

TECHNICAL APPENDICES

“A” – Parking & Trip Generation Analysis

“B” – Noise/Acoustical Assessment

"A"

Parking & Trip Generation Analysis

MEMORANDUM

To: Art Piñon
City of San Marcos

Date: December 1, 2015

From: K.C. Yellapu, P.E.
Erika Carino, E.I.T.
LLG, Engineers

LLG Ref: 3-15-2522

Subject: Shooting Range Parking & Trip Generation Analysis Results

Linscott, Law & Greenspan, Engineers (LLG) has prepared this memorandum to evaluate the proposed parking rate & trip generation rate for the North County Shooting Range project.

PARKING

Currently, the San Marcos Municipal Code (SMMC) does not identify a parking requirement for indoor firearm shooting ranges. However, City staff is recommending that the SMMC be revised to include the following parking rate:

- Shooting Lanes: 1.25 spaces/lane
- Retail within the Shooting Center: Per SMMC (i.e. 1 space/250 SF)
- Storage within the Shooting Center: 1 space/4,000 SF

To validate the above recommendations, LLG collected parking data at three shooting ranges to determine a peak parking demand rate. The three sites were chosen based on their physical and operational similarities to the proposed project (See *Table 1*). Due to privacy issues, the names of the shooting ranges are not provided.

TABLE 1
SHOOTING RANGE CHARACTERISTIC

	Building Square Footage	Hours of Operations	Retail/Rental	Location	Shooting Lane Type	Number of Shooting Lanes
Site #1	Approx. 10 KSF	10-10	Yes	Suburban	Indoor	24
Site #2	Approx. 10 KSF	M-Sat: 10-7 Sun: 12-7	Yes	Urban	Indoor	14
Site #3	Approx. 8 KSF	10-10	Yes	Urban	Indoor	15

Data was collected several times during both weekdays and weekends. *Table 2* tabulates the highest peak parking demand rate observed as well as parking rates for a bowling center and a driving range for comparative purposes (other traffic consultants have used these land use categories to estimate parking for shooting ranges). It is important to note that data collected does not distinguish between those that came to the retail portion only, to the shooting range only or both. Therefore, the parking rates calculated in *Table 2* are inclusive of the site's retail portion. *Attachment A* contains that count data.

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TABLE 2
PEAK DEMAND PARKING RATE

For Comparative Purposes		Parking Rate Per Lane	Parking Rate Per Total KSF
	Site #1	1.17	2.73
	Site #2	0.88	1.19
	Site #3	1.20	2.25
	Golf Driving Range ^a	1.00 ^b	No Rate
	Bowling Center ^a	4.00 ^b	No Rate

Footnotes

- a. Based on the City of Escondido Municipal Code
- b. Not inclusive of employee parking

Based on *Table 2*, the highest observed parking demand was 1.2 spaces/lane or 2.73 spaces/KSF. Per the above parking demand assessment, the City recommended parking rate is conservative and therefore is recommended for shooting range projects.

Based on the City's recommended parking rate, the proposed project site would need to provide 41 parking spaces. Per the site plan contained in *Attachment B*, the project is proposing 41 parking spaces. Below is the table depicting the calculations.

TABLE 3
PROPOSED PROJECT PARKING CALCULATION

Use	Qty	Type	Rate	Total Parking
Indoor Shooting Range Lanes	20	Lanes	1.25/lane	25
Retail	3695	SF	1/250 SF	15
Storage	4079	SF	1/4000 SF	1
Total Required Parking				41

TRIP GENERATION

ITE's *Trip Generation Manual* and SANDAG's *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region* do not identify a trip generation rate specifically for a shooting range. These documents do provide a bowling center trip rate and a driving range trip rate, which have been utilized by other traffic consultants to represent a shooting range.

LLG conducted data collection at Site #1 and Site #2 to determine the peak hour trip rate. As seen in the *Table 1*, both contain indoor shooting lanes and a retail front, similar to the proposed project. As previously mentioned the data collected does not distinguish between those that came to the retail portion only, to the shooting range only or both, therefore the trip rates per lane are inclusive of the retail portion of each site. *Table 4* tabulates the site-specific trip rates and the trips rates for a driving range

and a bowling alley for comparative purposes. *Attachment C* contains the count data. It should be noted that both the study sites had similar square footage and generated a similar amount of traffic. Therefore, even though the trip rate per lane is different, the trip rate per square footage are similar.

TABLE 4
TRIP GENERATION RATE

		AM Peak Hour			PM Peak Hour	
		ADT Trip Rate Per Lane	Trip Rate Per Lane	In:Out Split	Trip Rate Per Lane	In:Out Split
For Comparative Purposes	Site #1	6.46	0.042	100:0	0.83	40:60
	Site #2	18.86	0.071	100:0	1.64	48:52
	Golf Driving Range ^a	14.00	0.40	70:30	1.25	50:50
	Bowling Center ^a	30.00	2.10	70:30	3.30	40:60

Footnotes:

a. Based on trip rates obtained from the SANDAG

As seen in *Table 4*, a shooting range closely resembles a golf driving range. Both facilities are set up with individual lanes, both offer rental equipment, and both are recreational uses. Although these characteristics also apply to a bowling alley, a bowling alley attracts larger groups of people, offers different activities (e.g. leagues/competition, billiards, arcades, etc.), and the social characteristics are much different from that of a shooting range. Instead of using the average of two sites, to be conservative, the higher trip for Site #2 is recommended for shooting range projects. The above assumes that the site will open after 9 AM. Golf driving range rates for AM Peak Hour are recommended for sites that open before 9 AM. It should be noted that the above data collection is deemed adequate to estimate the trip rate for future shooting range projects due to the similarity in the trips generated (based on the square footage), the conservative assumption of using the higher of all two sites, the low traffic generation from each site and the fact that the trips are consistent with a similar type of land use (i.e. golf driving range).

Table 5 tabulates the trips generated for the proposed site. This calculation assumes that the proposed project, similar to other shooting ranges, will open for business at 10 AM. Also, to be conservative, even though the project is proposing to relocate existing retail in San Marcos, no additional trip credits were applied.

TABLE 5
WEEKDAY TRIP GENERATION

Land Use	Quantity	Daily Trip Ends (ADT)	AM Peak Hour (7AM-9AM)					PM Peak Hour (4PM-6PM)				
			Trip Rate	In:Out Split	Volume			Trip Rate	In:Out Split	Volume		
					In	Out	Total			In	Out	Total
Shooting Range	20 Lanes	378	0.071/Lane	100 : 0	1	0	1	1.64/Lane	48 : 52	16	17	33

Based on SANTEC/ITE's guidelines for traffic impact studies (TIS) in the San Diego Region, a TIS should be prepared for projects that generate traffic greater than 1,000 total average daily trips or 100 peak hour trips. Based on the above, the project generates less than 1,000 ADT and less than 100 peak hours trips. Therefore, per SANTEC/ITE guidelines, a traffic impact study is not required for the proposed project.

Please call if you have any questions.

cc: File



ATTACHMENT A

**DATA COLLECTION
PARKING COUNTS**

Site #1 – 24 Lanes	
Tuesday October 20, 2015	
Time	Number of Parked Vehicles
2:50 PM	16
6:15 PM	18
Saturday October 24, 2015	
11:50 AM	15
12:56 PM	25
2:45 PM	28

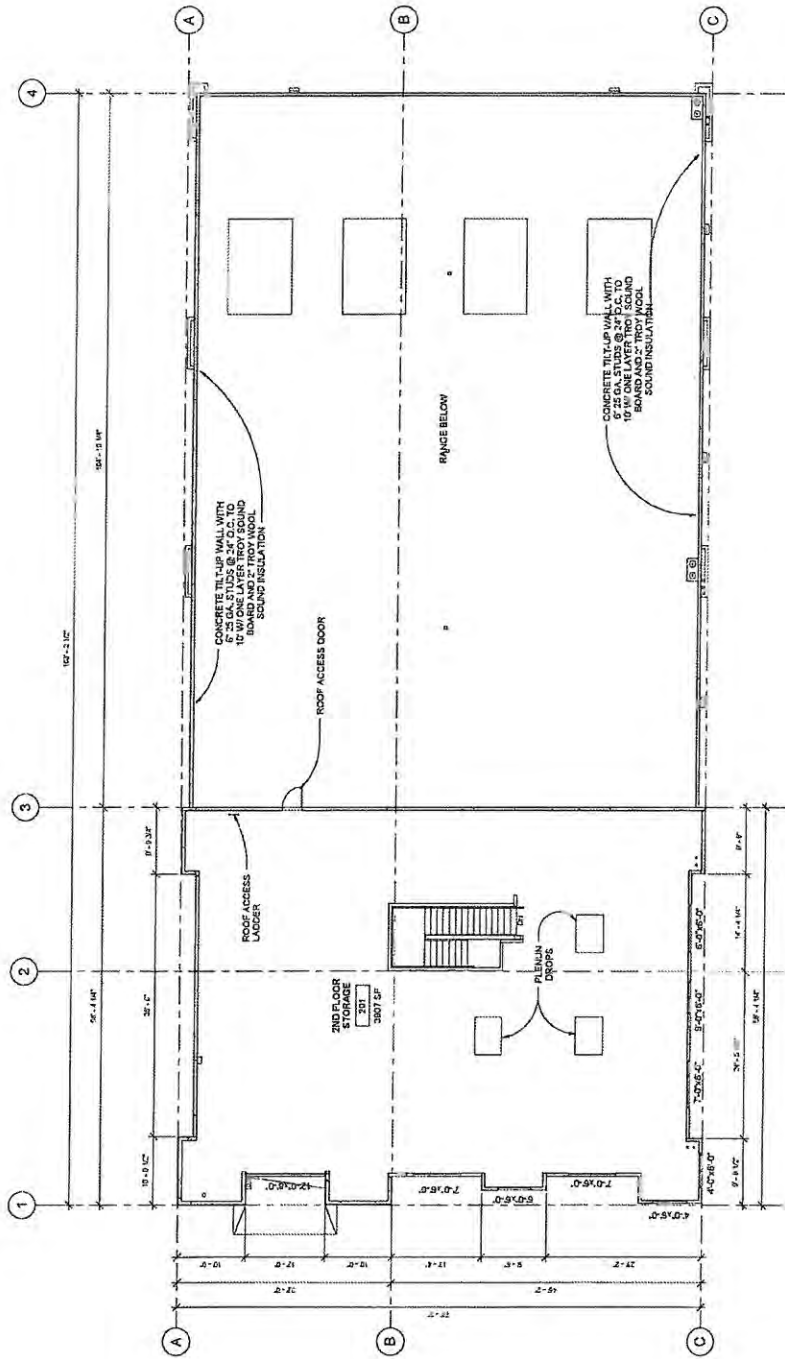
Site # 2 – 14 Lanes	
Thursday October 15, 2015	
Time	Number of Parked Vehicles
5:30 PM	10
6:30 PM	12
Saturday October 24, 2015	
12:00 PM	9
1:00 PM	11

Site # 3 – 15 Lanes	
Saturday November 7, 2015	
Time	Number of Parked Vehicles
12:30 PM	18

ATTACHMENT B



2147 P



LEVEL 2 FLOOR PLAN PLANNING ① ② ③ ④

NO.	DATE	REVISION

**NORTH COUNTY
SHOOTING CENTER**
1440 DESCANSO AVE
SAN MARCOS, CA 92069

HB&A
ARCHITECTS

PROJECT: NORTH COUNTY SHOOTING CENTER
DATE: 09/12/18
SHEET: 2 OF 2

A2.1P

LEVEL 2 FLOOR PLAN

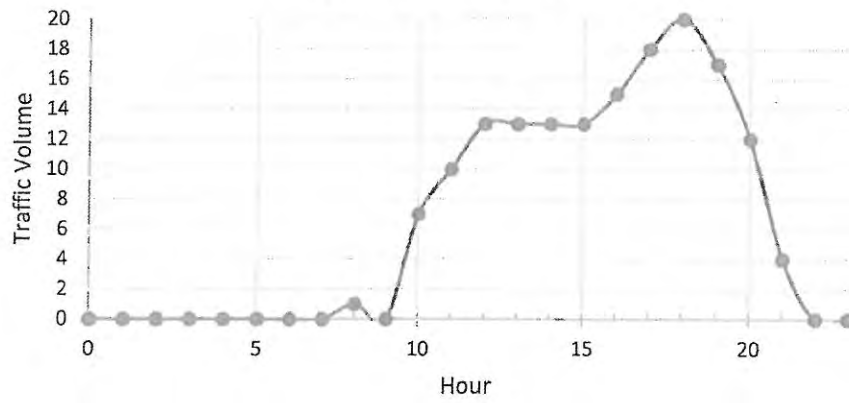
ATTACHMENT C

**DATA COLLECTION
PEAK PERIOD DRIVEWAY COUNTS**

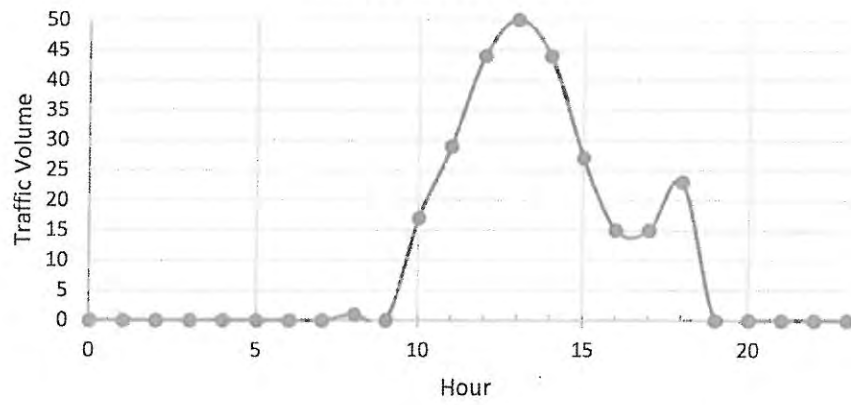
Site # 1 – 24 Lanes		
Tuesday October 20, 2015		
Time	In	Out
7:00-7:15 AM	0	0
7:15-7:30 AM	0	0
7:30-7:45 AM	0	0
7:45-8:00 AM	0	0
8:00-8:15 AM	0	0
8:15-8:30 AM	0	0
8:30-8:45 AM	0	0
8:45-9:00 AM	1	0
AM Total	1	0
AM Peak Hour Volume	1	0
4:00-4:15 PM	1	0
4:15-4:30 PM	0	1
4:30-4:45 PM	0	2
4:45-5:00 PM	2	1
5:00-5:15 PM	2	4
5:15-5:30 PM	3	4
5:30-5:45 PM	1	2
5:45-6:00 PM	2	2
PM Total	15	17
PM Peak Hour Volume	8	12

Site # 2 – 14 Lanes		
Thursday October 15, 2015		
Time	In	Out
7:00-7:15 AM	0	0
7:15-7:30 AM	0	0
7:30-7:45 AM	0	0
7:45-8:00 AM	0	0
8:00-8:15 AM	0	0
8:15-8:30 AM	0	0
8:30-8:45 AM	1	0
8:45-9:00 AM	0	0
AM Total	1	0
AM Peak Hour Total	1	0
4:00-4:15 PM	0	1
4:15-4:30 PM	1	0
4:30-4:45 PM	1	2
4:45-5:00 PM	1	2
5:10-5:25 PM	3	8
5:25-5:40 PM	5	0
5:40-5:55 PM	2	2
5:55-6:10 PM	1	2
PM Total	15	17
PM Peak Hour Total	11	12

Site #1 - 24 Lanes
Tuesday October 20



Site #2 - 14 Lanes
Thursday October 15



“B”

Noise/Acoustical Assessment

December 2015

ACOUSTICAL ASSESSMENT

North County Shooting Center

PREPARED BY:

Michael Baker
INTERNATIONAL

Michael Baker

I N T E R N A T I O N A L

ACOUSTICAL ASSESSMENT
for the
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San Marcos, California

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December 1, 2015

JN 149164

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DEFINITIONS OF COMMONLY USED TERMS IN NOISE CONTROL

The definitions that follow are in general agreement with those contained in publications of various professional organizations, including the American National Standards Institute (ANSI); the American Society for Testing and Materials (ASTM); the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); the International Organization for Standardization (ISO); and the International Electrotechnical Commission (IEC).

TERMINOLOGY

acoustic; acoustical: *Acoustic* is usually used when the term being qualified designates something that has the properties, dimensions, or physical characteristics associated with sound waves (e.g., acoustic power); *acoustical* is usually used when the term which it modifies does not explicitly designate something that has the properties, dimensions, or physical characteristics of sound (e.g., acoustical material).

ambient noise: The all-encompassing noise associated with a given environment at a specified time, usually being a composite of sound from many sources arriving from many directions, near and far; no particular sound is dominant.

attenuation: The decrease in level of sound, usually from absorption, divergence, scattering, or the cancellation of the sound waves.

average sound level (L_{eq}): The level of a steady sound which, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.

Unit: decibel.

A-weighted sound level (L_A): The sound level measured with a sound-level meter using A-weighting. Unit: decibel (dBA).

background noise: The total noise from all sources other than a particular sound that is of interest (e.g., other than the noise being measured or other than the speech or music being listened to).

decibel (dB): A unit of level which denotes the ratio between two quantities that are proportional to power; the number of decibels correspond to the logarithm (to the base 10) of this ratio. [In many sound fields, the sound pressure ratios are not proportional to the corresponding power ratios, but it is common practice to extend the use of the decibel to such cases. One decibel equals one-tenth of a *bel*.]

equivalent continuous sound level (average sound level) (L_{eq}): The level of a steady sound which, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound. Unit: decibel (dBA).

frequency (f): Of a periodic function, the number of times that a quantity repeats itself in one second, i.e., the number of cycles per second. *Unit:* hertz (Hz).

noise: Any disagreeable or undesired sound, i.e., unwanted sound.

noise level: Same as sound level. Usually used to describe the sound level of an unwanted sound.

noise reduction (NR): The difference in sound pressure level between any two points along a path of sound propagation.

sound: (1) A change in air pressure that is capable of being detected by the human ear.
(2) The hearing sensation excited by a change in air pressure.

sound level: Ten times the logarithm to the base 10 of the square of the ratio of the frequency-weighted (and time-averaged) sound pressure to the reference sound pressure of 20 micropascals. The frequency-weightings and time-weighting employed should be specified; if they are not specified, it is understood that A-frequency-weighting is used and that an averaging time of 0.125 is used. *Unit:* decibel (dBA).

