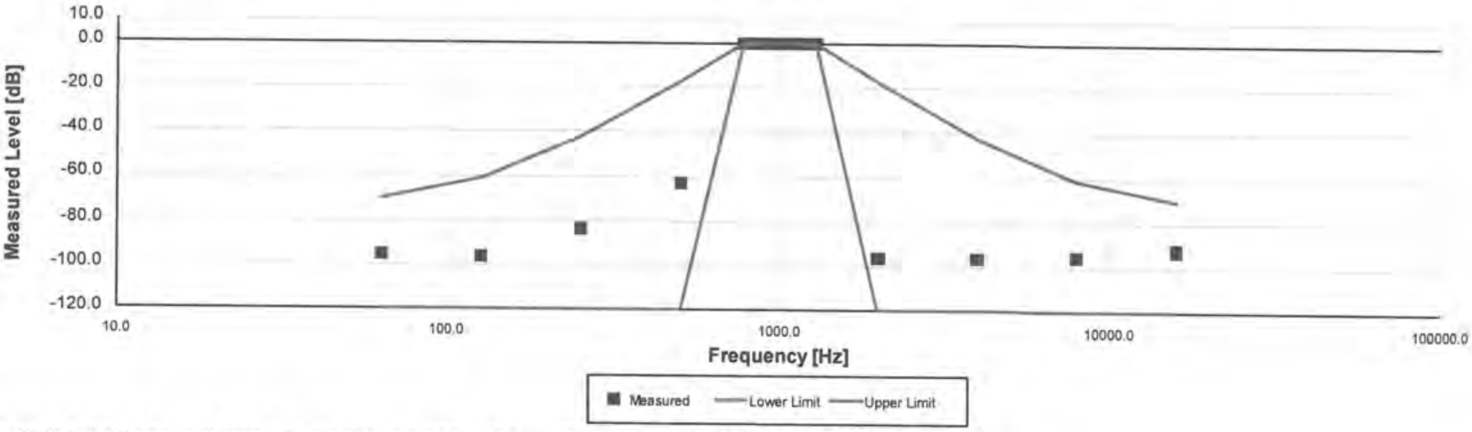
The SLM is set to normal range. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
0.50	-95.31	-inf	-70.00	2.70	Pass
1.00	-94.38	-inf	-61.00	2.00	Pass
2.00	-79.15	-inf	-42.00	0.29	Pass
3.98	-62.57	-inf	-17.50	0.34	Pass
6.13	-0.41	-1.30	0.30	0.15	Pass
6.68	-0.17	-0.60	0.30	0.15	Pass
7.29	-0.15	-0.40	0.30	0.15	Pass
7.94	-0.13	-0.30	0.30	0.15	Pass
8.66	-0.11	-0.40	0.30	0.15	Pass
9.44	-0.07	-0.60	0.30	0.15	Pass
10.29	-0.03	-1.30	0.30	0.15	Pass
15.85	-103.09	-inf	-17.50	1.30	Pass
31.62	-102.78	-inf	-42.00	1.70	Pass
63.10	-108.58	-inf	-61.00	1.50	Pass
125.89	-105.89	-inf	-70.00	1.60	Pass

