Appendix C Noise Modeling

Appendices

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NOISE FUNDAMENTALS

Fundamentals of Noise

NOISE

Noise is most often defined as unwanted sound; whether it is loud, unpleasant, unexpected, or otherwise undesirable. Although sound can be easily measured, the perception of noise and the physical response to sound complicate the analysis of its impact on people. People judge the relative magnitude of sound sensation in subjective terms such as "noisiness" or "loudness."

Noise Descriptors

The following are brief definitions of terminology used in this chapter:

- **Sound.** A disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.

- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.

- **Decibel (dB).** A unitless measure of sound, expressed on a logarithmic scale and with respect to a defined reference sound pressure. The standard reference pressure is 20 micropascals (20 μPa).

- **Vibration Decibel (VdB).** A unitless measure of vibration, expressed on a logarithmic scale and with respect to a defined reference vibration velocity. In the U.S., the standard reference velocity is 1 micro-inch per second ($1x10^{-6}$ in/sec).

- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.

- **Equivalent Continuous Noise Level (L_{eq}); also called the Energy-Equivalent Noise Level.** The value of an equivalent, steady sound level which, in a stated time period (often over an hour) and at a stated location, has the same A-weighted sound energy as the time-varying sound. Thus, the L_{eq} metric is a single numerical value that represents the equivalent amount of variable sound energy received by a receptor over the specified duration.

- **Statistical Sound Level (L_n).** The sound level that is exceeded "n" percent of time during a given sample period. For example, the L_{50} level is the statistical indicator of the time-varying noise signal that is exceeded 50 percent of the time (during each sampling period); that is, half of the sampling time, the changing noise levels are above this value and half of the time they are below it. This is called the "median sound level." The L_{10} level, likewise, is the value that is exceeded 10 percent of the time (i.e., near the maximum) and this is often known as the "intrusive sound level." The L_{90} is the sound level exceeded 90 percent of the time and is often considered the "effective background level" or "residual noise level."

- **Maximum Sound Level (L_{max})**. The highest RMS sound level measured during the measurement period.
- **Root Mean Square Sound Level (RMS).** The square root of the average of the square of the sound pressure over the measurement period.
- **Day-Night Sound Level (L_{dn} or DNL).** The energy-average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the sound levels occurring during the period from 10:00 PM to 7:00 AM.
- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added from 7:00 PM to 10:00 PM and 10 dB from 10:00 PM to 7:00 AM. NOTE: For general community/environmental noise, CNEL and L_{dn} values rarely differ by more than 1 dB (with the CNEL being only slightly more restrictive – that is, higher than the L_{dn} value). As a matter of practice, L_{dn} and CNEL values are interchangeable and are treated as equivalent in this assessment.
- **Peak Particle Velocity (PPV).** The peak rate of speed at which soil particles move (e.g., inches per second) due to ground vibration.
- **Sensitive Receptor.** Noise- and vibration-sensitive receptors include land uses where quiet environments are necessary for enjoyment and public health and safety. Residences, schools, motels and hotels, libraries, religious institutions, hospitals, and nursing homes are examples.

Characteristics of Sound

When an object vibrates, it radiates part of its energy in the form of a pressure wave. Sound is that pressure wave transmitted through the air. Technically, airborne sound is a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure that creates sound waves.

Sound can be described in terms of amplitude (loudness), frequency (pitch), or duration (time). Loudness or amplitude is measured in dB, frequency or pitch is measured in Hertz [Hz] or cycles per second, and duration or time variations is measured in seconds or minutes.

Amplitude

Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale. Because of the physical characteristics of noise transmission and perception, the relative loudness of sound does not closely match the actual amounts of sound energy. Table 1 presents the subjective effect of changes in sound pressure levels. Ambient sounds generally range from 30 dBA (very quiet) to 100 dBA (very loud). Changes of 1 to 3 dB are detectable under quiet, controlled conditions, and changes of less than 1 dB are usually not discernible (even under ideal conditions). A 3 dB change in noise levels is considered the minimum change that is detectable with human hearing in outside environments. A change of 5 dB is readily discernible to most people in an exterior environment, and a 10 dB change is perceived as a doubling (or halving) of the sound.