SYMBOLS, ABBREVIATIONS, AND ACRONYMS

ADT	Average Daily Traffic
ANSI	American National Standards Institute
AM	Ante Meridiem
APN	Assessor's Parcel Number
CEQA	California Environmental Quality Act
CMU	Concrete Masonry Unit
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
INCE	Institute of Noise Control Engineering
HVAC	heating, ventilation, and air conditioning
I-15	Interstate 15
in/sec	inches per second
L_{dn}	average day/night sound level
L_{eq}	equivalent sound level
L_{max}	maximum noise level
L_{min}	minimum noise level
L_n	exceedance level
MPH	miles per hour
PM	Post Meridiem
PPV	peak particle velocity
SR-78	State Route 78
STC	sound transmission class
VdB	velocity decibels

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EXECUTIVE SUMMARY

The purpose of this Acoustical Assessment is to evaluate potential short- and long-term noise impacts resulting from implementation of the proposed North County Shooting Center project ("project" or "proposed project"). The proposed project is located at 1440 Descanso Avenue in the City of San Marcos. Overall, the project site is located within a light industrial area in the western portion of the City of San Marcos.

The project proposes to construct a 15,534 square foot indoor firearm shooting range and firearm retail store. The shooting range would include two shooting ranges, and also provide areas for retail, training, premier room, break area, gun vault, and storage. The building would include soundproof walls to attenuate noise from discharging firearms. The lot is approximately 0.83 acres (36,338 square feet) in size, and is surrounded by industrial uses. The project site is relatively flat and slightly slopes to the south toward Descanso Avenue. Vehicle/site access would be accomplished via a driveway/entrance along Descanso Avenue to the south. A total of 41 vehicular parking spots would be provided on-site for employees and patrons.

Temporary Impacts. Based upon the results of the analysis, noise from construction activities would not exceed the noise standards of the City of San Marcos's Noise Ordinance at nearby residential uses with compliance with the recommended mitigation measures. Additionally, short-term vibration impacts from construction would be less than significant.

Long-Term Impacts. The analysis has concluded that implementation of the proposed project would result in less than significant impacts with regard to mobile noise sources from project operations. Additionally, less than significant impacts have been identified in regard to stationary sources.

1.0 INTRODUCTION

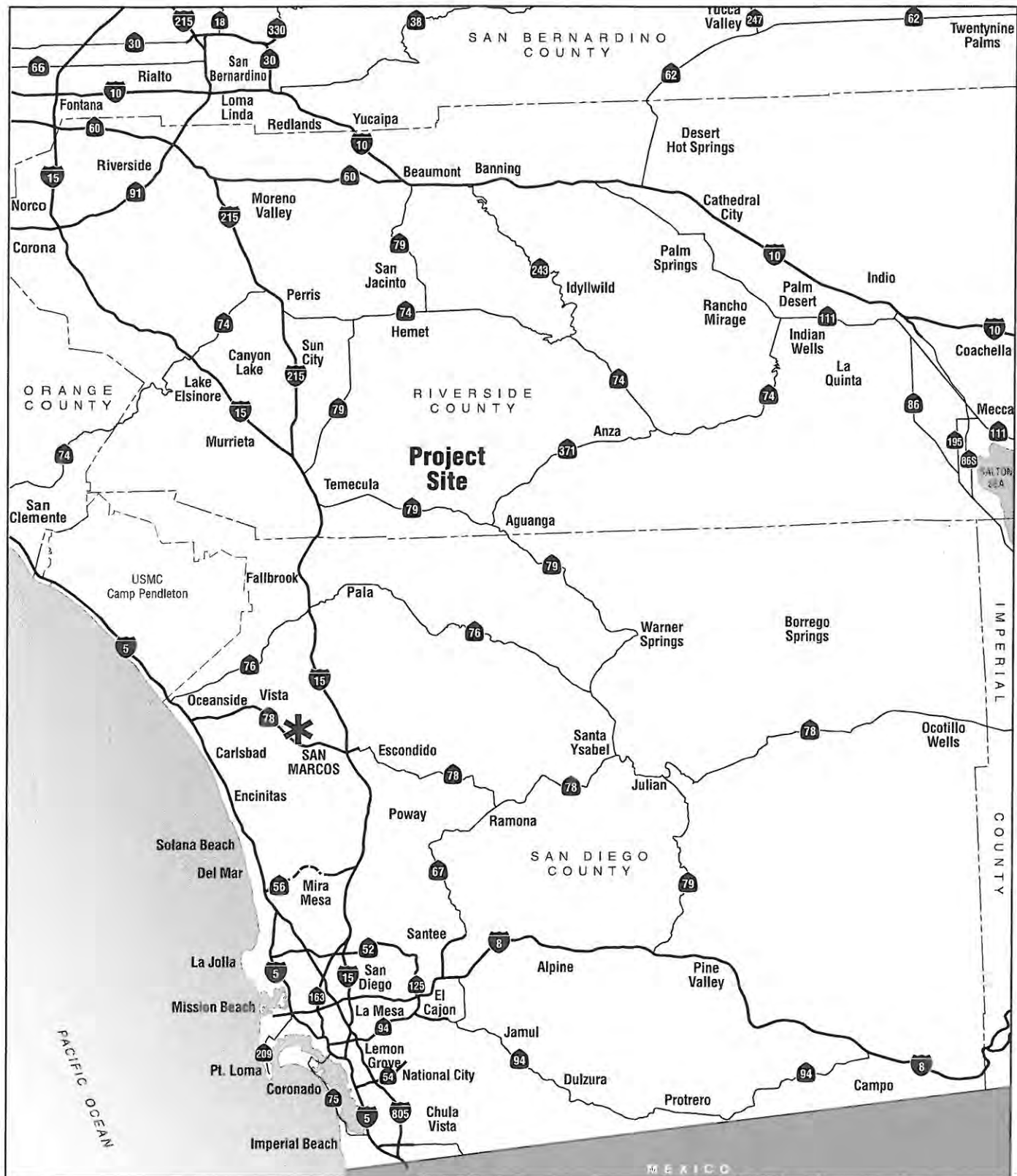
The purpose of this Acoustical Assessment is to evaluate potential short- and long-term noise impacts resulting from implementation of the proposed North County Shooting Center project ("project" or "proposed project") in the City of San Marcos (City).

1.1 PROJECT LOCATION

The proposed project is located near the northeast corner of North Pacific Street and Descanso Avenue (1440 Descanso Avenue), in the City of San Marcos, California. The project site (Assessor's Parcel Number [APN] 219-122-37) is located to the north of Descanso Avenue, east of North Pacific Street, and approximately 0.04 miles north of State Route 78 (SR-78), and 5.10 miles west of Interstate 15 (I-15); refer to [Exhibit 1, Regional Vicinity](#). Overall, the project site is located within an industrial area in the western portion of the City of San Marcos. Industrial uses surround the project site to the north, east, south, and west; refer to [Exhibit 2, Site Vicinity](#). The project site currently consists of vacant disturbed land.

1.2 PROJECT DESCRIPTION

The project proposes to construct a 15,534 square foot indoor firearm shooting range and firearm retail store; refer to [Exhibit 3, Conceptual Site Plan](#). The shooting range would include two shooting ranges, and also provide areas for retail, training, premier room, break area, gun vault, and storage. The building would include soundproof walls to attenuate noise from discharging firearms. The lot is approximately 0.83 acres (36,338 square feet) in size, and is surrounded by industrial uses. The project site is relatively flat and slightly slopes to the south toward Descanso Avenue. Vehicle/site access would be accomplished via a driveway/entrance along Descanso Avenue to the south. A total of 41 vehicular parking spots would be provided on-site for employees and patrons.



ACOUSTICAL ASSESSMENT
NORTH COUNTY SHOOTING CENTER
Regional Vicinity

Exhibit 1





Source: Google Earth, 2015.
- Project Site Boundary

NOT TO SCALE



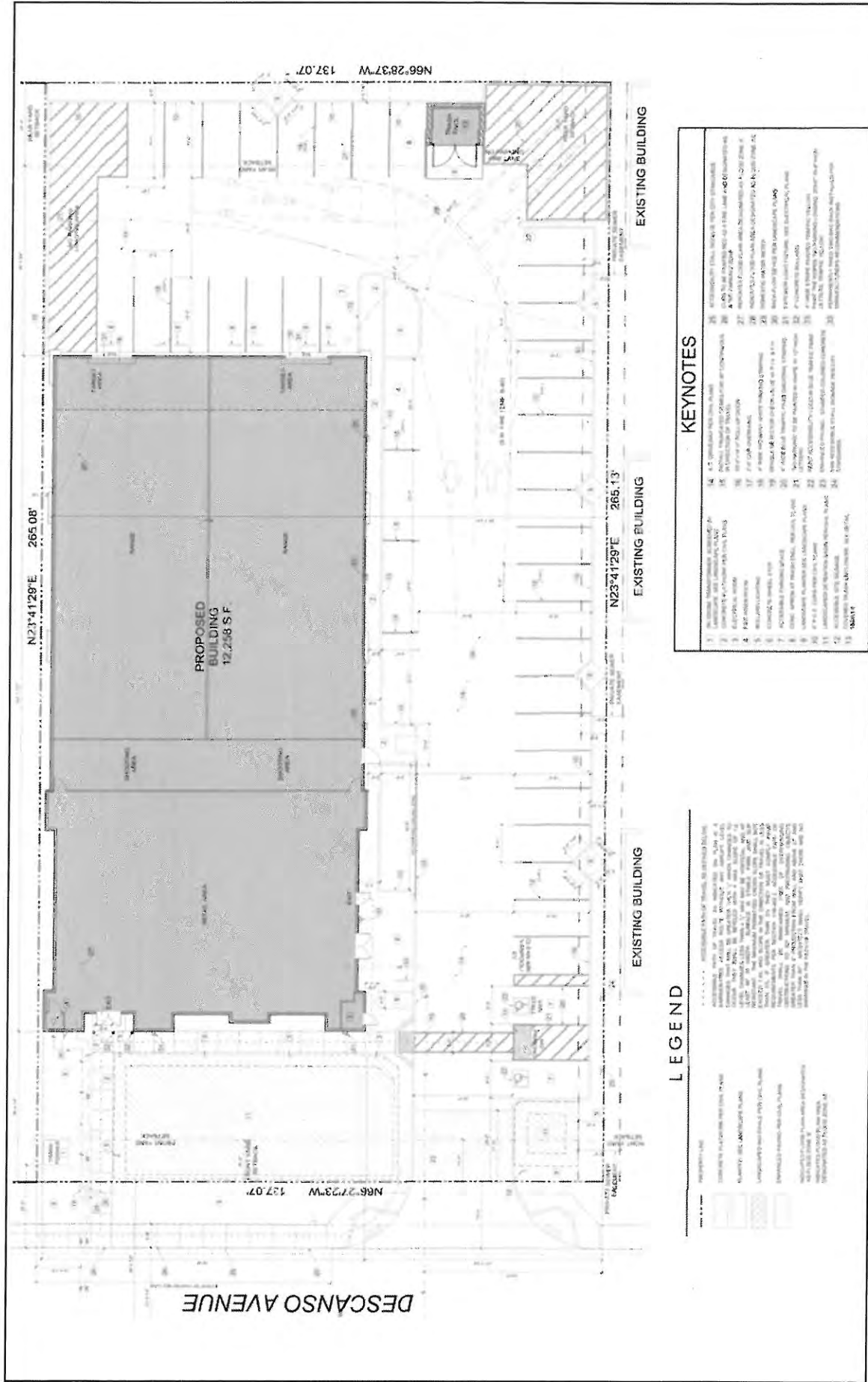
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ACOUSTICAL ASSESSMENT
NORTH COUNTY SHOOTING CENTER

Site Vicinity

Exhibit 2



Source: HB&A Architects; September 22, 2015.

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ACOUSTICAL ASSESSMENT
NORTH COUNTY SHOOTING CENTER

Site Plan

Exhibit 3

2.0 DESCRIPTION OF NOISE METRICS

2.1 STANDARD UNIT OF MEASUREMENT

Sound is described in terms of the loudness (amplitude) of the sound and frequency (pitch) of the sound. The standard unit of measurement of the loudness of sound is the decibel (dB). Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by differentiating among frequencies in a manner approximating the sensitivity of the human ear.

Decibels are based on the logarithmic scale. The logarithmic scale compresses the wide range in sound pressure levels to a more usable range of numbers in a manner similar to the Richter scale used to measure earthquakes. In terms of human response to noise, a sound 10 dBA higher than another is perceived to be twice as loud and 20 dBA higher is perceived to be four times as loud, and so forth. Everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud). Examples of various sound levels in different environments are illustrated on Exhibit 4, Common Environmental Noise Levels.

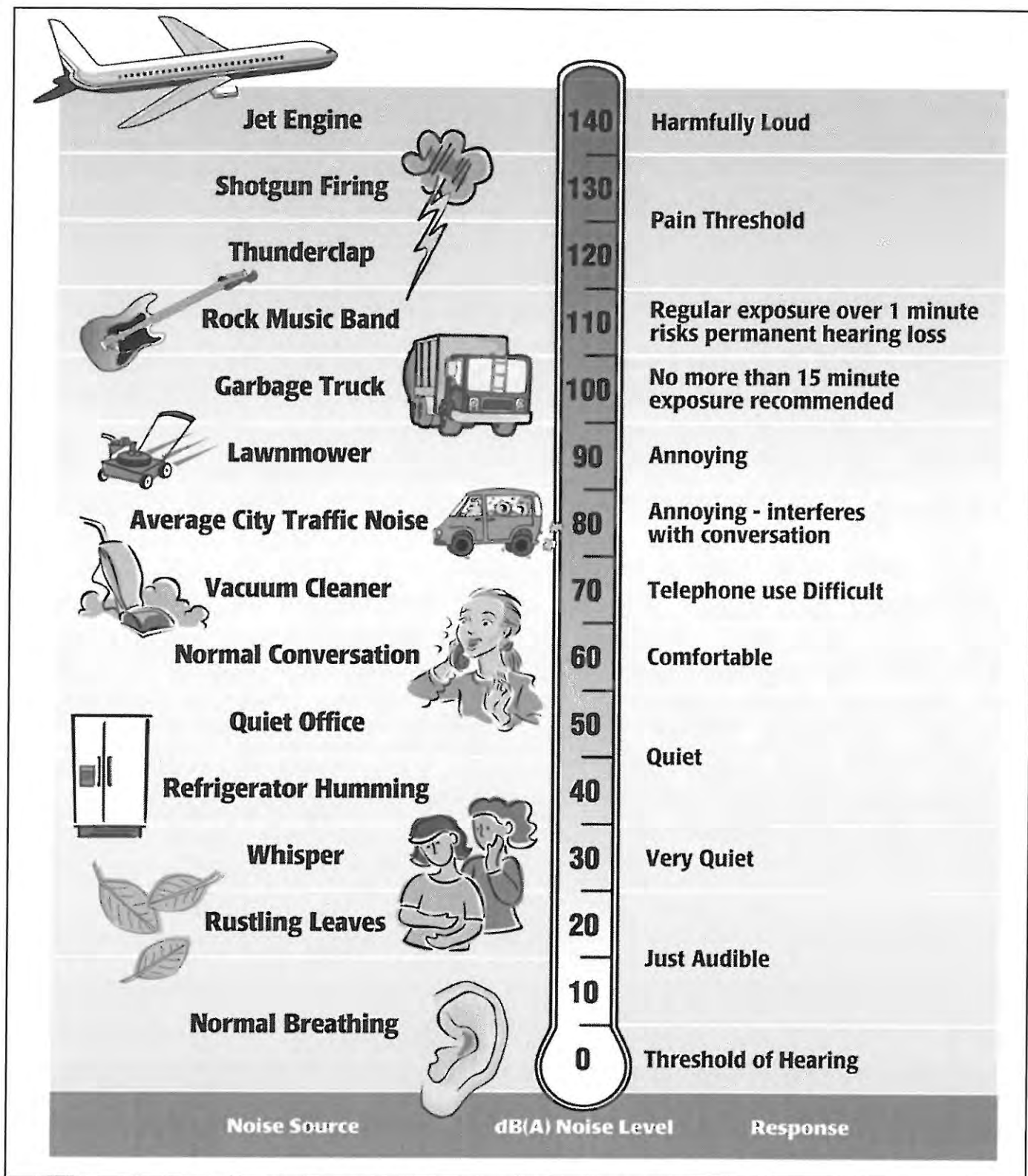
Many methods have been developed for evaluating community noise to account for, among other things:

- The variation of noise levels over time;
- The influence of periodic individual loud events; and
- The community response to changes in the community noise environment.

Table 1, Noise Descriptors, provides a listing of methods to measure sound over a period of time.

2.2 HEALTH EFFECTS OF NOISE

Human response to sound is highly individualized. Annoyance is the most common issue regarding community noise. The percentage of people claiming to be annoyed by noise generally increases with the environmental sound level. However, many factors also influence people's response to noise. The factors can include the character of the noise, the variability of the sound level, the presence of tones or impulses, and the time of day of the occurrence. Additionally, non-acoustical factors, such as the person's opinion of the noise source, the ability to adapt to the noise, the attitude towards the source and those associated with it, and the predictability of the noise, all influence people's response. As such, response to noise varies widely from one person to another and with any particular noise, individual responses would range from "not annoyed" to "highly annoyed."



Source: Environmental Protection Agency, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA/ONAC 550/9-74-004), March 1974.