-- End of measurement results--

1/1 Octave Filter: 1 kHz

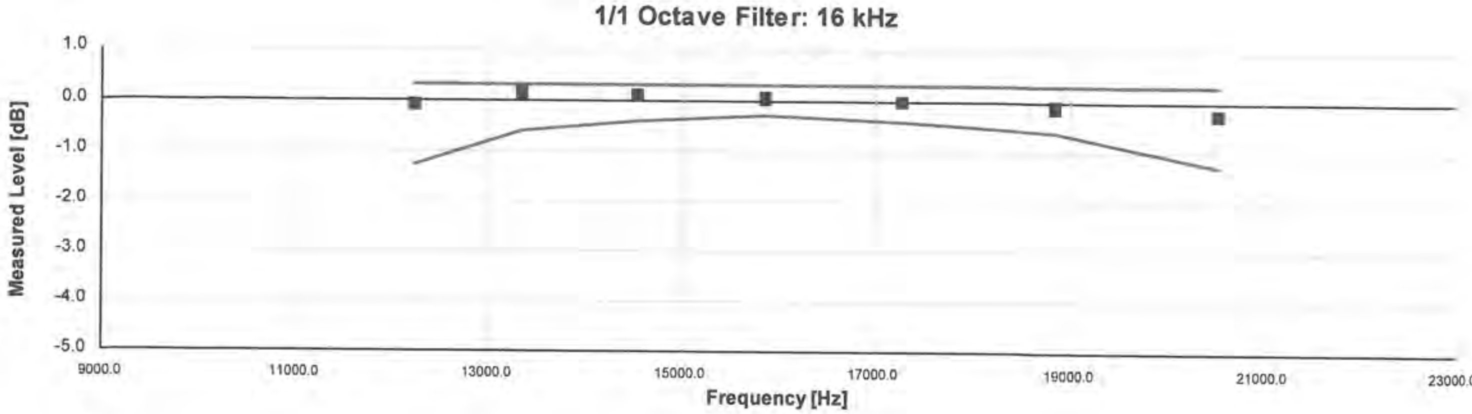


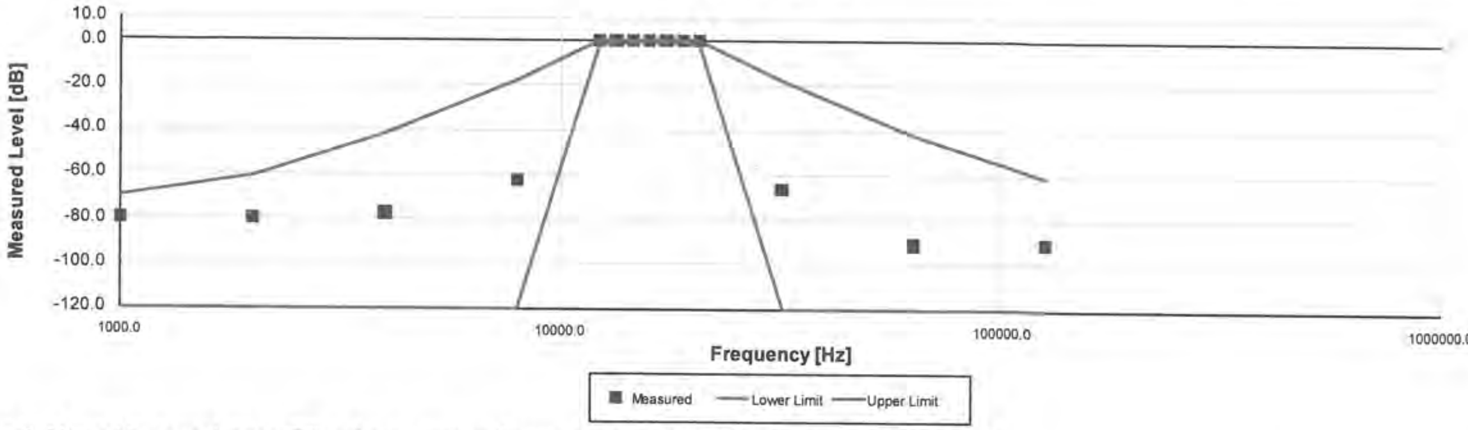


The SLM is set to normal range. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
63.10	-95.47	-inf	-70.00	0.27	Pass
125.89	-96.52	-inf	-61.00	0.28	Pass
251.19	-83.76	-inf	-42.00	0.18	Pass
501.19	-63.32	-inf	-17.50	0.15	Pass
771.79	-0.23	-1.30	0.30	0.15	Pass
841.40	-0.02	-0.60	0.30	0.15	Pass
917.28	-0.01	-0.40	0.30	0.15	Pass
1,000.00	0.00	-0.30	0.30	0.15	Pass
1,090.18	-0.02	-0.40	0.30	0.15	Pass
1,188.50	-0.01	-0.60	0.30	0.15	Pass
1,295.69	0.01	-1.30	0.30	0.15	Pass
1,995.26	-96.25	-inf	-17.50	0.27	Pass
3,981.07	-96.18	-inf	-42.00	0.31	Pass
7,943.28	-95.72	-inf	-61.00	0.26	Pass
15,848.93	-92.33	-inf	-70.00	0.26	Pass