Table 1 Noise Perceptibility

Change in dB	Noise Level
± 3 dB	Barely perceptible increase
± 5 dB	Readily perceptible increase
± 10 dB	Twice or half as loud
± 20 dB	Four times or one-quarter as loud

Source: California Department of Transportation (Caltrans). 2013, September. Technical Noise Supplement ("TeNS").

Frequency

The human ear is not equally sensitive to all frequencies. Sound waves below 16 Hz are not heard at all, but are "felt" more as a vibration. Similarly, though people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz.

When describing sound and its effect on a human population, A-weighted (dBA) sound levels are typically used to approximate the response of the human ear. The A-weighted noise level has been found to correlate well with people's judgments of the "noisiness" of different sounds and has been used for many years as a measure of community and industrial noise. Although the A-weighted scale and the energy-equivalent metric are commonly used to quantify the range of human response to individual events or general community sound levels, the degree of annoyance or other response also depends on several other perceptibility factors, including:

- Ambient (background) sound level
- General nature of the existing conditions (e.g., quiet rural or busy urban)
- Difference between the magnitude of the sound event level and the ambient condition
- Duration of the sound event
- Number of event occurrences and their repetitiveness
- Time of day that the event occurs

Duration

Time variation in noise exposure is typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called L_{eq}), or alternately, as a statistical description of the sound level that is exceeded over some fraction of a given observation period. For example, the L_{50} noise level represents the noise level that is exceeded 50 percent of the time; half the time the noise level exceeds this level and half the time the noise level is less than this level. This level is also representative of the level that is exceeded 30 minutes in an hour. Similarly, the L_2, L_8 and L_{25} values represent the noise levels that are exceeded 2, 8, and 25 percent of the time or 1, 5, and 15 minutes per hour, respectively. These "n" values are typically used to demonstrate compliance for stationary noise sources with many cities' noise ordinances. Other values typically noted during a noise survey are the L_{min} and L_{max}. These values represent the minimum and maximum root-mean-square noise levels obtained over the measurement period, respectively.

Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law and many local jurisdictions use an adjusted 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL) or Day-Night Noise Level (L_{dn}). The CNEL descriptor requires that an artificial increment (or "penalty") of 5 dBA be added to the actual noise level for the hours from 7:00 PM to 10:00

PM and 10 dBA for the hours from 10:00 PM to 7:00 AM. The L_{dn} descriptor uses the same methodology except that there is no artificial increment added to the hours between 7:00 PM and 10:00 PM. Both descriptors give roughly the same 24-hour level, with the CNEL being only slightly more restrictive (i.e., higher). The CNEL or L_{dn} metrics are commonly applied to the assessment of roadway and airport-related noise sources.

Sound Propagation

Sound dissipates exponentially with distance from the noise source. This phenomenon is known as "spreading loss." For a single-point source, sound levels decrease by approximately 6 dB for each doubling of distance from the source (conservatively neglecting ground attenuation effects, air absorption factors, and barrier shielding). For example, if a backhoe at 50 feet generates 84 dBA, at 100 feet the noise level would be 79 dBA, and at 200 feet it would be 73 dBA. This drop-off rate is appropriate for noise generated by on-site operations from stationary equipment or activity at a project site. If noise is produced by a line source, such as highway traffic, the sound decreases by 3 dB for each doubling of distance over a reflective ("hard site") surface such as concrete or asphalt. Line source noise in a relatively flat environment with ground-level absorptive vegetation decreases by an additional 1.5 dB for each doubling of distance.

Psychological and Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. Extended periods of noise exposure above 90 dBA results in permanent cell damage, which is the main driver for employee hearing protection regulations in the workplace. For community environments, the ambient or background noise problem is widespread, through generally worse in urban areas than in outlying, less-developed areas. Elevated ambient noise levels can result in noise interference (e.g., speech interruption/masking, sleep disturbance, disturbance of concentration) and cause annoyance. Since most people do not routinely work with decibels or A-weighted sound levels, it is often difficult to appreciate what a given sound pressure level number means. To help relate noise level values to common experience, Table 2 shows typical noise levels from familiar sources.