Table 1
Noise Descriptors

Term	Definition
Decibel (dB)	The unit for measuring the volume of sound equal to 10 times the logarithm (base 10) of the ratio of the pressure of a measured sound to a reference pressure (20 micropascals).
A-Weighted Decibel (dBA)	A sound measurement scale that adjusts the pressure of individual frequencies according to human sensitivities. The scale accounts for the fact that the region of highest sensitivity for the human ear is between 2,000 and 4,000 cycles per second (hertz).
Equivalent Sound Level (L_{eq})	The sound level containing the same total energy as a time varying signal over a given time period. The L_{eq} is the value that expresses the time averaged total energy of a fluctuating sound level.
Maximum Sound Level (L_{max})	The highest individual sound level (dBA) occurring over a given time period.
Minimum Sound Level (L_{min})	The lowest individual sound level (dBA) occurring over a given time period.
Community Noise Equivalent Level (CNEL)	A rating of community noise exposure to all sources of sound that differentiates between daytime, evening, and nighttime noise exposure. These adjustments are +5 dBA for the evening, 7:00 PM to 10:00 PM, and +10 dBA for the night, 10:00 PM to 7:00 AM.
Day/Night Average (L_{dn})	The L_{dn} is a measure of the 24-hour average noise level at a given location. It was adopted by the U.S. Environmental Protection Agency for developing criteria for the evaluation of community noise exposure. It is based on a measure of the average noise level over a given time period called the L_{eq} . The L_{dn} is calculated by averaging the L_{eq} 's for each hour of the day at a given location after penalizing the "sleeping hours" (defined as 10:00 PM to 7:00 AM) by 10 dBA to account for the increased sensitivity of people to noises that occur at night.
Exceedance Level (L_n)	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% (L_{01} , L_{10} , L_{50} , L_{90} , respectively) of the time during the measurement period.
Source: Cyril M. Harris, <i>Handbook of Noise Control</i> , 1979.	

When the noise level of an activity rises above 70 dBA, the chance of receiving a complaint is possible, and as the noise level rises, dissatisfaction among the public steadily increases. However, an individual's reaction to a particular noise depends on many factors, such as the source of the sound, its loudness relative to the background noise, and the time of day. The reaction to noise can also be highly subjective; the perceived effect of a particular noise can vary widely among individuals in a community.

The effects of noise are often only transitory, but adverse effects can be cumulative with prolonged or repeated exposure. The effects of noise on the community can be organized into six broad categories:

- Noise-Induced Hearing Loss;
- Interference with Communication;
- Effects of Noise on Sleep;
- Effects on Performance and Behavior;

- Extra-Auditory Health Effects; and
- Annoyance.

Although it often causes discomfort and sometimes pain, noise-induced hearing loss usually takes years to develop. Noise-induced hearing loss can impair the quality of life through a reduction in the ability to hear important sounds and to communicate with family and friends. Hearing loss is one of the most obvious and easily quantified effects of excessive exposure to noise. While the loss may be temporary at first, it could become permanent after continued exposure. When combined with hearing loss associated with aging, the amount of hearing loss directly caused by the environment is difficult to quantify. Although the major cause of noise-induced hearing loss is occupational, substantial damage can be caused by non-occupational sources.

According to the United States Public Health Service, nearly ten million of the estimated 21 million Americans with hearing impairments owe their losses to noise exposure. Noise can mask important sounds and disrupt communication between individuals in a variety of settings. This process can cause anything from a slight irritation to a serious safety hazard, depending on the circumstance. Noise can disrupt face-to-face communication and telephone communication, and the enjoyment of music and television in the home. It can also disrupt effective communication between teachers and pupils in schools, and can cause fatigue and vocal strain in those who need to communicate in spite of the noise.

Interference with communication has proven to be one of the most important components of noise-related annoyance. Noise-induced sleep interference is one of the critical components of community annoyance. Sound level, frequency distribution, duration, repetition, and variability can make it difficult to fall asleep and may cause momentary shifts in the natural sleep pattern, or level of sleep. It can produce short-term adverse effects on mood changes and job performance, with the possibility of more serious effects on health if it continues over long periods. Noise can cause adverse effects on task performance and behavior at work, and non-occupational and social settings. These effects are the subject of some controversy, since the presence and degree of effects depends on a variety of intervening variables. Most research in this area has focused mainly on occupational settings, where noise levels must be sufficiently high and the task sufficiently complex for effects on performance to occur.

Recent research indicates that more moderate noise levels can produce disruptive after-effects, commonly manifested as a reduced tolerance for frustration, increased anxiety, decreased incidence of "helping" behavior, and increased incidence of "hostile" behavior. Noise has been implicated in the development or exacerbation of a variety of health problems, ranging from hypertension to psychosis. As with other categories, quantifying these effects is difficult due to the amount of variables that need to be considered in each situation. As a biological stressor, noise can influence the entire physiological system. Most effects seem to be transitory, but with continued exposure some effects have been shown to be chronic in laboratory animals.

Annoyance can be viewed as the expression of negative feelings resulting from interference with activities, as well as the disruption of one's peace of mind and the enjoyment of one's environment. Field evaluations of community annoyance are useful for predicting the consequences of planned actions involving highways, airports, road traffic, railroads, or other noise sources. The consequences of noise-induced annoyance are privately held dissatisfaction, publicly expressed complaints to authorities, and potential adverse health effects, as discussed above. In a study conducted by the United States Department of Transportation, the relationship between the effects of annoyance and the community were quantified. In areas where exterior noise levels were consistently above 60 dBA CNEL, approximately nine percent of the community is highly annoyed. When levels exceed 65 dBA Community Noise Equivalent Level (CNEL), that percentage rises to 15 percent. Although evidence for the various effects of noise have differing levels of certainty, it is clear that noise can affect human health. Most of the effects are, to a varying degree, stress related.

3.0 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Land uses deemed sensitive by the State of California (State) within the vicinity of the project site include schools. Many jurisdictions also consider single- and multi-family residential uses particularly noise-sensitive because families and individuals expect to use time in the home for rest and relaxation, and noise can interfere with those activities. Some jurisdictions may also identify other noise-sensitive uses such as churches. Land uses that are relatively insensitive to noise include office, commercial, and retail developments. There is a range of insensitive noise receptors that include uses that generate significant noise levels and that typically have a low level of human occupancy.

This noise analysis was conducted in accordance with Federal, State, and local criteria described in the following sections.

3.1 U.S. ENVIRONMENTAL PROTECTION AGENCY

The U.S. Environmental Protection Agency (EPA) offers guidelines for community noise exposure in the publication *Noise Effects Handbook – A Desk Reference to Health and Welfare Effects of Noise*. These guidelines consider occupational noise exposure as well as noise exposure in homes. The EPA recognizes an exterior noise level of 55 decibels day-night level (dB L_{dn}) as a general goal to protect the public from hearing loss, activity interference, sleep disturbance, and annoyance. The EPA and other Federal agencies have adopted suggested land use compatibility guidelines that indicate that residential noise exposures of 55 to 65 dB L_{dn} are acceptable. However, the EPA notes that these levels are not regulatory goals, but are levels defined by a negotiated scientific consensus, without concern for economic and technological feasibility or the needs and desires of any particular community.

3.2 CALIFORNIA ENVIRONMENTAL QUALITY ACT

The State Office of Planning and Research Noise Element Guidelines include recommended exterior and interior noise level standards for local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The Noise Element Guidelines contain a land use compatibility table that describes the compatibility of various land uses with a range of environmental noise levels in terms of the CNEL. Table 2, Land Use Compatibility for Community Noise Environments, presents guidelines for determining acceptable and unacceptable community noise exposure limits for various land use categories. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

Table 2
Land Use Compatibility for Community Noise Environments

Land Use Category	Community Noise Exposure (Ldn or CNEL, dBA)			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential - Low Density, Single-Family, Duplex, Mobile Homes	50 – 60	55 - 70	70-75	75-85
Residential - Multiple Family	50 – 65	60 - 70	70 – 75	70 - 85
Transient Lodging - Motel, Hotels	50 – 65	60 - 70	70 – 80	80 - 85
Schools, Libraries, Churches, Hospitals, Nursing Homes	50 – 70	60 - 70	70 – 80	80 - 85
Auditoriums, Concert Halls, Amphitheaters	NA	50 - 70	NA	65 - 85
Sports Arenas, Outdoor Spectator Sports	NA	50 - 75	NA	70 - 85
Playgrounds, Neighborhood Parks	50 – 70	NA	67.5 – 75	72.5 - 85
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50 – 70	NA	70 – 80	80 - 85
Office Buildings, Business Commercial and Professional	50 – 70	67.5 - 77.5	75 – 85	NA
Industrial, Manufacturing, Utilities, Agriculture	50 – 75	70 - 80	75 – 85	NA
NA: Not Applicable; Ldn: average day/night sound level; CNEL: Community Noise Equivalent Level				
Notes:				
<u>Normally Acceptable</u> - Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.				
<u>Conditionally Acceptable</u> - New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.				
<u>Normally Unacceptable</u> - New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.				
<u>Clearly Unacceptable</u> - New construction or development should generally not be undertaken.				
Source: Office of Planning and Research, California, <i>General Plan Guidelines</i> , October 2003.				

3.3 LOCAL JURISDICTION

CITY OF SAN MARCOS GENERAL PLAN

The *General Plan* Noise Element identifies noise-sensitive land uses and noise sources, defines areas of noise impact, and establishes goals, policies, and programs to ensure that City residents are protected from excessive noise. The following lists applicable noise goals and targets obtained from the *General Plan*:

Goal N-1: Promote a pattern of land uses compatible with current and future noise levels.

Policy N-1.1: Address the potential for excessive noise levels when making land use planning decisions in accordance with Table 7-3 Land Use Compatibility Noise Standards [for Transportation-related Noise].

Policy N-1.2: Ensure that acceptable noise levels are maintained near noise-sensitive uses

Policy N-1.4: Require new development projects to provide barriers to reduce noise levels, or provide sufficient spatial buffers to separate excessive noise generating land uses and noise-sensitive land uses.

Policy N-1.5: Require an acoustical study for proposed developments in areas where the existing and projected noise level exceeds or would exceed the Normally Acceptable levels identified in Table 7-3.

Policy N-2.1: Encourage only noise-compatible land uses along existing and future roadways, highways, and freeways.

Policy N-3.1: When adjacent to noise sensitive receptors, require developers and contractors to employ noise reduction techniques during construction and maintenance operations.

Policy N-3.2: Limit the hours of construction and maintenance operations located adjacent to noise-sensitive land uses.

Policy N-3.3: Limit the allowable hours of operations and deliveries for commercial, mixed-use, and industrial uses located adjacent to residential areas.

Policy N-3.4: Avoid excessive noise of commercial and industrial land uses through site and building design features.

Policy N-3.5: Require industrial land uses to locate vehicular traffic and operations away from adjacent residential areas as much as possible.

In addition, the Noise Element provides the following noise standards for designated land uses within the City:

1. The exterior noise level (as defined in Item 3) standard for Category A shall be 60 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
2. The exterior noise level standard for Categories B and C shall be 65 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
3. The exterior noise level standard for Categories D and G shall be 65 CNEL and the interior noise level standard shall be 50 dBA Leq (one hour average).

4. For single-family detached dwelling units, "exterior noise level" is defined as the noise level measured at an outdoor living area which adjoins and is on the same lot as the dwelling, and which contains at least the following minimum net lot area: (i) for lots less than 4,000 square feet in area, the exterior area shall include 400 square feet, (ii) for lots between 4,000 square feet to 10 acres in area, the exterior area shall include 10 percent of the lot area; (iii) for lots over 10 acres in area, the exterior area shall include 1 acre.
5. For all other residential land uses, "exterior noise level" is defined as noise measured at exterior areas which are provided for private or group usable open space purposes. "Private Usable Open Space" is defined as usable open space intended for use of occupants of one dwelling unit, normally including yards, decks, and balconies. When the noise limit for Private Usable Open Space cannot be met, then a Group Usable Open Space that meets the exterior noise level standard shall be provided. "Group Usable Open Space" is defined as usable open space intended for common use by occupants of a development, either privately owned and maintained or dedicated to a public agency, normally including swimming pools, recreation courts, patios, open landscaped areas, and greenbelts with pedestrian walkways and equestrian and bicycle trails, but not including off-street parking and loading areas or driveways.
6. For non-residential noise sensitive land uses, exterior noise level is defined as noise measured at the exterior area provided for public use.
7. For noise sensitive land uses where people normally do not sleep at night, the exterior and interior noise standard may be measured using either CNEL or the one-hour average noise level determined at the loudest hour during the period when the facility is normally occupied.
8. The exterior noise standard does not apply for land uses where no exterior use area is proposed or necessary, such as a library.
9. For Categories E and F the exterior noise level standard shall not exceed the limit defined as "Acceptable" in by the City, or an equivalent one-hour noise standard.

CITY OF SAN MARCOS MUNICIPAL CODE

Although the City's noise standards are contained within the *General Plan*, the *Municipal Code* includes several references to noise control. The following sections of the *Municipal Code* are applicable to the proposed project.

SECTION 10.24.010 LOUD, ANNOYING, AND UNNECESSARY NOISES PROHIBITED.

No person shall make, cause to be made, or continue to make or cause to be made, within the city limits of the City of San Marcos, any loud, annoying or unnecessary noise that injures, impairs or endangers the health, peace or safety of any person of reasonable sensibilities, or that disturbs the peace, quiet, comfort or tranquility of the neighborhood or community. The characteristics and conditions that should be considered in determining whether a violation of the provisions of this section exists, include, but are not limited to, the following: (Ord. No. 2008-1300; 2/26/08)

- (1) The level and intensity of the noise;*
- (2) Whether the nature of the noise is usual or unusual;*
- (3) Whether the origin of the noise is natural or unnatural;*
- (4) The level and intensity of background noise;*
- (5) The nature and zoning of the area abutting and within which the noise emanates;*
- (6) The time of the day or night the noise occurs;*
- (7) Whether the noise is recurrent, intermittent or constant;*

TITLE 20 – ZONING ORDINANCE, CHAPTER 20.300, SITE PLANNING AND GENERAL DEVELOPMENT STANDARDS

F. Noise. These regulations aim to prohibit unnecessary, excessive, and annoying from all sources, as certain levels are detrimental to the health and welfare of individuals. The standards apply to all land uses in all Zones unless otherwise specified.

- 1. Noise shall be measured with a sound-level meter that meets the standards of the American National Standards Institute (ANSI) (Section S1.4-1979, Type 1 or Type 2). Noise levels shall be measured in decibels at the property line of the receptor property, and at least four (4) feet above the ground and five (5) feet from the nearest structure or wall. The unit of measure shall be designated as an A-weighted decibel (dBA) Leq standard. A calibration check shall be made of the instrument at the time any measurement is made.*
- 2. No person shall create or allow the creation of exterior that causes the level to exceed the standards established by Table 20.300-4. Increases in allowable levels listed in Table 20.300-4 may be permitted in accordance with the standards outlined in Table 20.300-5.*

Table 20.300-4
Noise Standards by Zone

Zone	Allowable Noise Level (dBA) Measured from the Property Line
Single-Family Residential (A, R-1, R-2)	
7 a.m. to 10 p.m. (daytime)	60
10 p.m. to 7 a.m. (overnight)	50
Multifamily Residential (R-3)	
7 a.m. to 10 p.m. (daytime)	65
10 p.m. to 7 a.m. (overnight)	55
Commercial (C, O-P, SR)	
7 a.m. to 10 p.m. (daytime)	60
10 p.m. to 7 a.m. (overnight)	55
Industrial	
7 a.m. to 10 p.m. (daytime)	65
10 p.m. to 7 a.m. (overnight)	60

Table 20.300-5
Permitted Increase in Noise Levels

Permitted Increase (dBA)	Duration (cumulative minutes per hour)
5	15
10	5
15	1
20	Less than 1 minute

3. No person shall create nor allow the creation of that causes the interior level when measured within a dwelling unit to exceed forty-five (45) dBA at any time, except as permitted by Table 20.300-6.

Table 20.300-6
Permitted Increase in Interior Noise Levels

Permitted Increase (dBA)	Duration (cumulative minutes per hour)
5	1
10	Less than 1 minute

4. Use of compressors or other equipment, including vents, ducts, and conduits, but excluding window or wall-mounted air-conditioners, that are located outside of the exterior walls of any building, shall be enclosed within a permanent, non-combustible, view-obscuring enclosure to ensure that the equipment does not emit in excess of the ANSI standards.

- G. *Vibration.* *Vibration may disturb the conduct of certain activities and create discomfort for some individuals. To minimize the disturbance and inconvenience from vibrations, no person or use shall create, maintain, or cause ground vibration that is discernible without instruments to a person of normal sensitivity at any point on a property that is adjacent to the property of the vibration source. The ground vibration caused by moving vehicles, trains, aircraft, or temporary construction or demolition is exempted.*

4.0 EXISTING CONDITIONS

4.1 NOISE MEASUREMENTS

In order to quantify existing ambient noise levels in the project area, Michael Baker International, Inc. (Michael Baker) conducted three noise measurements on October, 2015; refer to [Table 3, Noise Measurements](#). The noise measurement sites were representative of typical existing noise exposure within and immediately adjacent to the project site. Ten-minute measurements were taken, between 9:30 a.m. and 10:30 a.m., at each site during the day. Short-term (L_{eq}) measurements are considered representative of the noise levels in the project vicinity.

Table 3
Noise Measurements

Site No.	Location	L_{eq} (dBA)	L_{min} (dBA)	L_{max} (dBA)	Peak (dBA)	Time
1	Near the North Pacific Street/Atlantic Avenue intersection, adjacent to the mobile home park to the west.	61.2	55.3	61.1	108.6	9:41 a.m.
2	Near the southern boundary of the project site.	59.8	50.3	77.9	95.5	9:52 a.m.
3	Along Los Vallecitos Boulevard, near the Residence Inn Marriott, and Palomar Station residential uses.	63.0	50.4	84.2	99.0	10:00 p.m.

Source: Michael Baker International, Inc., October 21, 2015.

Meteorological conditions were clear skies, warm temperatures, with light wind speeds (0 to 5 miles per hour), and low humidity. Measured noise levels during the daytime measurements ranged from 59.8 to 63.0 dBA L_{eq} . Noise monitoring equipment used for the ambient noise survey consisted of a Brüel & Kjær Hand-held Analyzer Type 2250 equipped with a Type 4189 pre-polarized microphone. The monitoring equipment complies with applicable requirements of the American National Standards Institute (ANSI) for Type I (precision) sound level meters. The results of the field measurements are included in [Appendix A, Noise Measurement Data](#). Refer to [Exhibit 5, Noise Measurement Locations](#), for the noise measurement sites.