-- End of measurement results--

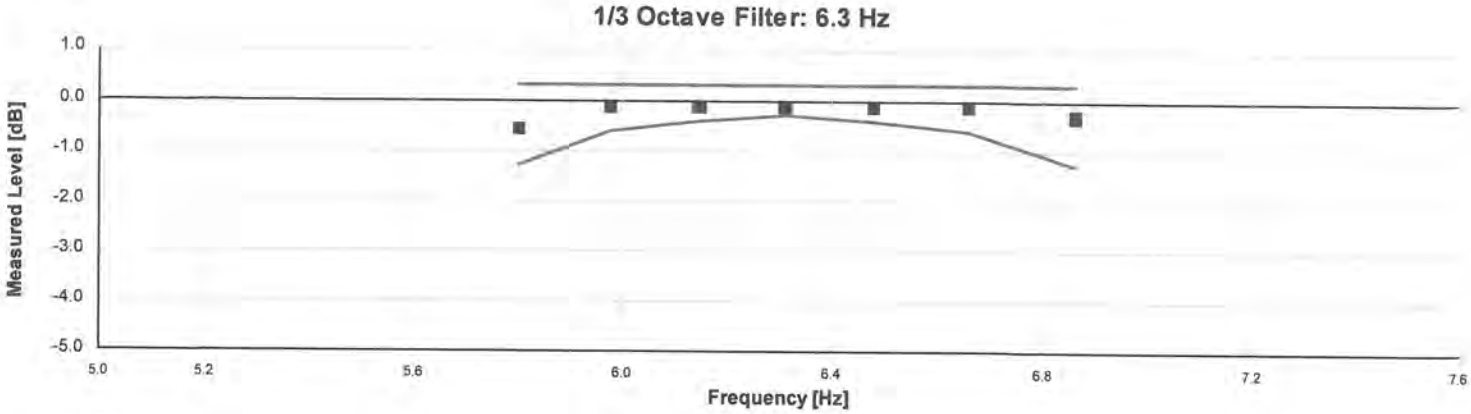


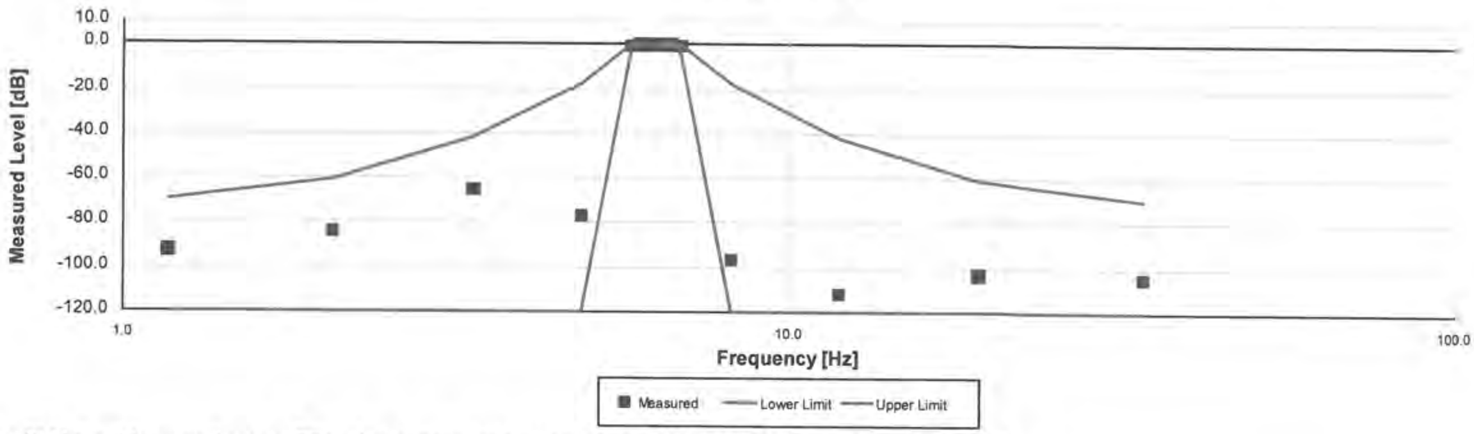


The SLM is set to normal range. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
1,000.00	-80.05	-inf	-70.00	0.16	Pass
1,995.26	-80.05	-inf	-61.00	0.16	Pass
3,981.07	-77.83	-inf	-42.00	0.15	Pass
7,943.28	-63.05	-inf	-17.50	0.17	Pass
12,232.07	-0.08	-1.30	0.30	0.15	Pass
13,335.21	0.12	-0.60	0.30	0.15	Pass
14,537.84	0.09	-0.40	0.30	0.15	Pass
15,848.93	0.05	-0.30	0.30	0.15	Pass
17,278.26	-0.02	-0.40	0.30	0.15	Pass
18,836.49	-0.11	-0.60	0.30	0.15	Pass
20,535.25	-0.24	-1.30	0.30	0.15	Pass
31,622.78	-66.74	-inf	-17.50	0.15	Pass
63,095.73	-91.08	-inf	-42.00	0.16	Pass
125,892.54	-90.92	-inf	-61.00	0.15	Pass