Table 2 Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Onset of physical discomfort	120+	
	110	Rock Band (near amplification system)
Jet Flyover at 1,000 feet		
	100	
Gas Lawn Mower at three 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		
	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: California Department of Transportation (Caltrans). 2013, September. Technical Noise Supplement ("TeNS").

Vibration Fundamentals

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Vibration is normally associated with activities stemming from operations of railroads or vibration-intensive stationary sources, but can also be associated with construction equipment such as jackhammers, pile drivers, and hydraulic hammers. As with noise, vibration can be described by both its amplitude and frequency. Vibration displacement is the distance that a point on a surface moves away from its original static position; velocity is the instantaneous speed that a point on a surface moves; and acceleration is the rate of change of the speed. Each of these descriptors can be used to correlate vibration to human response, building damage, and acceptable equipment vibration levels. During construction, the operation of construction equipment can cause groundborne vibration. During the operational phase of a project, receptors may be subject to levels of vibration that can cause annoyance due to noise generated from vibration of a structure or items within a structure.

Vibration amplitudes are usually described in terms of either the peak particle velocity (PPV) or the root mean square (RMS) velocity. PPV is the maximum instantaneous peak of the vibration signal and RMS is the

square root of the average of the squared amplitude of the signal. PPV is more appropriate for evaluating potential building damage and RMS is typically more suitable for evaluating human response.

As with airborne sound, annoyance with vibrational energy is a subjective measure, depending on the level of activity and the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Persons accustomed to elevated ambient vibration levels, such as in an urban environment, may tolerate higher vibration levels. Table 3 displays the human response and the effects on buildings resulting from continuous vibration (in terms of various levels of PPV).

Table 3 Human Reaction to Typical Vibration Levels

Vibration Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.006–0.019	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibration begins to annoy people	Virtually no risk of "architectural" (i.e. not structural) damage to normal buildings
0.20	Vibrations annoying to people in buildings	Threshold at which there is a risk to "architectural" damage to normal dwelling – houses with plastered walls and ceilings
0.4–0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

Source: California Department of Transportation (Caltrans). 2020, April. *Transportation and Construction Vibration Guidance Manual.* Prepared by ICF International.

AMBIENT NOISE MONITORING DATA

Summary

File Name on Meter	LxT_Data.013.s
File Name on PC	LxT_0005426-20230525 143705-LxT_Data.013.ldbin
Serial Number	0005426
Model	SoundTrack LxT®
Firmware Version	2.404
User	AG
Location	LT-1
Job Description	SMUS-07
Note	

Measurement

Description	
Start	2023-05-25 14:37:05
Stop	2023-05-25 14:52:06
Duration	00:15:00.7
Run Time	00:00:00.5
Pause	00:15:00.2
Pre-Calibration	2023-05-25 13:03:27
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	Z Weighting
Detector	Slow
Preamplifier	PRMLxT1
Microphone Correction	Off
Integration Method	Exponential
OBA Range	Low
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	Z Weighting
OBA Max Spectrum	Bin Max
Overload	143.6 dB

	A	C	Z	
Under Range Peak	99.5	96.5	**101.5**	dB
Under Range Limit	**36.7**	36.4	43.4	dB
Noise Floor	27.6	27.2	34.3	dB

Results

LASeq	47.7	dB		
LASE	44.7	dB		
EAS	0.003	µPa²h		
EAS8	188.430	µPa²h		
EAS40	942.150	µPa²h		
LZpeak (max)	2023-05-25 14:37:05		-99.9	dB
LASmax	2023-05-25 14:37:05		48.0	dB
LASmin	2023-05-25 14:37:05		47.5	dB
SEA	-99.9	dB		

	Exceedance Counts	Duration	
LAS > 85.0 dB	0	0.0	s
LAS > 115.0 dB	0	0.0	s
LZpeak > 135.0 dB	0	0.0	s
LZpeak > 137.0 dB	0	0.0	s
LZpeak > 140.0 dB	0	0.0	s