4.2 SENSITIVE RECEPTORS

Certain land uses are particularly sensitive to noise, including schools, hospitals, rest homes, long-term medical and mental care facilities, and parks and recreation areas. Residential areas are also considered noise sensitive, especially during the nighttime hours. Existing sensitive receptors located in the project vicinity include residential uses (mobile home park), schools, medical uses, and places of worship. Sensitive receptors are listed in [Table 4, Sensitive Receptors](#).



ACOUSTICAL ASSESSMENT
NORTH COUNTY SHOOTING CENTER

Noise Measurement Locations

Exhibit 5

Source: Google Earth, 2015.
- Project Site Boundary

NOT TO SCALE



Michael Baker
INTERNATIONAL

12/15 - JN 149164

Table 4
Sensitive Receptors

Type	Name	Distance from Project Site (feet)	Direction from Project Site	Location
Residential	Residential Uses	535	Northwest	Along North Pacific Street.
		1,260	North	Along North Pacific Street, north of West Mission Road.
		1,800	Northeast	Along Palm Drive.
		1,270	East	Along Los Vallecitos Boulevard
Schools	Palomar College	1,857	East	1140 W Mission Road, San Marcos, CA 92069
Places of Worship	San Marcos CA LDS Institute (Church of Jesus Christ of Latter-day Saints)	1,800	Northeast	349 Palm Road, San Marcos, CA 92069
	The Movement Church	1,228	West/Northwest	349 Palm Road, San Marcos, CA 92069
	Palomar Korean Church	2,306	West	170 Bosstick Boulevard, San Marcos, CA 92069
Note: 1 – Distances are measured from the exterior project boundary only and not from individual construction areas within the interior of the project site. Source: Google Earth, 2015.				

4.3 EXISTING NOISE LEVELS

MOBILE SOURCES

In order to assess the potential for mobile source noise impacts, it is necessary to determine the noise currently generated by vehicles traveling through the project area. The majority of the existing noise in the vicinity of the project site is from vehicles traveling at high speeds along SR-78, and cars and heavy trucks driving along North Pacific Street/Descanso Avenue. According to the *General Plan* Noise Element, the project site is located within the 60-65 dBA CNEL noise contour for SR-78.

STATIONARY SOURCES

The primary sources of stationary noise in the project vicinity are those associated with the operations of adjacent industrial uses on all sides of the project site. This includes the use of mechanical equipment (e.g., forklifts, power drills, sawing, cutting, etc.), loading/unloading trucks, and heavy trucks entering and exiting industrial properties, among others.

5.0 POTENTIAL ACOUSTICAL IMPACTS

CEQA THRESHOLDS

Appendix G of the *CEQA Guidelines* contains analysis guidelines related to the assessment of noise impacts. These guidelines have been used by the City to develop thresholds of significance for this analysis. As stated in Appendix G, a project would create a significant environmental impact if it would:

- Expose persons to, or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (refer to Impact Statement NOI-1);
- Expose persons to or generate excessive ground borne vibration or ground borne noise levels (refer to Impact Statement NOI-2);
- Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project (refer to Impact Statement NOI-1);
- Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project (refer to Impact Statement NOI-1);
- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels (refer to Impact Statement NOI-3); and
- For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels (refer to Impact Statement NOI-3).

Based on these standards and thresholds, the effects of the proposed project have been categorized as either a “less than significant impact” or a “potentially significant impact.” Mitigation measures are provided for all potentially significant impacts.

NOI-1

- *EXPOSE PERSONS TO, OR GENERATE NOISE LEVELS IN EXCESS OF STANDARDS ESTABLISHED IN THE LOCAL GENERAL PLAN OR NOISE ORDINANCE, OR APPLICABLE STANDARDS OF OTHER AGENCIES?*
- *A SUBSTANTIAL PERMANENT INCREASE IN AMBIENT NOISE LEVELS IN THE PROJECT VICINITY ABOVE LEVELS EXISTING WITHOUT THE PROJECT?*
- *A SUBSTANTIAL TEMPORARY OR PERIODIC INCREASE IN AMBIENT NOISE LEVELS IN THE PROJECT VICINITY ABOVE LEVELS EXISTING WITHOUT THE PROJECT?*

Level of Significance Before Mitigation: Potentially Significant Impact.

SHORT-TERM CONSTRUCTION

Construction activities for the project would include site preparation, grading, paving, building construction, and architectural coating. Ground-borne noise and other types of construction-related noise impacts would typically occur during excavation activities of the grading phase. This phase of construction has the potential to create the highest levels of noise. Typical noise levels generated by construction equipment are shown in Table 5, *Maximum Noise Levels Generated by Construction Equipment*. It should be noted that the noise levels identified in Table 5 are maximum sound levels (L_{max}), which are the highest individual sound occurring at an individual time period. Operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Other primary sources of acoustical disturbance would be due to random incidents, which would last less than one minute (such as dropping large pieces of equipment or the hydraulic movement of machinery lifts).

Pursuant to the City's Noise Ordinance and as a standard condition of approval of any Building Permit, construction activities will be limited and subject to city-wide "quiet hours" between 6:00 p.m. to 7:00 a.m. Monday through Friday, and 5:00 p.m. to 8:00 a.m. on Saturdays. Construction activities are prohibited on Sundays and Holidays (observed by the City of San Marcos). These permitted hours of construction are included in the code in recognition that construction activities undertaken during daytime hours are a typical part of living in an urban environment and do not cause a significant disruption.

Table 5
Maximum Noise Levels Generated by Construction Equipment

Type of Equipment	Acoustical Use Factor ¹	L _{max} at 50 Feet (dBA)
Concrete Saw	20	90
Crane	16	81
Concrete Mixer Truck	40	79
Backhoe	40	78
Dozer	40	82
Excavator	40	81
Forklift	40	78
Paver	50	77
Roller	20	80
Tractor	40	84
Water Truck	40	80
Grader	40	85
General Industrial Equipment	50	85
Note: 1 – Acoustical Use Factor (percent): Estimates the fraction of time each piece of construction equipment is operating at full power (i.e., its loudest condition) during a construction operation. Source: Federal Highway Administration, <i>Roadway Construction Noise Model (FHWA-HEP-05-054)</i> , January 2006.		

The potential for construction-related noise to affect nearby residential receptors would depend on the location and proximity of construction activities to these receptors. Construction would occur throughout the project site and would not be concentrated or confined in the area directly adjacent to sensitive receptors. Therefore, construction noise would be acoustically dispersed throughout the project site and not concentrated in one area near adjacent sensitive uses. It should be noted that the noise levels depicted in Table 5 are maximum noise levels, which would occur sporadically when construction equipment is operated in proximity to sensitive receptors. Given the sporadic and variable nature of proposed project construction and the implementation of time limits specified in the City's Noise Ordinance, noise impacts would be reduced to a less than significant level. Additionally, to further reduce the potential for noise impacts, Mitigation Measure NOI-1 would be implemented to incorporate best management practices during construction. Implementation of Mitigation Measure NOI-1 would further minimize impacts from construction noise as it requires construction equipment to be equipped with properly operating and maintained mufflers and other state required noise attenuation devices. Thus, with mitigation, a less than significant noise impact would result from construction activities.

Construction Truck Trips

Construction activities would also cause increased mobile noise along access routes to and from the site due to movement of equipment and workers. However, this source of noise would be temporary and would cease upon project completion. It is anticipated that hauling would occur

along Pacific Street/Descanso Avenue, which is an industrial corridor. Although there would be a relatively high single-event noise exposure resulting in intermittent noise nuisance, the effect on longer term (hourly or daily) ambient noise levels would be minimal. Additionally, Mitigation Measure NOI-1 would require construction activities only take place within the allowable hours specified by the City's Noise Ordinance. Therefore, short-term construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

LONG-TERM OPERATIONAL IMPACTS

Off-Site Mobile Noise

Future development generated by the proposed project would result in additional traffic on adjacent roadways, thereby increasing vehicular noise in the vicinity of existing and proposed land uses. Based on the *Shooting Range Trip Generation & Parking Analysis Results Memorandum* (Traffic Memo), the proposed project is projected to generate a total of approximately 378 daily trips, including one trip during the a.m. peak hour and 33 trips during the p.m. peak hour. According to Figure 3-1 of the *General Plan* Mobility Element, North Pacific Street/Descanso Avenue is designated as a "Major Road." The County of San Diego Mobility Element states that, "Local public roads....support local traffic at a lower design speed and accommodate traffic volumes up to 4,500 average daily trips." As North Pacific Street/Descanso Avenue is similar to the local public road described in the Mobility Element, this roadway is expected to have traffic volume capacity of up to 4,500 daily trips. Additionally, based on the traffic counts conducted for the Traffic Memo, Descanso Avenue currently has a daily traffic volume of 3,899 vehicles, North Pacific Street currently has a daily traffic volume of 3,217 vehicles, and Capalina Road currently has a daily traffic volume 3,343 vehicles. As discussed above, the project would result in approximately 387 daily vehicle trips. In general, a doubling of a noise source (i.e., traffic volumes with regard to the project) produces only a 3 dB increase.¹ Therefore, the 387 daily trips from the proposed project would not create a discernible difference in mobile traffic noise levels along North Pacific Street/Descanso Avenue. A less than significant impact would occur in this regard.

STATIONARY NOISE IMPACTS

Firing Range

The project proposes an indoor firing range facility in the central/western portion of the project site. As such, it is anticipated that the proposed firing range could be audible at off-site locations. Maximum impulsive noise levels for indoor firing ranges can be between 84 and 93

¹ Federal Highway Administration, *Highway Traffic Noise Analysis and Abatement Policy and Guidance, Noise Fundamentals*, https://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/polguide/polguide02.cfm, accessed November 6, 2015.

dBA L_{max} during fairly continuous firing.² As noted above in Section 1.2, Project Description, the proposed building would include soundproof walls to attenuate noise from continuous firing in the firing range area. Specifically, the walls around the perimeter of the firing range would include concrete tilt-up walls with six-inch 25-gauge studs, one layer troy sound board, and two-inch troy wool sound insulation. The interior wall separating the two firing range areas would be composed of eight-inch concrete masonry unit (CMU) with 2.5-inch 25 gauge studs with one layer troy sound board and two-inch troy wool sound insulation. These soundwalls with insulation would attenuate indoor to outdoor noise by a minimum of 58 dBA.³ Therefore, the 93 dBA L_{max} levels generated by the project would be reduced to 35 dBA at the exterior of the site. The firing range noise levels would not exceed the any of the City's standards, including the daytime and nighttime residential standard of 60 and 50 dBA, respectively. Additionally, it should be noted that the nearest sensitive receptors (mobile home residential uses) are located approximately 535 feet to the northwest of the project site. Noise levels from the project site would not be audible at this distance. The closest structure to the proposed shooting range is an industrial building that would be approximately 60 feet to the east. Distance attenuation and anomalous excess absorption would further reduce the 35 dBA exterior noise level at the surrounding industrial uses. As such, stationary noise associated with the firing range would not exceed any of the City's noise standards for uses in the project vicinity. A less than significant impact would occur in this regard.

Parking Areas

Traffic associated with parking lots is typically not of sufficient volume to exceed community noise standards, which are based on a time-averaged scale such as the CNEL scale. However, the instantaneous maximum sound levels generated by a car door slamming, engine starting up and car passbys may be an annoyance to adjacent noise-sensitive receptors. Estimates of the maximum noise levels associated with some parking lot activities are presented in Table 6, Typical Noise Levels Generated by Parking Lots. Conversations in parking areas may also be an annoyance to adjacent sensitive receptors. Sound levels of speech typically range from 33 dBA at 48 feet for normal speech to 50 dBA at 50 feet for very loud speech.

Table 6
Typical Noise Levels Generated by Parking Lots

Noise Source	Maximum Noise Levels at 50 Feet from Source
Car door slamming	63 dBA L_{eq}
Car starting	60 dBA L_{eq}
Car idling	61 dBA L_{eq}

² Gavilan College, *Draft Environmental Impact Report – Gavilan College Coyote Campus Project*, February 2008.

³ Cyril M. Harris, *Noise Control in Buildings*, 1994, Troy Acoustics Corporation, *Acoustic Panel Specifications Sheet*, and .U.S. Department of Housing and Urban Development, *Noise Guidebook, Sound Transmission Class, Guidance*, March 2009.

As shown in Table 6, during operation of the proposed project, noise levels from parking activities would range from approximately 60.0 to 63.0 dBA at 50 feet from the parking lot, assuming no reductions from barriers or intervening structures. The project site is surrounded by industrial uses. Thus, noise associated with parking activities would be within the City's 65 dBA standard. Additionally, based on an outdoor-indoor attenuation rate of 20 dBA for standard construction⁴, the project would not expose sensitive receptors to noise levels in excess of the City's daytime or nighttime interior noise standards of 45 dBA CNEL (as established in the City's Noise Element) for noise sensitive indoor spaces. Parking noise is anticipated to be lower than the levels presented in Table 6, due to distance attenuation and intervening structures. The noise would also be partially masked by background noise from traffic along North Pacific Street/Descanso Avenue, which currently ranges from 59.8 dBA to 63.0 dBA. Therefore, noise from parking areas would be less than significant.

Mitigation Measures:

NOI-1 Prior to Grading Permit issuance, the Project Applicant shall demonstrate, to the satisfaction of the San Marcos Planning Division that the project complies with the following:

- Construction contracts specify that all construction equipment, fixed or mobile, shall be equipped with properly operating and maintained mufflers and other state required noise attenuation devices.
- Property owners and occupants located within 200 feet of the project boundary shall be sent a notice, at least 15 days prior to commencement of construction of each phase, regarding the construction schedule of the proposed project. A sign, legible at a distance of 50 feet shall also be posted at the project construction site. All notices and signs shall be reviewed and approved by the City of San Marcos Development Services Director (or designee), prior to mailing or posting and shall indicate the dates and duration of construction activities, as well as provide a contact name and a telephone number where residents can inquire about the construction process and register complaints.
- The Contractor shall provide evidence that a construction staff member will be designated as a Noise Disturbance Coordinator and will be present on-site during construction activities. The Noise Disturbance Coordinator shall be responsible for responding to any local complaints about construction noise. When a complaint is received, the Noise Disturbance Coordinator shall notify the City within 24-hours of the complaint and determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and shall implement

⁴ U.S. Department of Housing and Urban Development, Noise Guidebook, *Sound Transmission Class, Guidance*, March 2009.

reasonable measures to resolve the complaint, as deemed acceptable by the Development Services Director (or designee). All notices that are sent to residential units immediately surrounding the construction site and all signs posted at the construction site shall include the contact name and the telephone number for the Noise Disturbance Coordinator.

- Construction haul routes shall be designed to avoid noise sensitive uses (e.g., residences, convalescent homes, etc.), to the extent feasible.
- During construction, stationary construction equipment shall be placed such that emitted noise is directed away from sensitive noise receivers.
- Construction activities shall not take place outside of the allowable hours specified by the City's Noise Ordinance (between 6:00 p.m. to 7:00 a.m. Monday through Friday, and 5:00 p.m. to 8:00 a.m. on Saturdays). Construction activities are prohibited on Sundays and Holidays (observed by the City of San Marcos).

Level of Significance After Mitigation: Less Than Significant Impact.

NOI-2 EXPOSURE OF PERSONS TO OR GENERATION OF EXCESSIVE GROUNDBORNE VIBRATION OR GROUNDBORNE NOISE LEVELS?

Level of Significance Before Mitigation: Less Than Significant Impact.

SHORT-TERM CONSTRUCTION

Project construction can generate varying degrees of groundborne vibration, depending on the construction procedure and the construction equipment used. Operation of construction equipment generates vibrations that spread through the ground and diminish in amplitude with distance from the source. The effect on buildings located in the vicinity of the construction site often varies depending on soil type, ground strata, and construction characteristics of the receiver building(s). The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibration at moderate levels, to slight damage at the highest levels. Groundborne vibrations from construction activities rarely reach levels that damage structures.

The Federal Transit Administration (FTA) has published standard vibration velocities for construction equipment operations. In general, the FTA architectural damage criterion for continuous vibrations (i.e., 0.2 inch/second) appears to be conservative. The types of construction vibration impacts include human annoyance and building damage. Human annoyance occurs when construction vibration rises significantly above the threshold of human perception for extended periods of time. Building damage can be cosmetic or structural. Ordinary buildings that are not particularly fragile would not experience any cosmetic damage

(e.g., plaster cracks) at distances beyond 30 feet. This distance can vary substantially depending on the soil composition and underground geological layer between vibration source and receiver. In addition, not all buildings respond similarly to vibration generated by construction equipment. The vibration produced by construction equipment, is illustrated in Table 7, Typical Vibration Levels for Construction Equipment.

Table 7
Typical Vibration Levels for Construction Equipment

Equipment	Approximate peak particle velocity at 15 feet (inches/second) ¹	Approximate peak particle velocity at 25 feet (inches/second) ²	Approximate peak particle velocity at 50 feet (inches/second) ²	Approximate peak particle velocity at 100 feet (inches/second) ²
Large bulldozer	0.192	0.089	0.031	0.011
Loaded trucks	0.164	0.076	0.027	0.010
Small bulldozer	0.007	0.003	0.001	0.000
Jackhammer	0.075	0.035	0.012	0.004

Notes:
 1 – Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Guidelines*, May 2006. Table 12-2.
 2 – Calculated using the following formula:

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

where: PPV (equip) = the peak particle velocity in in/sec of the equipment adjusted for the distance
 PPV (ref) = the reference vibration level in in/sec from Table 12-2 of the FTA *Transit Noise and Vibration Impact Assessment Guidelines*
 D = the distance from the equipment to the receiver

Groundborne vibration decreases rapidly with distance. As indicated in Table 7, based on the FTA data, vibration velocities from typical heavy construction equipment operation that would be used during project construction range from 0.007 to 0.192 in/sec peak particle velocity (PPV) at 15 feet from the source of activity. With regard to the proposed project, groundborne vibration would be generated primarily during site clearing and grading activities on-site and by off-site haul-truck travel. The majority of construction activities would not involve equipment that would generate excessive vibration impacts to the nearby sensitive receptors.