-- End of measurement results--

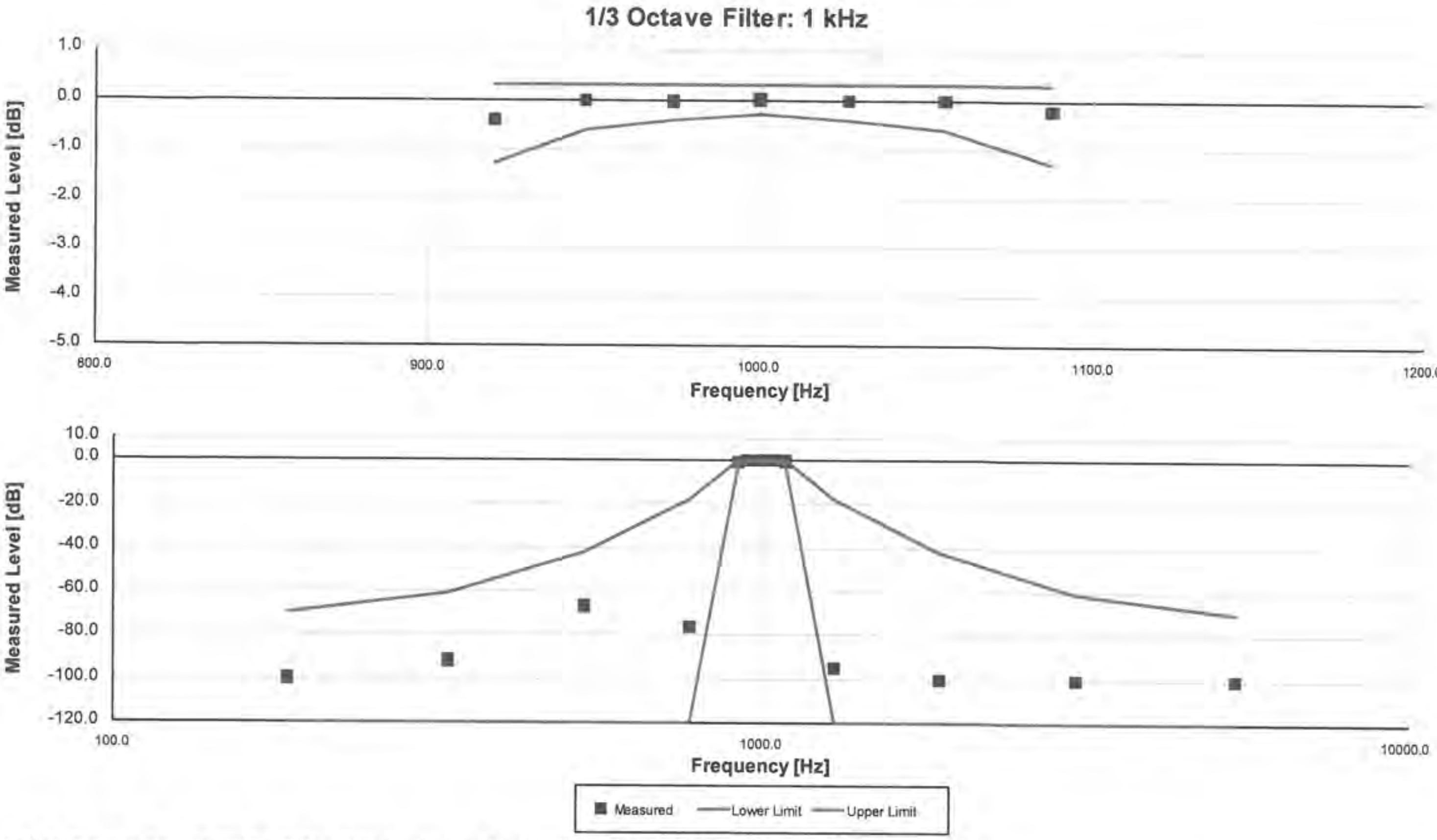




The SLM is set to normal range. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
1.17	-92.53	-inf	-70.00	1.90	Pass
2.07	-84.10	-inf	-61.00	0.21	Pass
3.35	-65.44	-inf	-42.00	0.15	Pass
4.87	-76.81	-inf	-17.50	0.15	Pass
5.80	-0.56	-1.30	0.30	0.15	Pass
5.98	-0.15	-0.60	0.30	0.15	Pass
6.15	-0.15	-0.40	0.30	0.15	Pass
6.31	-0.14	-0.30	0.30	0.15	Pass
6.48	-0.14	-0.40	0.30	0.15	Pass
6.66	-0.13	-0.60	0.30	0.15	Pass
6.86	-0.32	-1.30	0.30	0.15	Pass
8.17	-96.38	-inf	-17.50	0.36	Pass
11.87	-111.94	-inf	-42.00	1.50	Pass
19.27	-103.31	-inf	-61.00	1.80	Pass
34.02	-104.59	-inf	-70.00	0.63	Pass