LCSeq	63.3	dB
LASeq	47.7	dB
LCSeq - LASeq	15.6	dB
LAIeq	51.2	dB
LAeq	46.8	dB
LAIeq - LAeq	4.4	dB

	A		C		
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**
Leq	46.8				
LS(max)	48.0	2023/05/25 14:37:05			
LS(min)	47.5	2023/05/25 14:37:05			

Overload Count	0	
Overload Duration	0.0	s
OBA Overload Count	0	
OBA Overload Duration	0.0	s

Dose Settings

Dose Name	OSHA-1	OSHA-2	
Exchange Rate	5	5	dB
Threshold	90	80	dB
Criterion Level	90	90	dB
Criterion Duration	8	8	h

Results			
Dose	-99.94	-99.94	%
Projected Dose	-99.94	-99.94	%
TWA (Projected)	-99.9	-99.9	dB
TWA (t)	-99.9	-99.9	dB
Lep (t)	0.1	0.1	dB

Statistics		
LAS 2.00	48.0	dB
LAS 8.00	47.9	dB
LAS 25.00	47.8	dB
LAS 50.00	47.7	dB
LAS 90.00	47.5	dB
LAS 99.00	47.5	dB

Summary

File Name on Meter	LxT_Data.011.s
File Name on PC	LxT_0005426-20230525 130530-LxT_Data.011.ldbin
Serial Number	0005426
Model	SoundTrack LxT®
Firmware Version	2.404
User	AG
Location	ST-2
Job Description	SMUS-07
Note	

Measurement

Description	
Start	2023-05-25 13:05:30
Stop	2023-05-25 13:20:48
Duration	00:15:17.9
Run Time	00:15:17.9
Pause	00:00:00.0
Pre-Calibration	2023-05-25 13:03:27
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting	
Peak Weight	Z Weighting	
Detector	Slow	
Preamplifier	PRMLxT1	
Microphone Correction	Off	
Integration Method	Exponential	
OBA Range	Low	
OBA Bandwidth	1/1 and 1/3	
OBA Frequency Weighting	Z Weighting	
OBA Max Spectrum	Bin Max	
Overload	143.6	dB

	A	C	Z	
Under Range Peak	99.5	96.5	**101.5**	dB
Under Range Limit	**36.7**	36.4	43.4	dB
Noise Floor	27.6	27.2	34.3	dB

Results

LASeq		58.3	dB	
LASE		87.9	dB	
EAS		68.953	µPa²h	
EAS8		2.163	mPa²h	
EAS40		10.817	mPa²h	
LZpeak (max)	2023-05-25 13:10:19			103.2 dB
LASmax	2023-05-25 13:10:47			75.9 dB
LASmin	2023-05-25 13:17:43			44.0 dB
SEA		-99.9	dB	

	Exceedance Counts	**Duration**
LAS > 85.0 dB	0	0.0 s
LAS > 115.0 dB	0	0.0 s
LZpeak > 135.0 dB	0	0.0 s
LZpeak > 137.0 dB	0	0.0 s
LZpeak > 140.0 dB	0	0.0 s

LCSeq	66.2	dB		
LASeq	58.3	dB		
LCSeq - LASeq	7.9	dB		
LAIeq	61.2	dB		
LAeq	58.3	dB		
LAIeq - LAeq	2.9	dB		

	A		**C**		
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**
Leq	58.3				
LS(max)	75.9	2023/05/25 13:10:47			
LS(min)	44.0	2023/05/25 13:17:43			
LPeak(max)					103.2

Overload Count	0	
Overload Duration	0.0	s
OBA Overload Count	0	
OBA Overload Duration	0.0	s

Statistics

LAS 2.00	68.9	dB
LAS 8.00	63.1	dB
LAS 25.00	52.0	dB
LAS 50.00	48.5	dB
LAS 90.00	46.0	dB
LAS 99.00	44.9	dB

Summary

File Name on Meter	LxT_Data.012.s
File Name on PC	LxT_0005426-20230525 132822-LxT_Data.012.ldbin
Serial Number	0005426
Model	SoundTrack LxT®
Firmware Version	2.404
User	AG
Location	LT-3
Job Description	SMUS-07
Note	