With regard to the proposed project, ground-borne vibration would be generated primarily during grading activities on-site and by off-site haul-truck travel. Pile driving activities would not be required for construction activities. The PPV from bulldozer and heavy truck operations is shown to be 0.192 inch-per-second PPV and 0.164 inch-per-second PPV, respectively, at a distance of 15 feet. As each of these values is below the 0.2 inch-per-second PPV significance threshold, vibration impacts associated with construction would be less than significant and no mitigation measures are required.

Mitigation Measures: No mitigation measures are required.

Level of Significance After Mitigation: Less Than Significant Impact.

NOI-3

- **FOR A PROJECT LOCATED WITHIN AN AIRPORT LAND USE PLAN OR, WHERE SUCH A PLAN HAS NOT BEEN ADOPTED, WITHIN TWO MILES OF A PUBLIC AIRPORT OR PUBLIC USE AIRPORT, EXPOSE PEOPLE RESIDING OR WORKING IN THE PROJECT AREA TO EXCESSIVE NOISE LEVELS?**
- **FOR A PROJECT WITHIN THE VICINITY OF A PRIVATE AIRSTRIp, EXPOSE PEOPLE RESIDING OR WORKING IN THE PROJECT AREA TO EXCESSIVE NOISE LEVELS?**

Level of Significance Before Mitigation: No Impact.

SHORT-TERM CONSTRUCTION

The proposed project is not located within an airport land use plan. There is no public airport, public use airport, or private airstrip located within two miles of the project site. The proposed project would not expose people residing or working in the area to excessive noise levels. Therefore, impacts in this regard would be less than significant.

LONG-TERM OPERATIONAL IMPACTS

Refer to the discussion above. The proposed project is not located within an airport land use plan and there is no public airport, public use airport, or private airstrip located within two miles of the project site.

Mitigation Measures: No mitigation measures are required.

Level of Significance After Mitigation: No Impact.

6.0 REFERENCES

6.1 LIST OF PREPARERS

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949/472-3505

Eddie Torres, INCE, Environmental Sciences Manager
Achilles Malisos, Manager of Air and Noise Studies
Ryan Chiene, Environmental Associate
Linda Bo, Graphics

6.2 DOCUMENTS

1. City of San Marcos, *City of San Marcos Charter*, last amended November 4, 2004.
2. City of San Marcos, *City of San Marcos General Plan*, adopted February 14, 2012.
3. City of San Marcos, *Zoning Ordinance*, adopted November 13, 2012.
4. Cyril M. Harris, *Handbook of Noise Control*, 1979.
5. Cyril M. Harris, *Noise Control in Buildings*, 1994.
6. Federal Highway Administration, *Roadway Construction Noise Model (FHWA-HEP-05-054)*, January 2006.
7. Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Guidelines*, May 2006.
8. Federal Highway Administration, *Highway Traffic Noise Analysis and Abatement Policy and Guidance, Noise Fundamentals*,
https://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/polguide/polguide02.cfm,
accessed November 6, 2015.
9. Gavilan College, *Draft Environmental Impact Report – Gavilan College Coyote Campus Project*, February 2008.
10. Harris, Cyril, *Handbook of Noise Control*, 1979.

11. Linscott Law & Greenspan Engineers, *Shooting Range Trip Generation & Parking Analysis Results, Technical Memorandum*, October 30, 2015.
12. State of California, Governor's Office of Planning and Research, *General Plan Guidelines*, October 2003.
13. Troy Acoustics Corporation, *Acoustic Panel Specifications Sheet*, undated.
14. U.S. Department of Housing and Urban Development, *Noise Guidebook, Sound Transmission Class, Guidance*, March 2009
15. U.S. Environmental Protection Agency, *Noise Effects Handbook – A Desk Reference to Health and Welfare Effects of Noise*, October 1979 (revised July 1981).
16. U.S. Environmental Protection Agency, *Protective Noise Levels (EPA 550/9-79-100)*, November 1979.

6.3 SOFTWARE/WEBSITES

Google Earth, 2015.

APPENDIX

APPENDIX A: NOISE MEASUREMENT DATA

Site Number: 1			
Recorded By: Ryan Chiene			
Job Number: 149164			
Date: 10/21/2015			
Time: 9:41 AM			
Location: Near the North Pacific Street/Atlantic Avenue intersection, adjacent to the mobile home park to the west.			
Source of Peak Noise: Cars and heavy trucks on North Pacific Street, commuter train passing by to the north, birds chirping.			
Noise Data			
Leq (dB)	Lmin (dB)	Lmax (dB)	Peak (dB)
61.2	55.3	61.1	108.6

Equipment						
Category	Type	Vendor	Model	Serial No.	Cert. Date	Note
Sound	Sound Level Meter	Brüel & Kjær	2250	2548189	11/18/2014	
	Microphone	Brüel & Kjær	4189	2543364	11/18/2014	
	Preamp	Brüel & Kjær	ZC 0032	4265	11/18/2014	
	Calibrator	Brüel & Kjær	4231	2545667	11/18/2014	
Weather Data						
Est.	Duration: 10 minutes			Sky: Sunny		
	Note: dBA Offset = 0.02			Sensor Height (ft): 5 ft		
	Wind Ave Speed (mph / m/s)		Temperature (degrees Fahrenheit)		Barometer Pressure (inches)	
	0.6		73.0		29.86	

Photo of Measurement Location





2250

Instrument:		2250
Application:		BZ7225 Version 4.4
Start Time:		10/21/2015 09:36:14
End Time:		10/21/2015 09:46:14
Elapsed Time:		00:10:00
Bandwidth:		1/3-octave
Max Input Level:		138.43

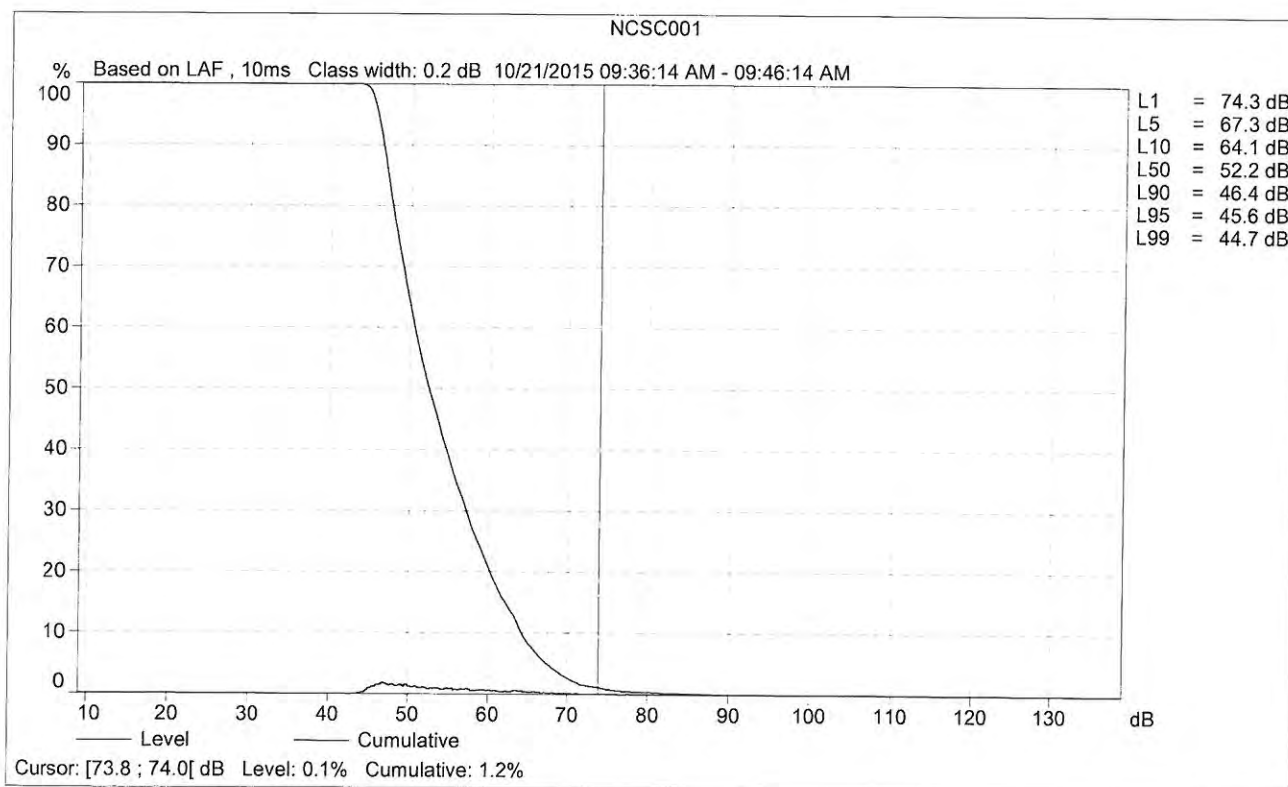
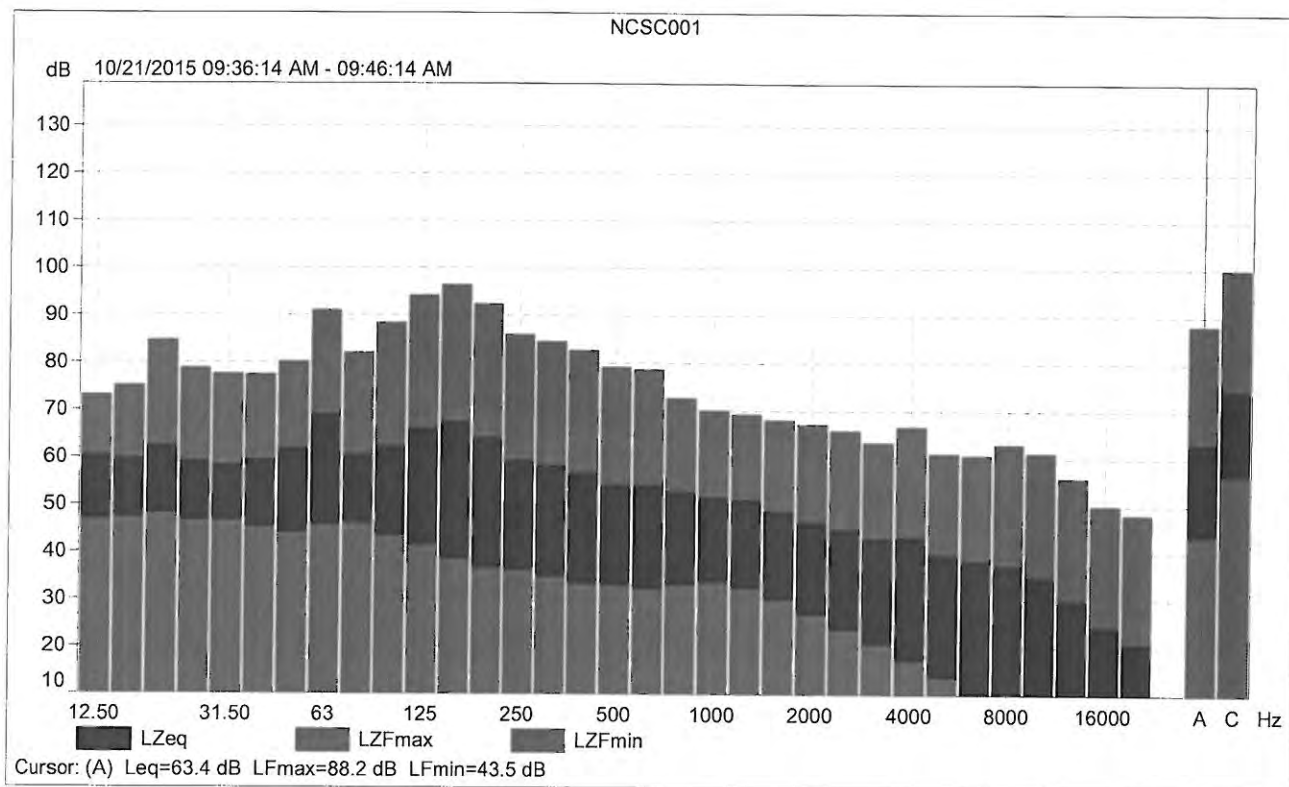
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Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	Z

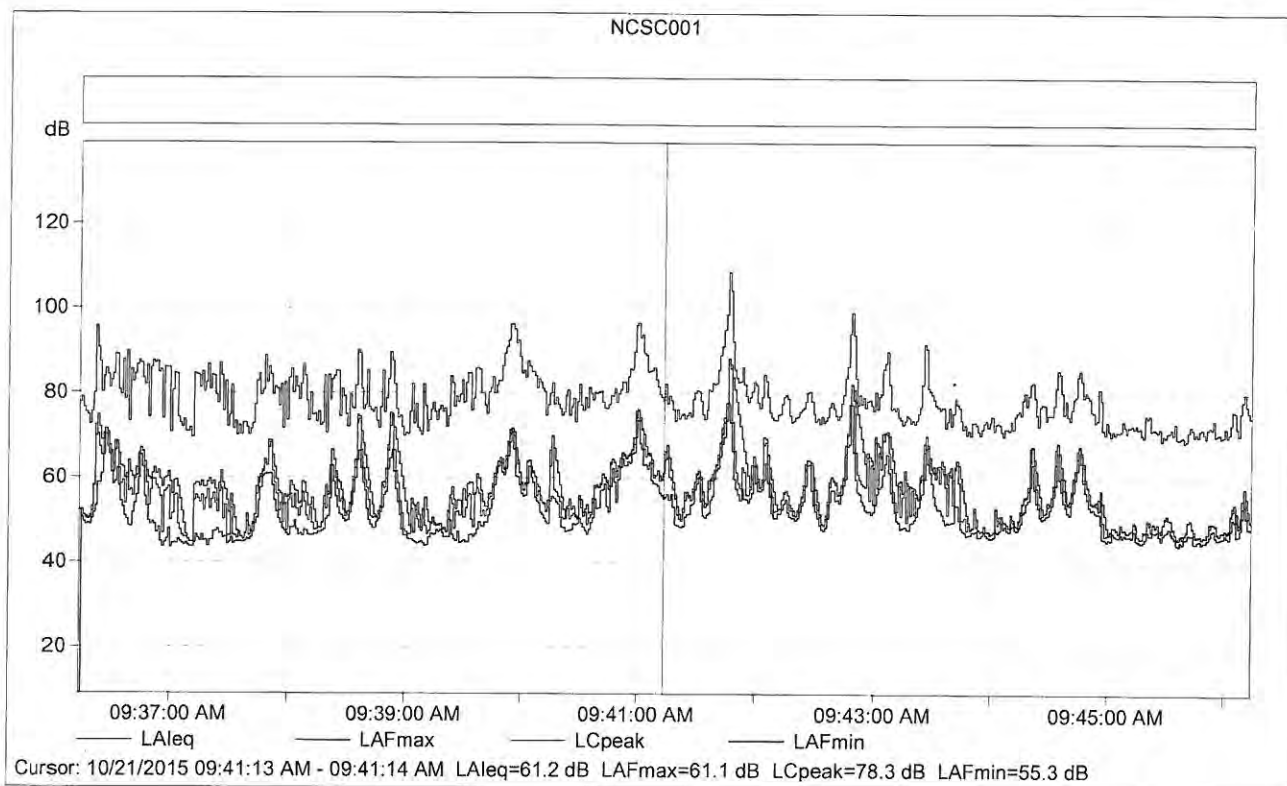
Instrument Serial Number:		2548189
Microphone Serial Number:		2543364
Input:		Top Socket
Windscreen Correction:		None
Sound Field Correction:		Free-field

Calibration Time:		10/15/2015 08:57:49
Calibration Type:		External reference
Sensitivity:		66.8102875351906 mV/Pa