-- End of measurement results--

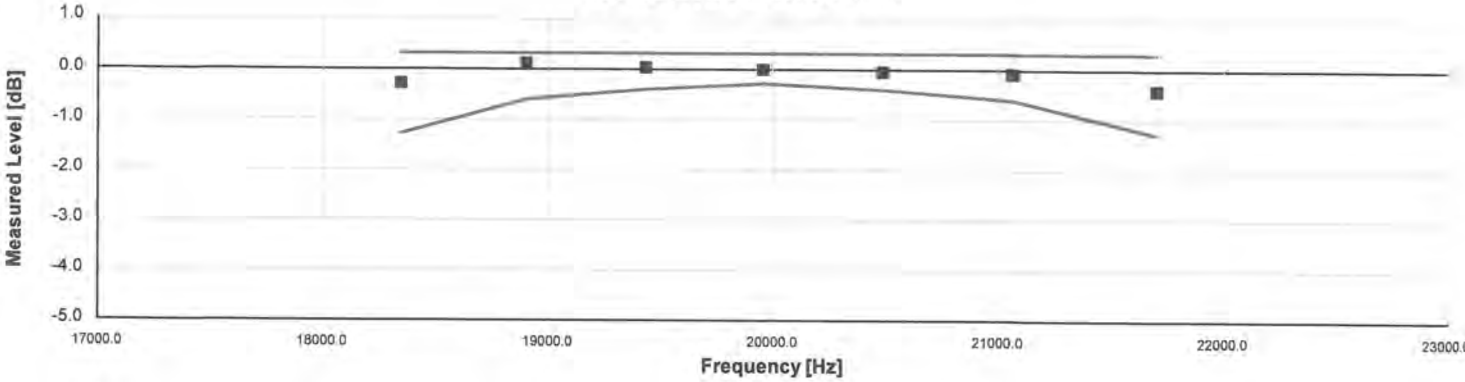


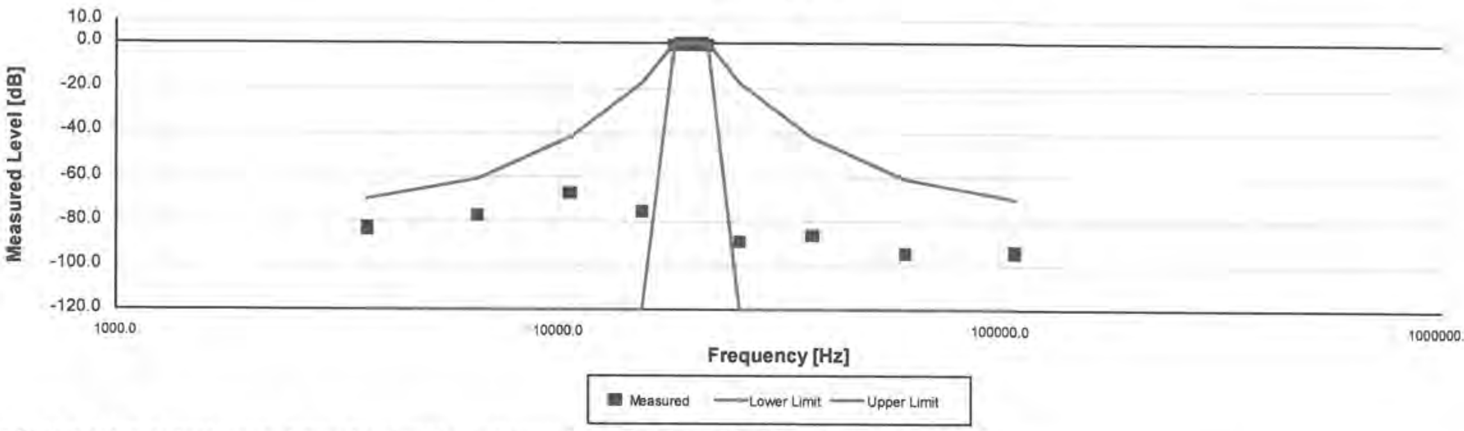
The SLM is set to normal range. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
185.46	-99.94	-inf	-70.00	0.31	Pass
327.48	-91.88	-inf	-61.00	0.16	Pass
531.43	-66.82	-inf	-42.00	0.15	Pass
772.57	-76.24	-inf	-17.50	0.15	Pass
919.58	-0.40	-1.30	0.30	0.15	Pass
947.19	0.00	-0.60	0.30	0.15	Pass
974.02	-0.04	-0.40	0.30	0.15	Pass
1,000.00	0.00	-0.30	0.30	0.15	Pass
1,026.67	0.00	-0.40	0.30	0.15	Pass
1,055.75	-0.01	-0.60	0.30	0.15	Pass
1,087.46	-0.22	-1.30	0.30	0.15	Pass
1,294.37	-95.32	-inf	-17.50	0.27	Pass
1,881.73	-100.30	-inf	-42.00	0.30	Pass
3,053.65	-100.57	-inf	-61.00	0.45	Pass
5,391.95	-100.21	-inf	-70.00	0.27	Pass