NCSC001

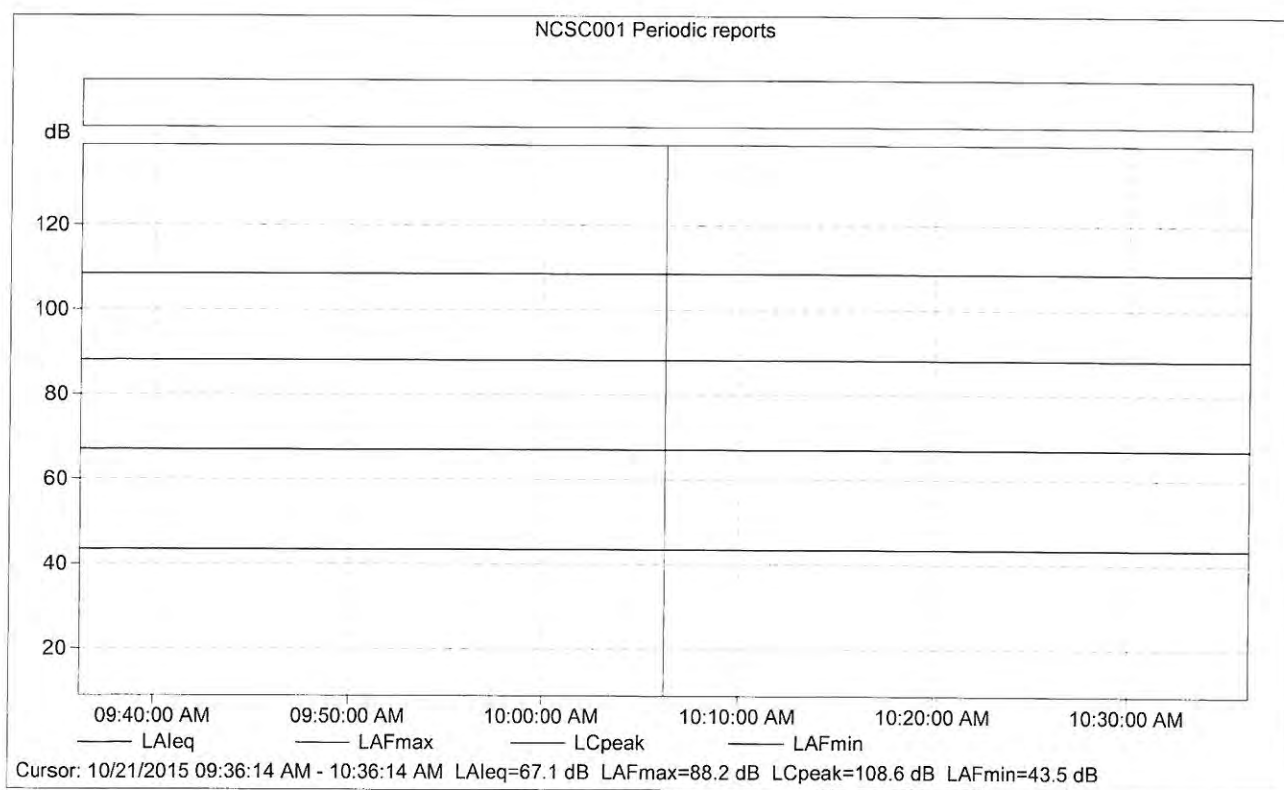
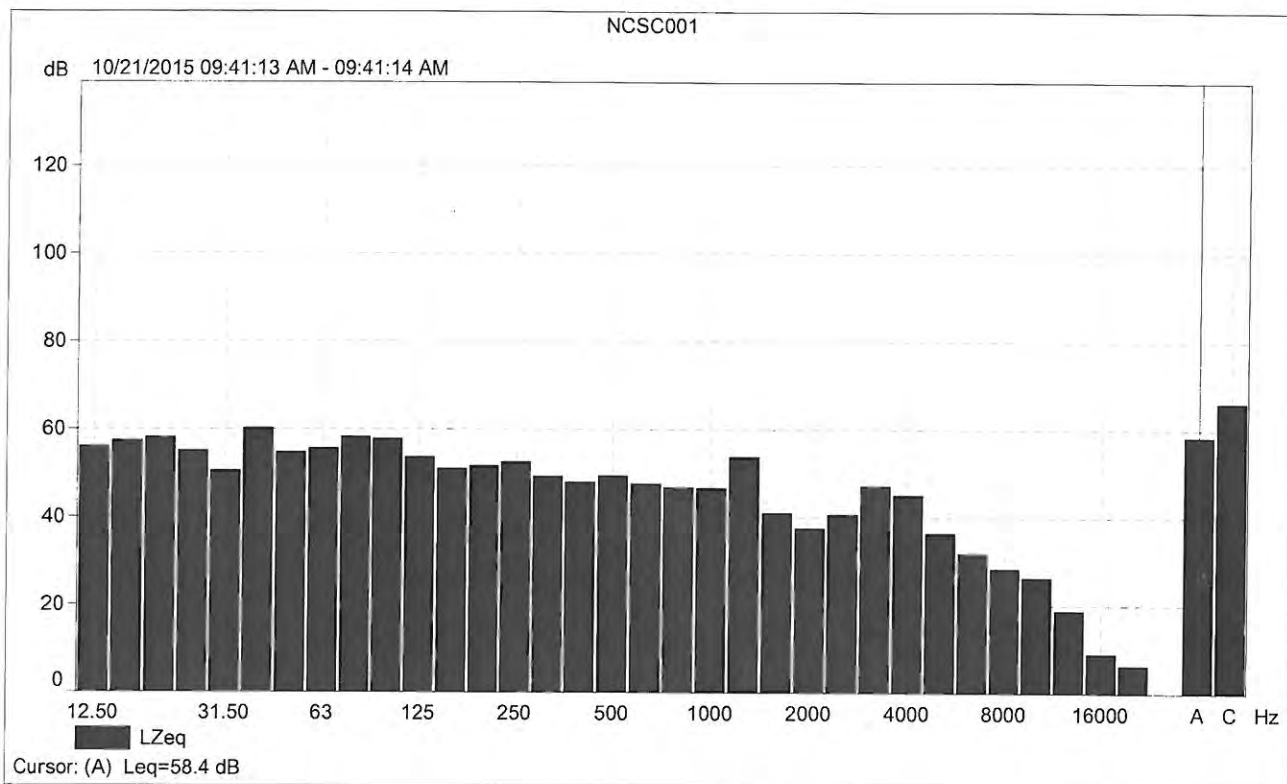
	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	63.4	88.2	43.5
Time	09:36:14 AM	09:46:14 AM	0:10:00				
Date	10/21/2015	10/21/2015					





NCSC001

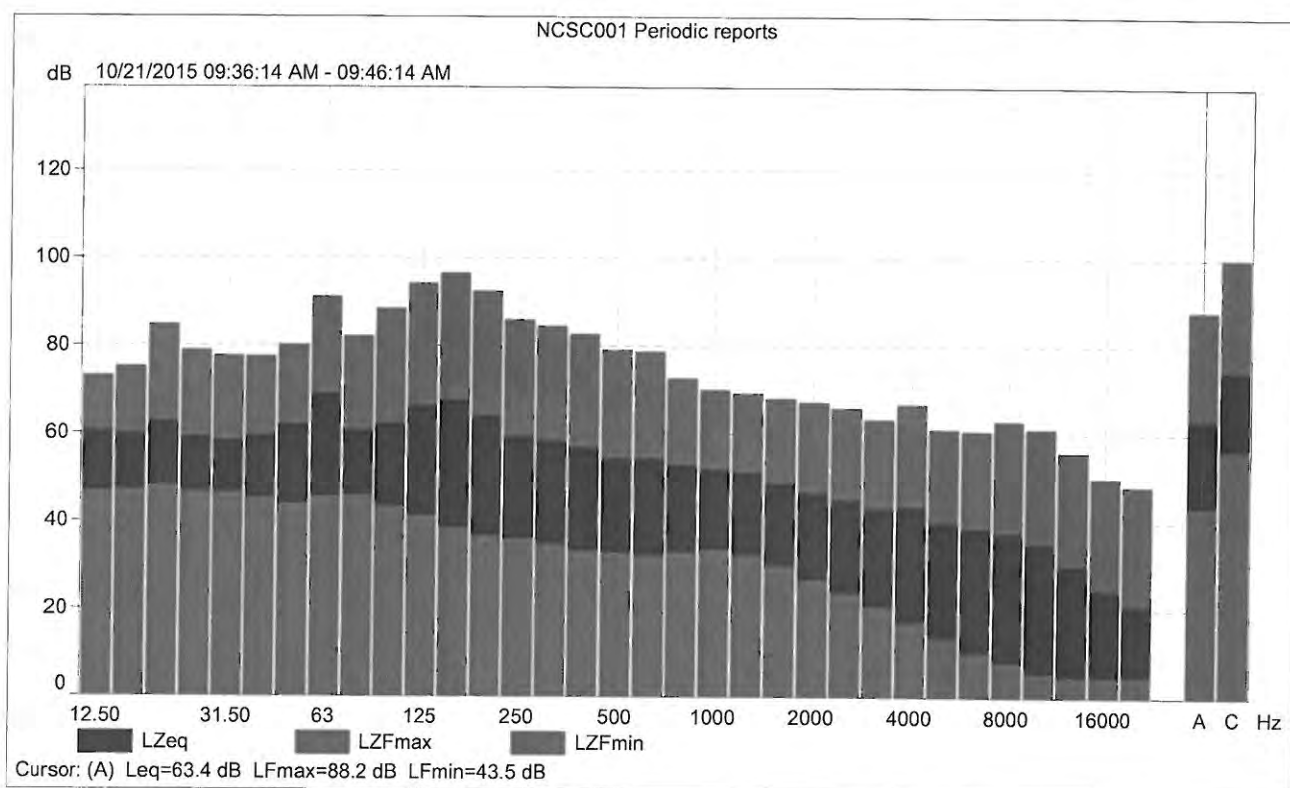
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Value			61.2	61.1	55.3
Time	09:41:13 AM	0:00:01			
Date	10/21/2015				

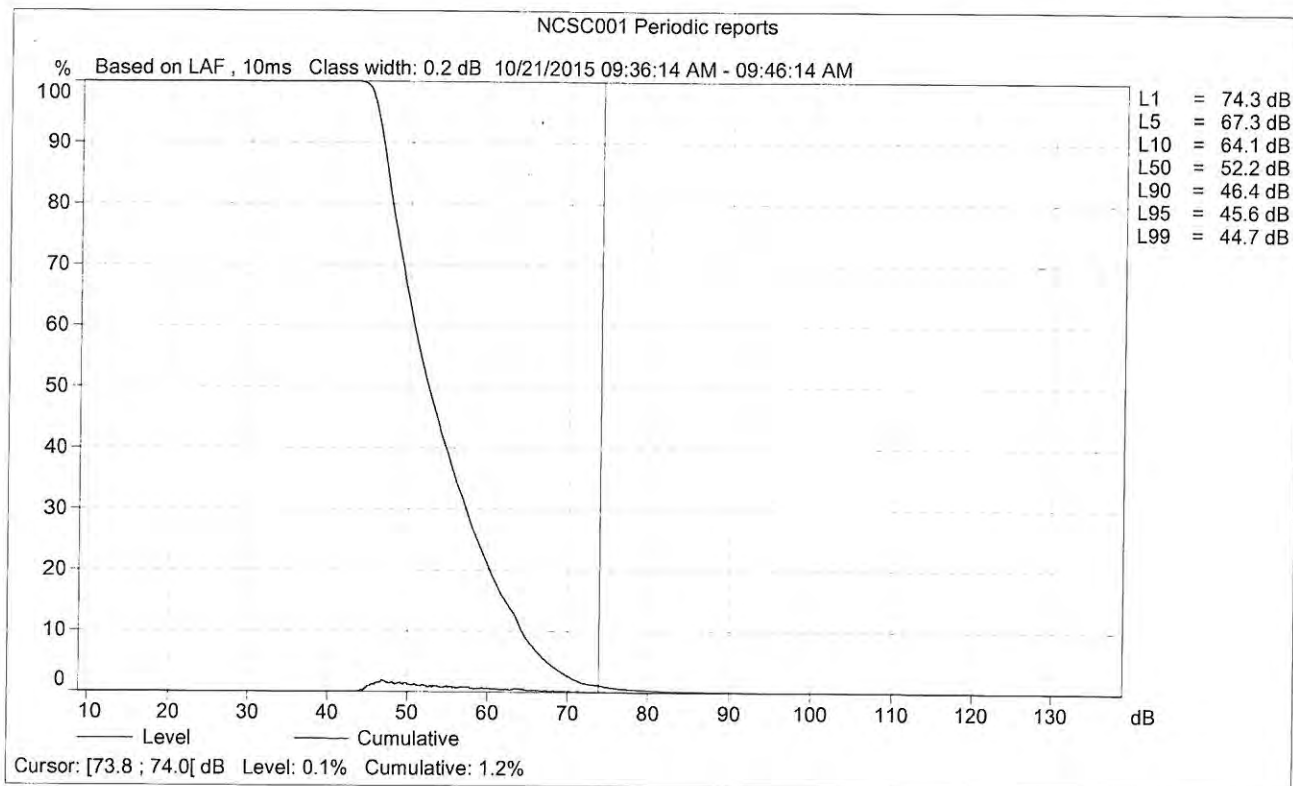




NCSC001 Periodic reports

	Start time	Elapsed time	Overload [%]	LAFeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			0.00	67.1	88.2	43.5
Time	09:36:14 AM	0:10:00				
Date	10/21/2015					





Site Number: 2			
Recorded By: Ryan Chiene			
Job Number: 149164			
Date: 10/21/2015			
Time: 9:52 AM			
Location: Near the southern boundary of the project site.			
Source of Peak Noise: Cars and heavy trucks on North Pacific Street, SR-78 freeway noise, cars/trucks pulling in and out of industrial use parking areas, mechanical equipment at industrial uses, plane flying overhead.			
Noise Data			
Leq (dB)	Lmin (dB)	Lmax (dB)	Peak (dB)
59.8	50.3	77.9	95.5

Equipment						
Category	Type	Vendor	Model	Serial No.	Cert. Date	Note
Sound	Sound Level Meter	Brüel & Kjær	2250	2548189	11/18/2014	
	Microphone	Brüel & Kjær	4189	2543364	11/18/2014	
	Preamp	Brüel & Kjær	ZC 0032	4265	11/18/2014	
	Calibrator	Brüel & Kjær	4231	2545667	11/18/2014	
Weather Data						
Est.	Duration: 10 minutes			Sky: Sunny		
	Note: dBA Offset = 0.02			Sensor Height (ft): 5 ft		
	Wind Ave Speed (mph / m/s)		Temperature (degrees Fahrenheit)		Barometer Pressure (inches)	
	1.2		74.9		29.86	

Photo of Measurement Location



2250

Instrument:		2250
Application:		BZ7225 Version 4.4
Start Time:		10/21/2015 09:52:35
End Time:		10/21/2015 10:02:35
Elapsed Time:		00:10:00
Bandwidth:		1/3-octave
Max Input Level:		138.43

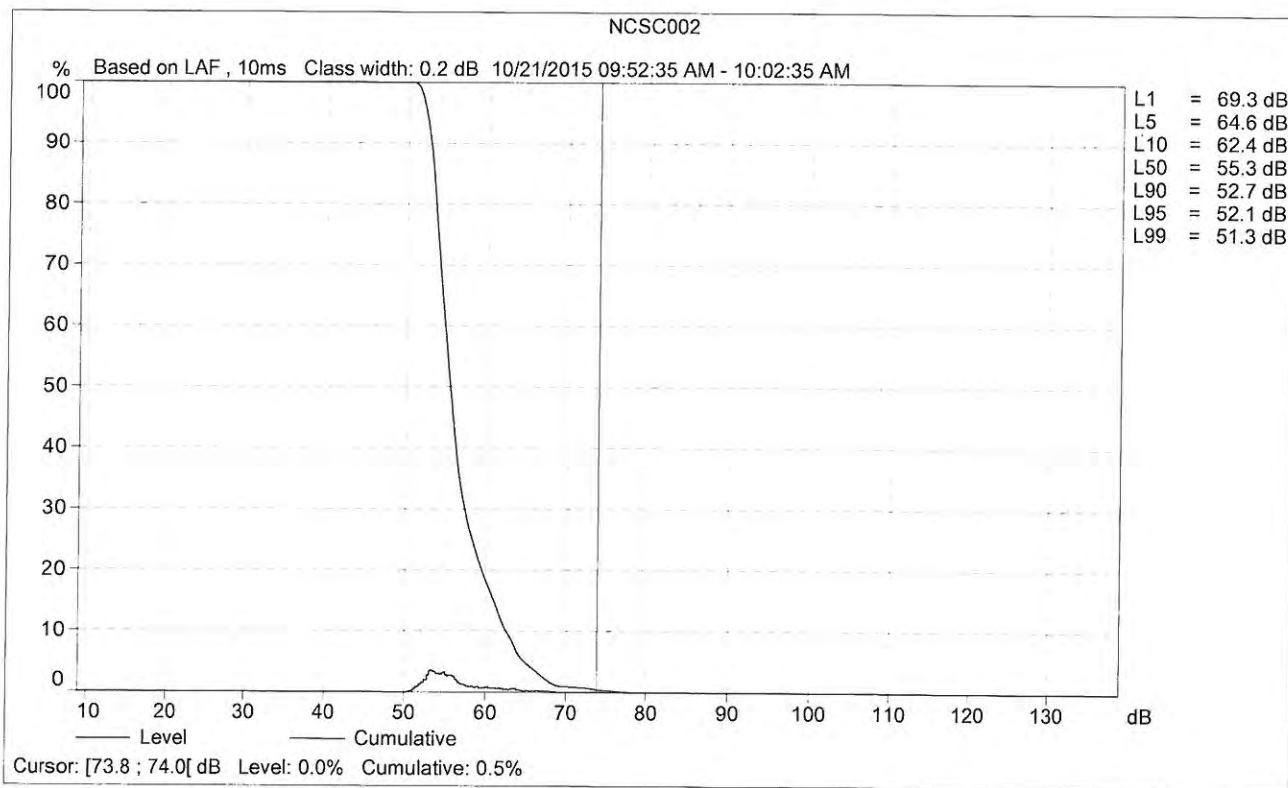
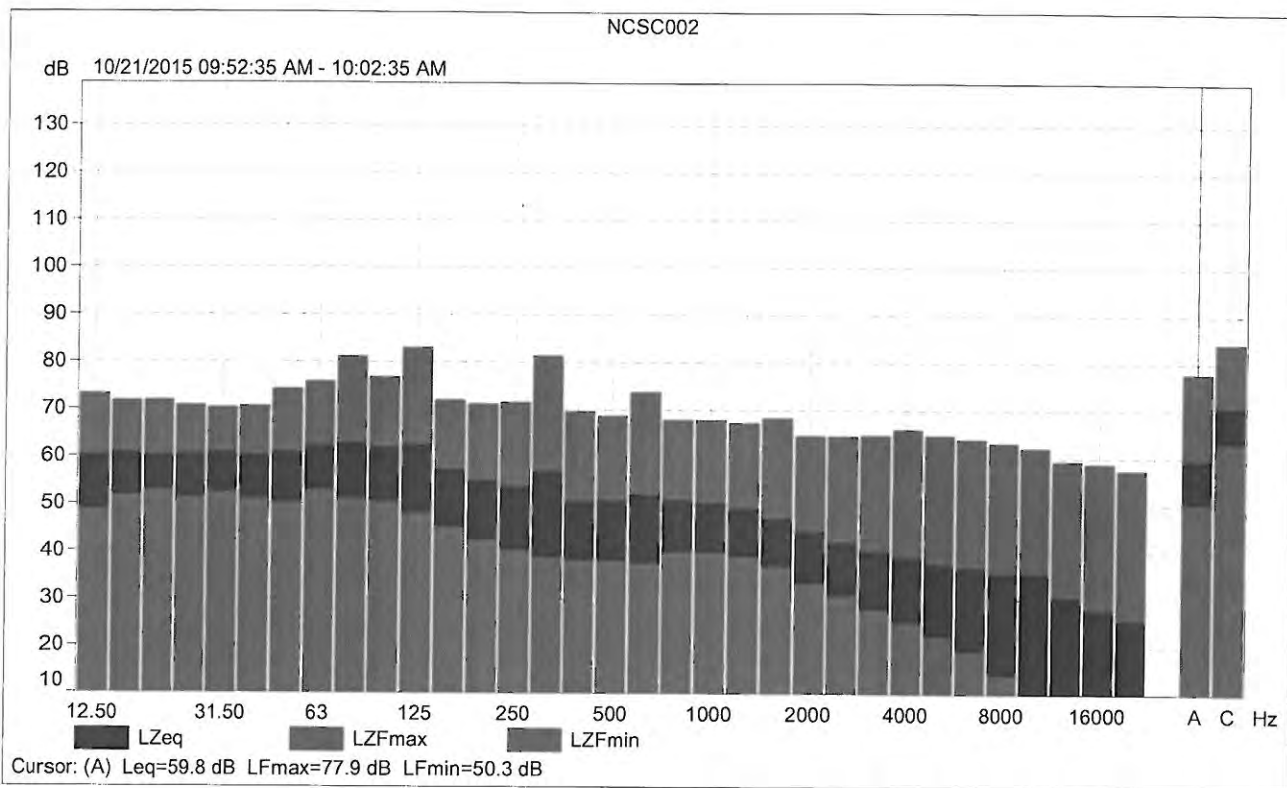
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	Z

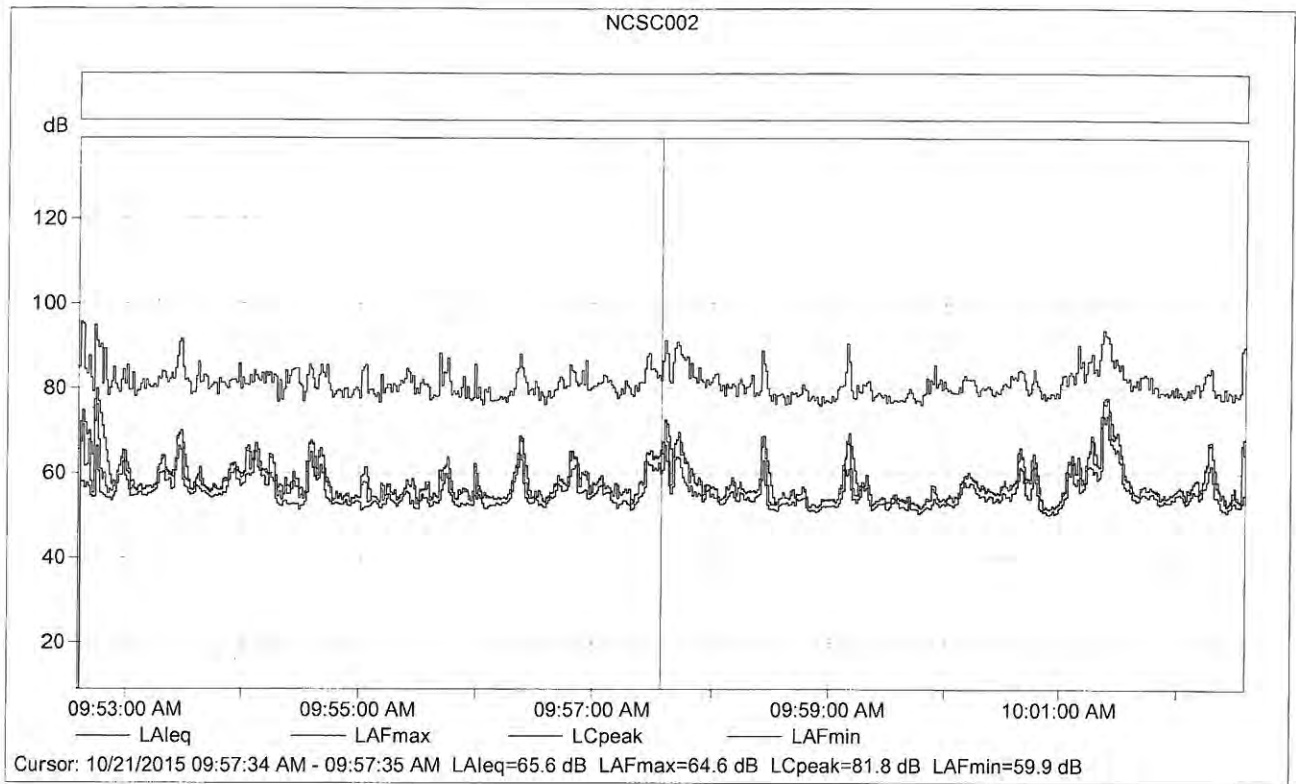
Instrument Serial Number:		2548189
Microphone Serial Number:		2543364
Input:		Top Socket
Windscreen Correction:		None
Sound Field Correction:		Free-field

Calibration Time:		10/15/2015 08:57:49
Calibration Type:		External reference
Sensitivity:		66.8102875351906 mV/Pa

NCSC002

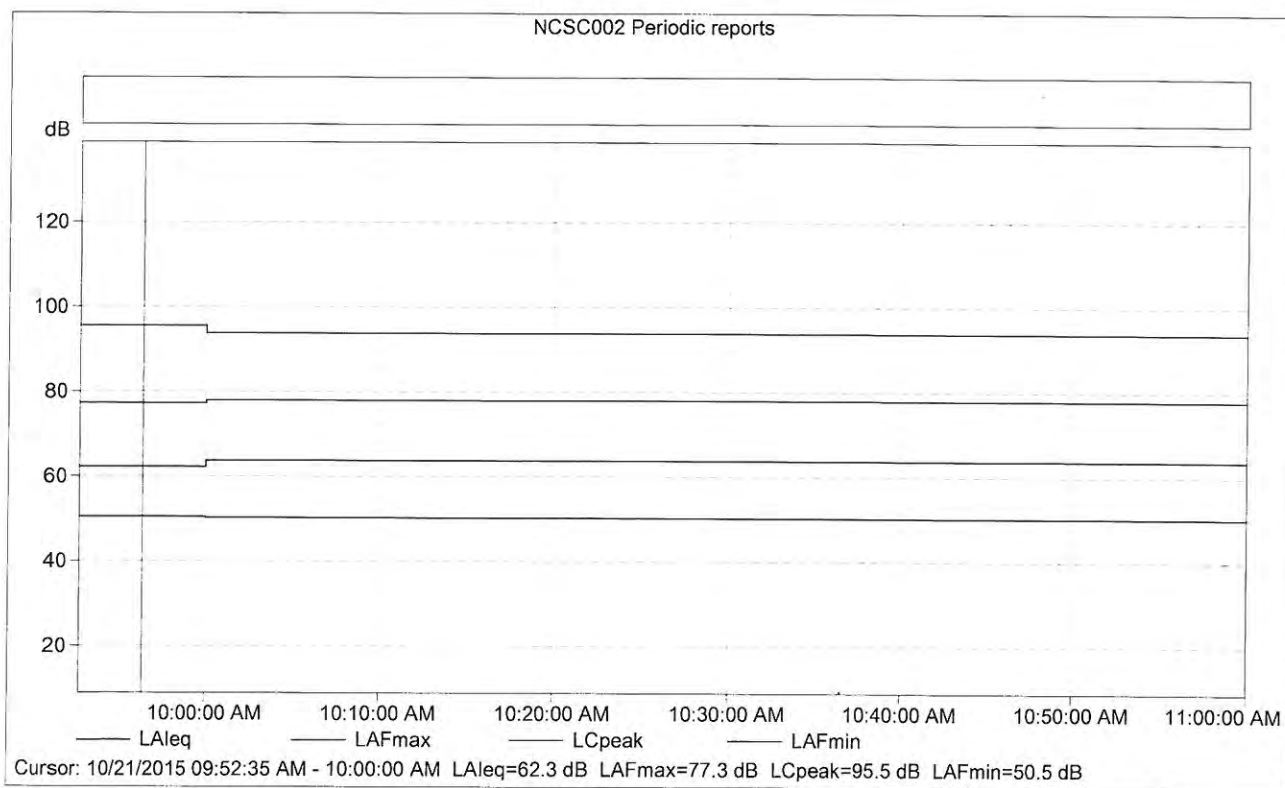
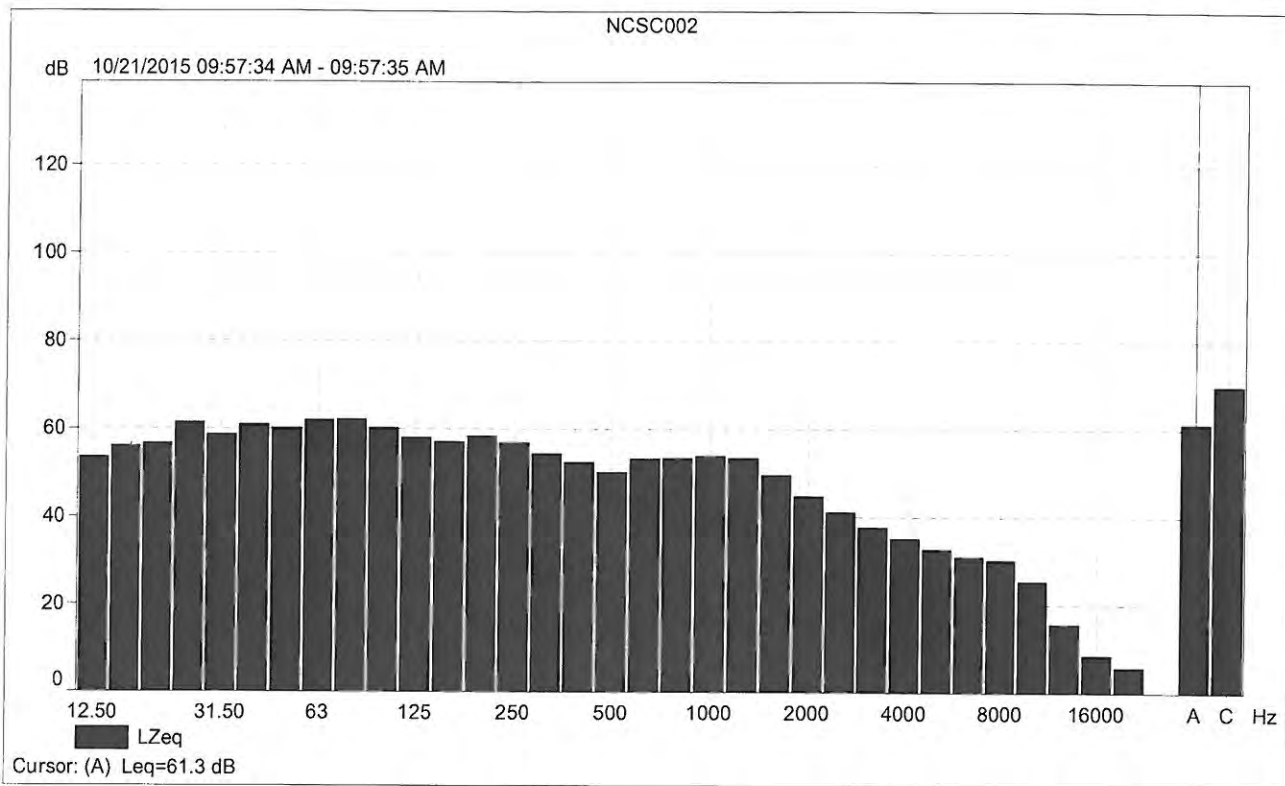
	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	59.8	77.9	50.3
Time	09:52:35 AM	10:02:35 AM	0:10:00				
Date	10/21/2015	10/21/2015					





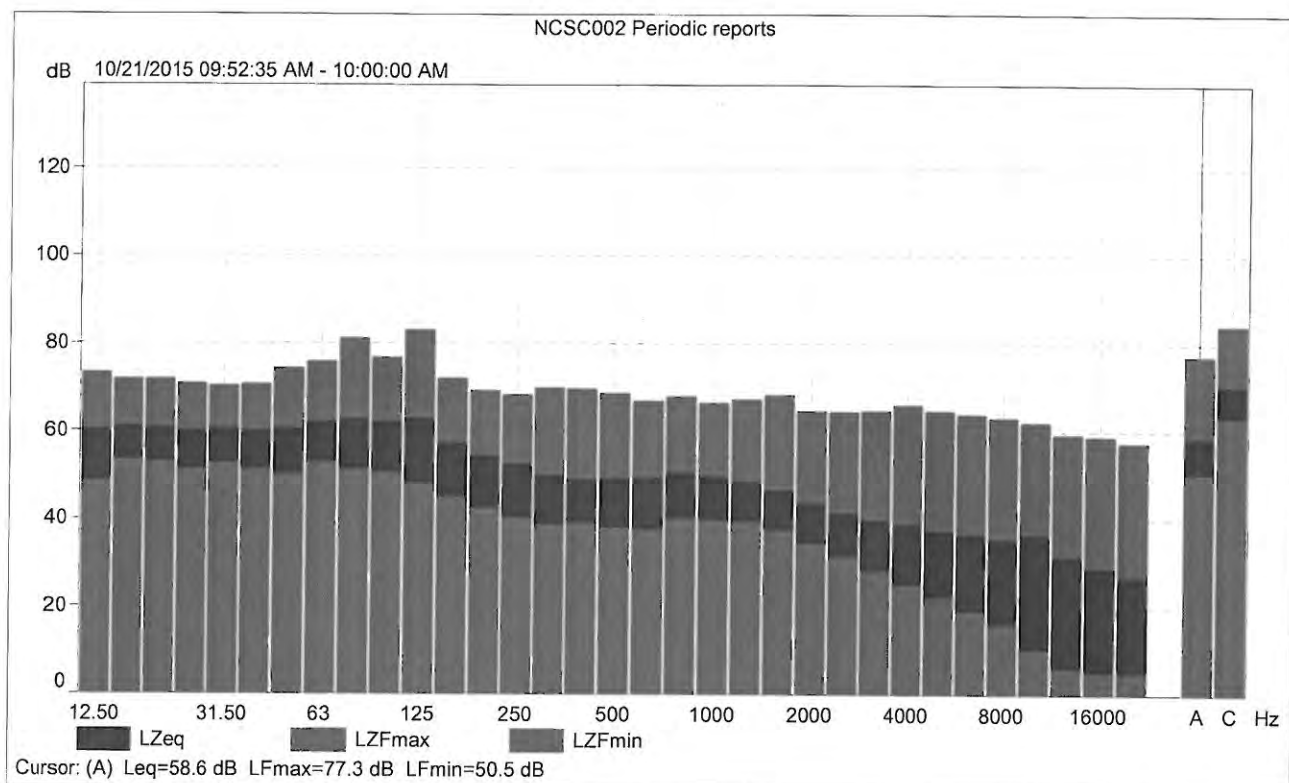
NCSC002

	Start time	Elapsed time	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			65.6	64.6	59.9
Time	09:57:34 AM	0:00:01			
Date	10/21/2015				

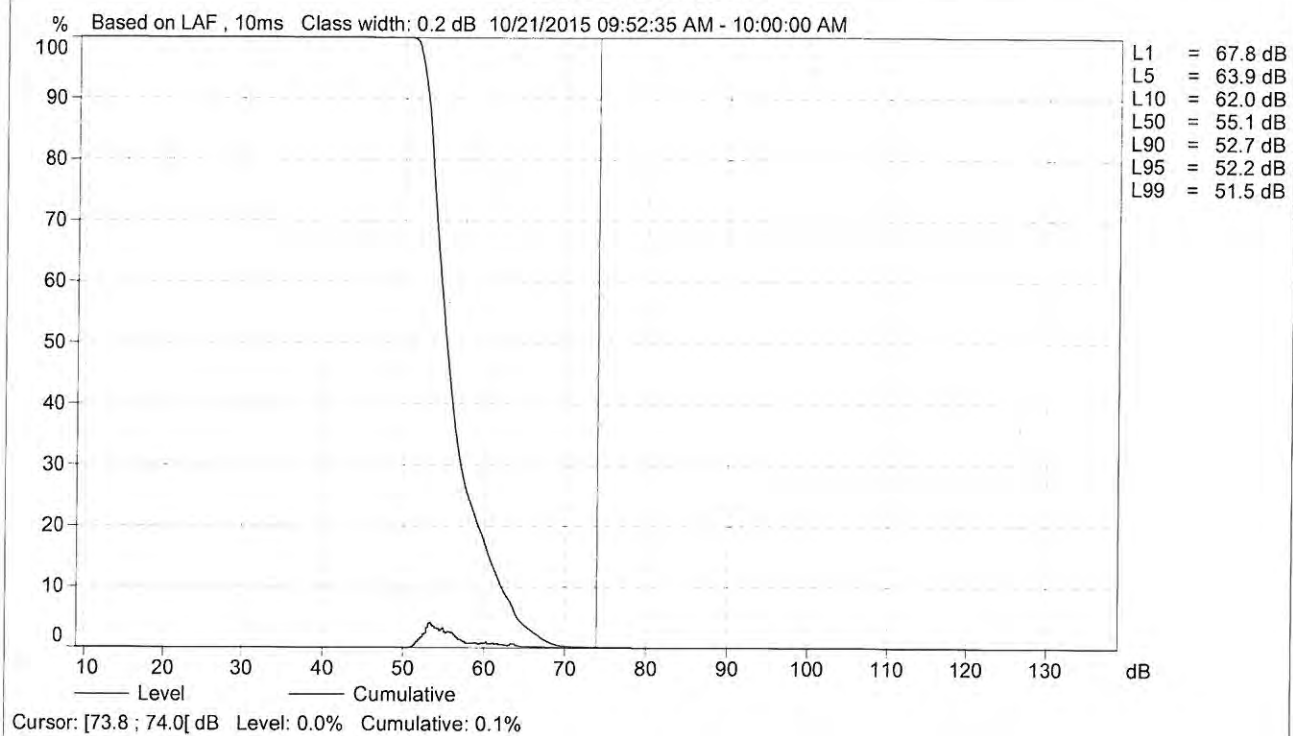


NCSC002 Periodic reports

	Start time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			0.00	62.3	77.3	50.5
Time	09:52:35 AM	0:07:25				
Date	10/21/2015					



NCSC002 Periodic reports



Site Number: 3			
Recorded By: Ryan Chiene			
Job Number: 149164			
Date: 10/21/2015			
Time: 10:00 AM			
Location: Along Los Vallecitos Boulevard, near the Residence Inn Marriott, and Palomar Station residential uses.			
Source of Peak Noise: Cars and heavy trucks on Los Vallecitos Boulevard, plane flying overhead.			
Noise Data			
Leq (dB)	Lmin (dB)	Lmax (dB)	Peak (dB)
63.0	50.4	84.2	99.0