-- End of measurement results--

1/3 Octave Filter: 20 kHz





The SLM is set to normal range. Filter shape measured according to IEC 61260:2001 and ANSI S1.11:2004

Frequency [Hz]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
3,700.45	-83.11	-inf	-70.00	0.16	Pass
6,534.02	-76.95	-inf	-61.00	0.16	Pass
10,603.35	-67.39	-inf	-42.00	0.15	Pass
15,414.88	-75.61	-inf	-17.50	0.15	Pass
18,347.97	-0.29	-1.30	0.30	0.15	Pass
18,898.93	0.09	-0.60	0.30	0.15	Pass
19,434.23	0.03	-0.40	0.30	0.15	Pass
19,952.62	-0.02	-0.30	0.30	0.15	Pass
20,484.85	-0.04	-0.40	0.30	0.15	Pass
21,065.07	-0.10	-0.60	0.30	0.15	Pass
21,697.62	-0.41	-1.30	0.30	0.15	Pass
25,826.16	-89.22	-inf	-17.50	0.16	Pass
37,545.40	-86.48	-inf	-42.00	0.16	Pass
60,928.37	-94.10	-inf	-61.00	0.17	Pass
107,583.52	-93.85	-inf	-70.00	0.18	Pass

-- End of measurement results--

-- End of Report--

Signatory: *Ron Harris*

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Calibration Certificate

Certificate Number 2020006807

Customer:
Urban Crossroads Inc
260 East Baker Street
Costa Mesa, CA 92626, United States

Model Number	CAL200	***Procedure Number***	D0001.8386		
Serial Number	4656	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	19 Jun 2020		
Initial Condition	Adjusted	***Calibration Due***	19 Jun 2022		
		Temperature	25	°C	± 0.3 °C
Description	Larson Davis CAL200 Acoustic Calibrator	***Humidity***	32	%RH	± 3 %RH
		Static Pressure	101.3	kPa	± 1 kPa

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

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

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

The quality system is registered to ISO 9001:2015.

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

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

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	08/15/2019	08/15/2020	001021
Larson Davis Model 2900 Real Time Analyzer	04/02/2020	04/02/2021	001051
Microphone Calibration System	03/03/2020	03/03/2021	005446
1/2" Preamplifier	09/17/2019	09/17/2020	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/06/2019	08/06/2020	006507
1/2 inch Microphone - RI - 200V	12/06/2019	12/06/2020	006511
Pressure Transducer	06/24/2019	06/24/2020	007310

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Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.2	114.01	113.80	114.20	0.14	Pass
94	101.3	94.00	93.80	94.20	0.14	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
114	101.2	999.95	990.00	1,010.00	0.20	Pass
94	101.3	999.95	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
114	101.2	0.39	0.00	2.00	0.25 ‡	Pass
94	101.3	0.39	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 23 °C, 35 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	107.9	-0.01	-0.30	0.30	0.04 ‡	Pass
101.3	101.3	0.00	-0.30	0.30	0.04 ‡	Pass
92.0	91.9	0.01	-0.30	0.30	0.04 ‡	Pass
83.0	83.0	0.01	-0.30	0.30	0.04 ‡	Pass
74.0	74.0	0.00	-0.30	0.30	0.04 ‡	Pass
65.0	65.0	-0.02	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 23 °C, 35 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	107.9	0.01	-10.00	10.00	0.20 ‡	Pass
101.3	101.3	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.9	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	83.0	-0.01	-10.00	10.00	0.20 ‡	Pass
74.0	74.0	-0.01	-10.00	10.00	0.20 ‡	Pass
65.0	65.0	-0.02	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