Equipment						
Category	Type	Vendor	Model	Serial No.	Cert. Date	Note
Sound	Sound Level Meter	Brüel & Kjær	2250	2548189	11/18/2014	
	Microphone	Brüel & Kjær	4189	2543364	11/18/2014	
	Preamp	Brüel & Kjær	ZC 0032	4265	11/18/2014	
	Calibrator	Brüel & Kjær	4231	2545667	11/18/2014	
Weather Data						
Est.	Duration: 10 minutes			Sky: Sunny		
	Note: dBA Offset = 0.02			Sensor Height (ft): 5 ft		
	Wind Ave Speed (mph / m/s)	Temperature (degrees Fahrenheit)		Barometer Pressure (inches)		
	1.0	75.1		29.86		

Photo of Measurement Location



2250

Instrument:		2250
Application:		BZ7225 Version 4.4
Start Time:		10/21/2015 10:11:16
End Time:		10/21/2015 10:21:16
Elapsed Time:		00:10:00
Bandwidth:		1/3-octave
Max Input Level:		138.43

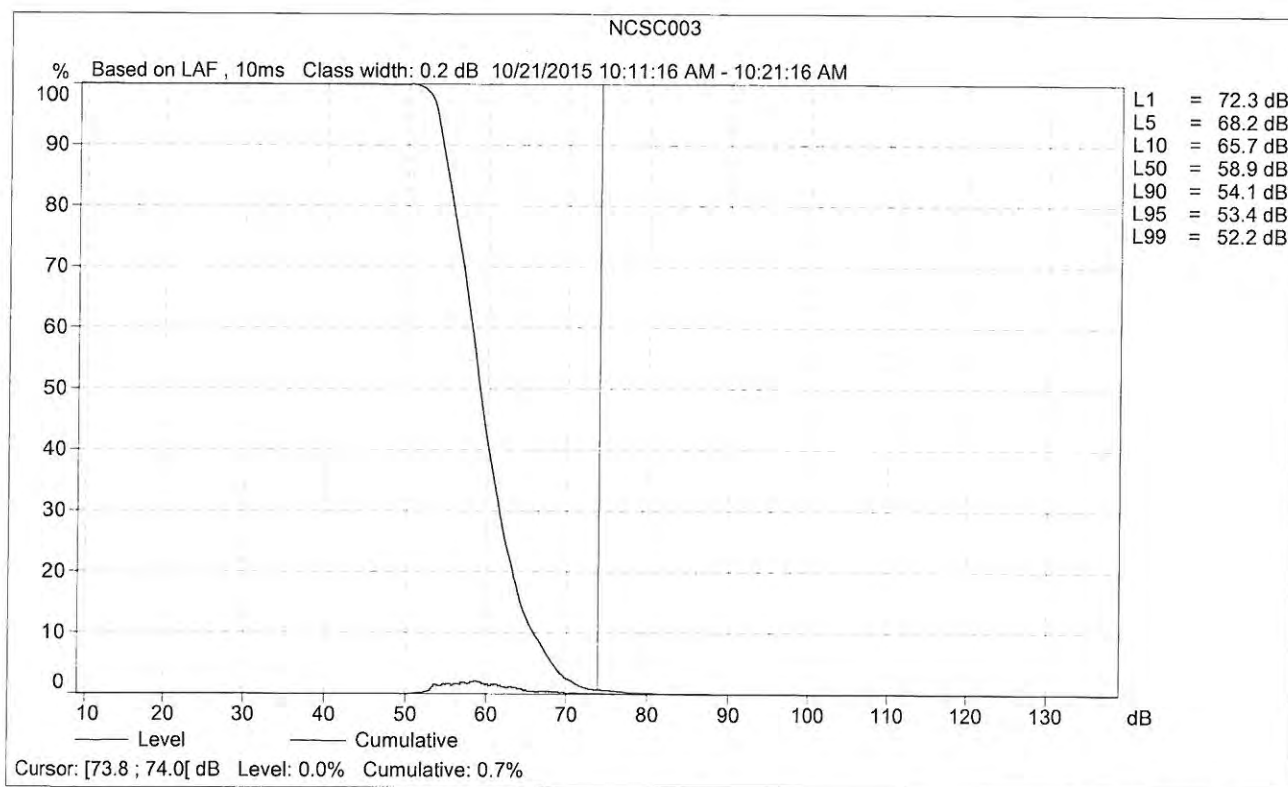
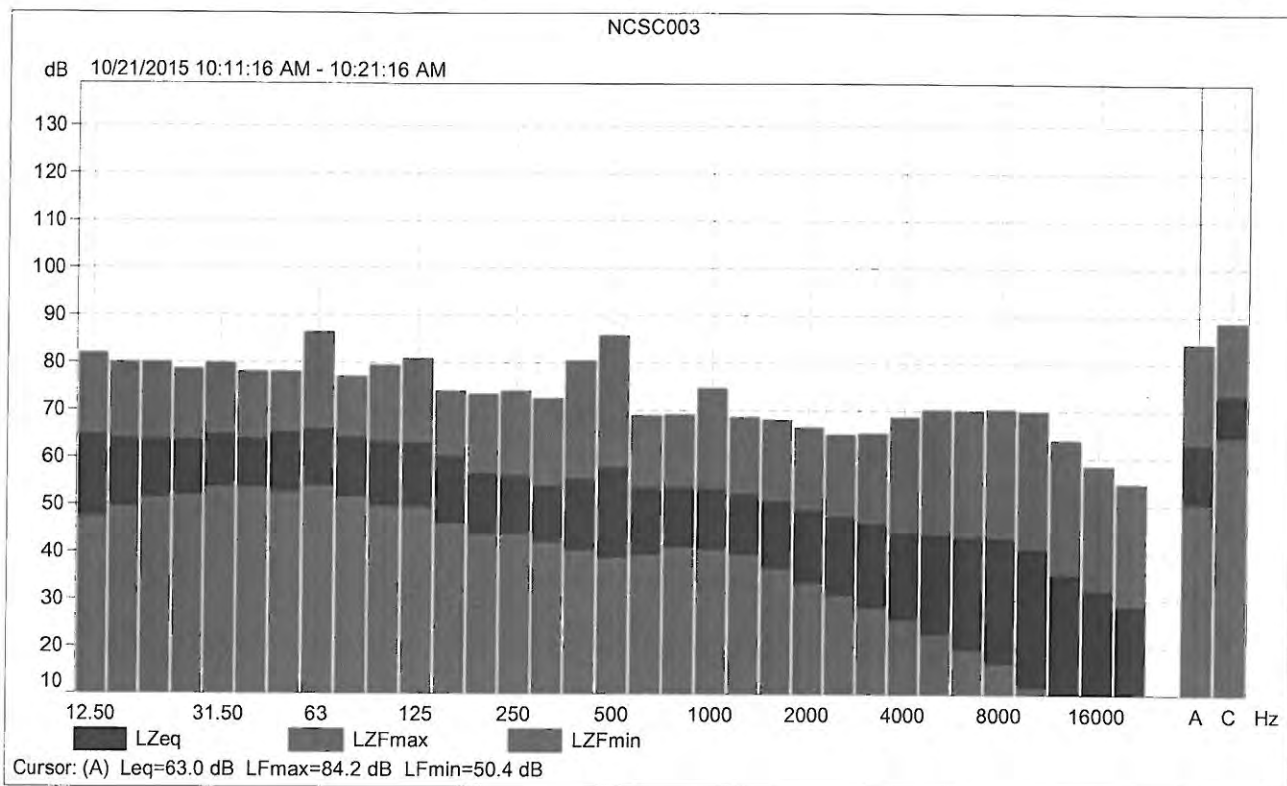
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	Z

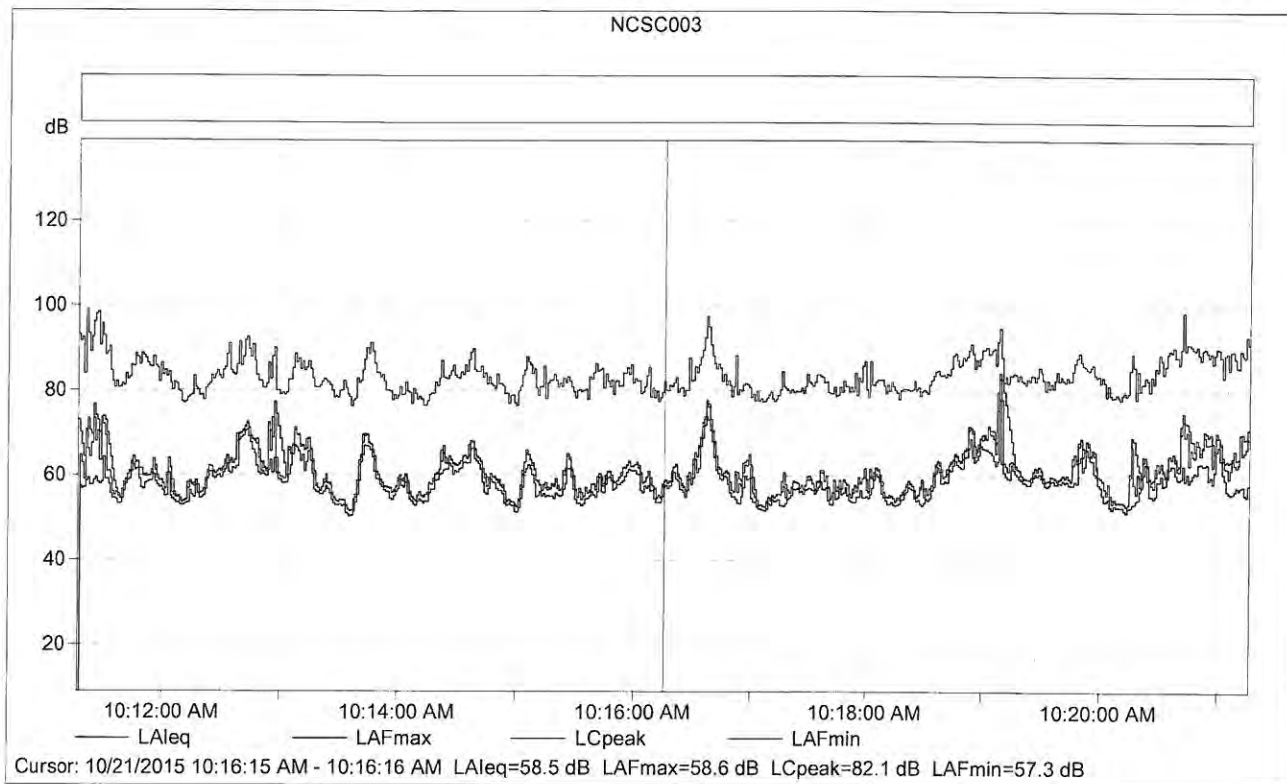
Instrument Serial Number:		2548189
Microphone Serial Number:		2543364
Input:		Top Socket
Windscreen Correction:		None
Sound Field Correction:		Free-field

Calibration Time:		10/15/2015 08:57:49
Calibration Type:		External reference
Sensitivity:		66.8102875351906 mV/Pa

NCSC003

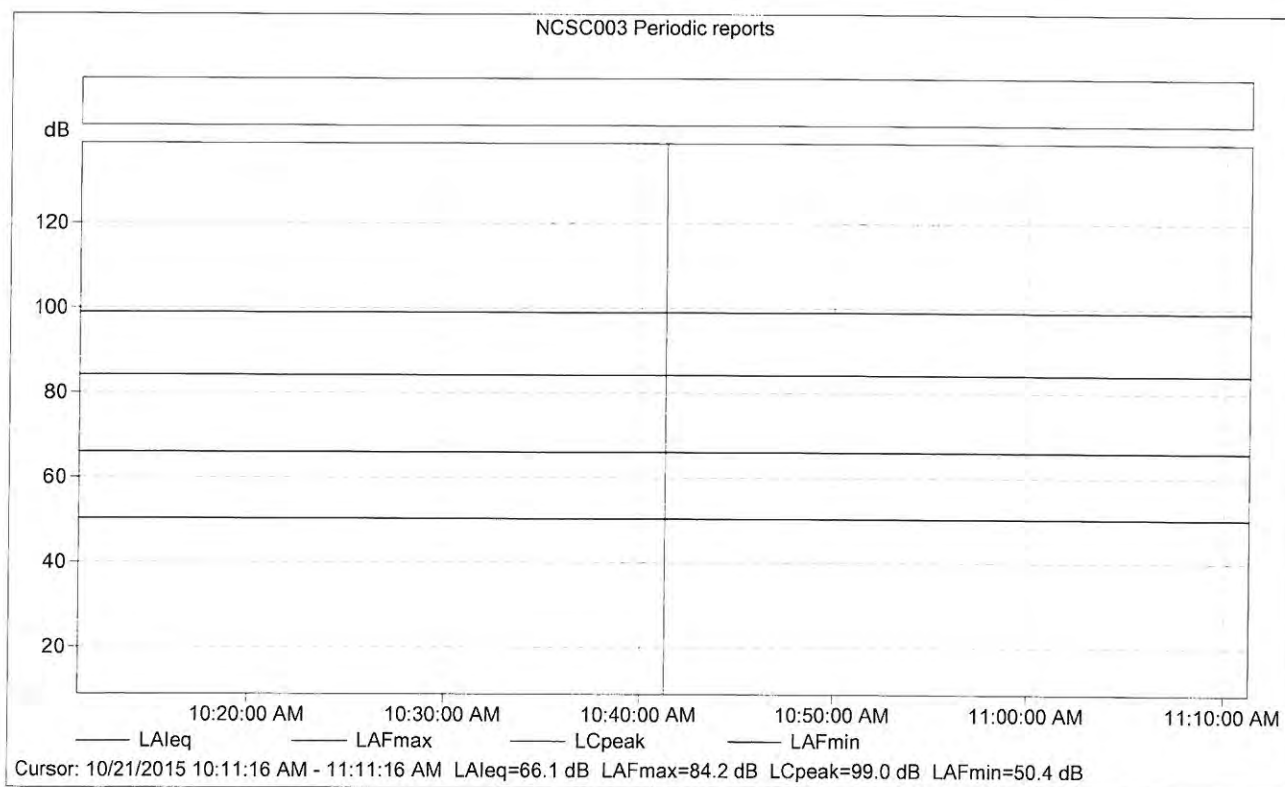
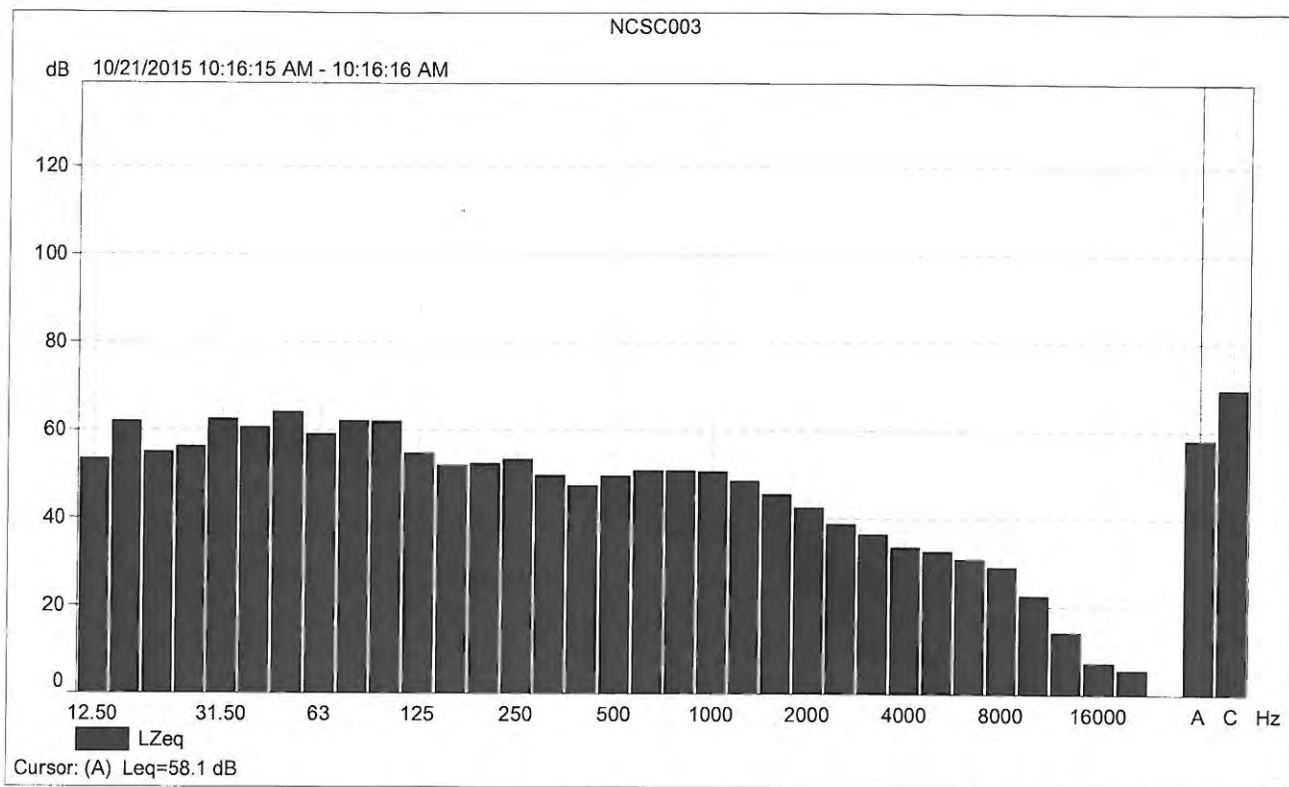
	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	63.0	84.2	50.4
Time	10:11:16 AM	10:21:16 AM	0:10:00				
Date	10/21/2015	10/21/2015					





NCSC003

	Start time	Elapsed time	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			58.5	58.6	57.3
Time	10:16:15 AM	0:00:01			
Date	10/21/2015				



NCSC003 Periodic reports

	Start time	Elapsed time	Overload [%]	LAFeq [dB]	LAFmax [dB]	LAFmin [dB]
Value			0.00	66.1	84.2	50.4
Time	10:11:16 AM	0:10:00				
Date	10/21/2015					