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

Tested at: 114 dB, 23 °C, 35 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	107.9	0.40	0.00	2.00	0.25 ‡	Pass
101.3	101.3	0.39	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.38	0.00	2.00	0.25 ‡	Pass
83.0	83.0	0.38	0.00	2.00	0.25 ‡	Pass
74.0	74.0	0.38	0.00	2.00	0.25 ‡	Pass
65.0	65.0	0.40	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

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

Tested at: 114 dB, 23 °C, 35 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	107.9	0.40	0.00	2.00	0.25 ‡	Pass
101.3	101.3	0.39	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.38	0.00	2.00	0.25 ‡	Pass
83.0	83.0	0.38	0.00	2.00	0.25 ‡	Pass
74.0	74.0	0.38	0.00	2.00	0.25 ‡	Pass
65.0	65.0	0.40	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

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Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.2	113.96	113.80	114.20	0.14	Pass
94	100.9	93.94	93.80	94.20	0.14	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
114	101.2	999.96	990.00	1,010.00	0.20	Pass
94	100.9	999.97	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
114	101.2	0.39	0.00	2.00	0.25 ‡	Pass
94	100.9	0.39	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 23 °C, 35 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	107.9	-0.01	-0.30	0.30	0.04 ‡	Pass
101.3	101.3	0.00	-0.30	0.30	0.04 ‡	Pass
92.0	91.9	0.01	-0.30	0.30	0.04 ‡	Pass
83.0	83.0	0.01	-0.30	0.30	0.04 ‡	Pass
74.0	74.0	0.00	-0.30	0.30	0.04 ‡	Pass
65.0	65.0	-0.02	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 23 °C, 35 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	107.9	0.01	-10.00	10.00	0.20 ‡	Pass
101.3	101.3	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.9	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	83.0	-0.01	-10.00	10.00	0.20 ‡	Pass
74.0	74.0	-0.01	-10.00	10.00	0.20 ‡	Pass
65.0	65.0	-0.02	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Initial Assessment

Certificate Number 2020006801

Customer:
Urban Crossroads Inc
260 East Baker Street
Costa Mesa, CA 92626, United States

Model Number	CAL200
Serial Number	4656
Test Results	**Pass**
Initial Condition	As Received
Description	Larson Davis CAL200 Acoustic Calibrator

Procedure Number	D0001.8386		
Technician	Scott Montgomery		
Calibration Date	19 Jun 2020		
Calibration Due	19 Jun 2022		
Temperature	24	°C	± 0.3 °C
Humidity	34	%RH	± 3 %RH
Static Pressure	100.9	kPa	± 1 kPa

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

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

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

The quality system is registered to ISO 9001:2015.

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

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

Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	08/15/2019	08/15/2020	001021
Larson Davis Model 2900 Real Time Analyzer	04/02/2020	04/02/2021	001051
Microphone Calibration System	03/03/2020	03/03/2021	005446
1/2" Preamplifier	09/17/2019	09/17/2020	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/06/2019	08/06/2020	006507
1/2 inch Microphone - RI - 200V	12/06/2019	12/06/2020	006511
Pressure Transducer	06/24/2019	06/24/2020	007310

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IEC 61672-3 – Section 17 – Level Linearity including Range Control

Range	Level	Applied	Measure	Error	Tolerance	PASS / FAIL
Low	Ref.	94,0	94,0	---	---	---
Low	UR+5dB	36,3	36,6	0,3	1,1	Pass
High	Ref.	94,0	94,0	0,0	1,1	Pass
High	UR+5dB	52,3	52,5	0,2	1,1	Pass

IEC 61672-3 – Section 18 – ToneBurst Response

Tb(ms)	Data	Applied	Measure	Meas. Diff.	Target Diff.	Error	Tolerance	PASS / FAIL
200	LASmax	106,2	98,8	-7,4	-7,4	0,0	±1,0	Pass
2	LASmax	106,2	79,2	-27,0	-27,0	0,0	1,0; -5,0	Pass
200	LAFmax	106,2	105,1	-1,1	-1,0	-0,1	±1,0	Pass
2	LAFmax	106,2	87,9	-18,3	-18,0	-0,3	1,0; -2,5	Pass
0,25	LAFmax	106,2	78,8	-27,4	-27,0	-0,4	1,5; -5,0	Pass
200	LAE	106,2	99,3	-6,9	-7,0	0,1	±1,0	Pass
2	LAE	106,2	79,3	-26,9	-27,0	0,1	1,0; -2,5	Pass
0,25	LAE	106,2	70,2	-36,0	-36,0	0,0	1,5; -5,0	Pass

IEC 61672-3 – Section 19 – C-Weighted Peak Sound Level

Freq.	Cycle	Applied	Meas.	Meas. Diff.	Target Diff.	Error	Tolerance	PASS / FAIL
31,5Hz	1 (Full)	121,2	124,3	3,1	2,5	0,6	±3,0	Pass
500Hz	1 (Full)	124,3	127,9	3,6	3,5	0,1	±2,0	Pass
8kHz	1 (Full)	121,2	124,5	3,3	3,4	-0,1	±3,0	Pass
500Hz	½ (Pos.)	124,3	126,1	1,8	2,4	-0,6	±2,0	Pass
500Hz	½ (Neg.)	124,3	126,1	1,8	2,4	-0,6	±2,0	Pass

IEC 61672-3 – Section 20 – Overload Indication

Low Range

Data	Freq.	Overload (+)	Overload (-)	Error	Tolerance	PASS / FAIL
LZE	4kHz	69,6	69,9	0,3	±1,5	Pass
LCE	4kHz	69,0	69,2	0,2	±1,5	Pass
LAE	4kHz	69,9	70,1	0,2	±1,5	Pass
LZpk	4kHz	111,3	111,5	0,2	±1,5	Pass
LCpk	4kHz	110,5	110,7	0,2	±1,5	Pass

High Range

Data	Freq.	Overload (+)	Overload (-)	Error	Tolerance	PASS / FAIL
LZE	4kHz	89,7	89,7	0,0	±1,5	Pass
LCE	4kHz	89,1	89,0	0,1	±1,5	Pass
LAE	4kHz	89,9	89,9	0,0	±1,5	Pass
LZpk	4kHz	131,2	131,3	0,1	±1,5	Pass
LCpk	4kHz	130,5	130,5	0,0	±1,5	Pass

IEC 61672-3 – Section 21 – High-level Stability

Initial	Final	Error	Tolerance	PASS / FAIL
127,3	127,3	0,0	0,3	Pass

Soft dB
WWW.SOFTDB.COM

1040, Avenue Belvedere, Suite 215
Quebec, Qc, Canada, G1S 3G3
1 (418) 686-0993
Email: info@softdb.com
www.softdb.com

P

Calibration Certificate No. P02QC2020043003

20/04/30

Instrument

Type: Integrating Averaging Sound Level Meter
Model: Piccolo-II
SN: P0220043003
Class: 2
Mic Sensitivity: 15,34mV/Pa (-1,3 dB from nominal)

Standards

Tested in accordance with procedures from ANSI/ASA S1.4-3 (2014) / IEC 61672-3 (2013) Electroacoustics - Sound Level Meters - Part 3: Periodic tests

Calibration Instruments

Description	Manufacturer	Model	Serial Number
Function Generator	Stanford Research Systems	DS360	33623
Multi-function Calibrator	Brüel & Kjær	4226	1551588

Environmental Conditions

Temperature	Barometric Pressure	Humidity
23,3°C	102,1kPa	54%

Personnel

Calibrated by: Sébastien Pomerleau, Tech — Date : 20/04/30

Summary

Description	PASS / FAIL
Section 11.1 – Self-generated noise (Microphone)	Pass
Section 11.2 – Self-generated noise (Electrical input)	Pass
Section 12 – Acoustical signal tests of frequency weightings	Pass
Section 13 – Electrical signal tests of frequency weightings	Pass
Section 14 – Frequency and time weightings at 1 kHz	Pass
Section 15 – Long-term stability	Pass
Section 16 – Level linearity on the reference level range	Pass
Section 17 – Level linearity including range control	Pass
Section 18 – Toneburst response	Pass
Section 19 – C-weighted peak sound level	Pass
Section 20 – Overload indication	Pass
Section 21 – High-level stability	Pass

Declaration of Conformity

The sound level meter submitted for testing has successfully completed the Class 2 tests of ANSI/ASA S1.4-3 (2014) / IEC 61672-3 (2013) (limited to sections 11, 12 , 13, 14, 15, 16, 17, 18, 19, 20 and 21), for the environment conditions under which the tests were performed.