Measurement

Description	
Start	2023-05-25 13:28:22
Stop	2023-05-25 14:27:41
Duration	00:15:04.7
Run Time	00:15:04.7
Pause	00:00:00.0
Pre-Calibration	2023-05-25 13:03:27
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting	
Peak Weight	Z Weighting	
Detector	Slow	
Preamplifier	PRMLxT1	
Microphone Correction	Off	
Integration Method	Exponential	
OBA Range	Low	
OBA Bandwidth	1/1 and 1/3	
OBA Frequency Weighting	Z Weighting	
OBA Max Spectrum	Bin Max	
Overload	143.6	dB

	A	C	Z	
Under Range Peak	99.5	96.5	**101.5**	dB
Under Range Limit	**36.7**	36.4	43.4	dB
Noise Floor	27.6	27.2	34.3	dB

Results

LASeq		72.2	dB	
LASE		101.8	dB	
EAS		1.668	mPa²h	
EAS8		53.107	mPa²h	
EAS40		265.534	mPa²h	
LZpeak (max)	2023-05-25 14:23:04			117.9 dB
LASmax	2023-05-25 14:23:00			90.3 dB
LASmin	2023-05-25 13:31:09			53.9 dB
SEA		-99.9	dB	

	Exceedance Counts	Duration
LAS > 85.0 dB	4	13.1 s
LAS > 115.0 dB	0	0.0 s
LZpeak > 135.0 dB	0	0.0 s
LZpeak > 137.0 dB	0	0.0 s
LZpeak > 140.0 dB	0	0.0 s

LCSeq	77.8	dB	
LASeq	72.2	dB	
LCSeq - LASeq	5.6	dB	
LAIeq	70.4	dB	
LAeq	68.4	dB	
LAIeq - LAeq	2.0	dB	

	A		C		
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**
Leq	68.4				
LS(max)	90.3	2023/05/25 14:23:00			
LS(min)	53.9	2023/05/25 13:31:09			
LPeak(max)					117.9

Overload Count	0	
Overload Duration	0.0	s
OBA Overload Count	1	
OBA Overload Duration	2.1	s

Dose Settings

Dose Name	OSHA-1	OSHA-2	
Exchange Rate	5	5	dB
Threshold	90	80	dB
Criterion Level	90	90	dB
Criterion Duration	8	8	h

Results		
Dose	0.00	0.05 %
Projected Dose	0.11	1.44 %
TWA (Projected)	41.0	59.4 dB
TWA (t)	16.0	34.4 dB
Lep (t)	57.2	57.2 dB

Statistics	
LAS 2.00	82.0 dB
LAS 8.00	74.1 dB
LAS 25.00	68.9 dB
LAS 50.00	63.9 dB
LAS 90.00	57.8 dB
LAS 99.00	54.3 dB

LOCAL REGULATIONS AND STANDARDS

7

NOISE ELEMENT

NOISE ELEMENT

7.1 Introduction

The City of San Marcos aims to protect residents' quality of life by reducing excessive or harmful noise. This includes reducing the community's overall ambient noise by minimizing point-source (e.g., construction activities), transportation related (e.g., vehicle, railroad, aircraft traffic) and stationary (e.g., air conditioner units, loading docks) noise sources. The City sets noise standards and identifies measures to control land uses that could impact sensitive receptors such as schools, libraries, hospitals, parks, and residential neighborhoods. The Noise Element addresses these potential issues through the identification of noise sources in the community and the development of goals, policies and implementation programs that serve to protect San Marcos' residents.

Purpose of the Noise Element

The Noise Element is a mandatory General Plan Element, required by California's Health and Safety Code Section 46050.01. The purpose of the Noise Element is to identify problems and noise sources threatening community safety and comfort and to establish policies and programs that will limit the community's exposure to excessive noise levels. It addresses both existing and foreseeable future noise abatement issues.

Recognizing that excessive or unusual noise can have significant adverse impacts on human health and welfare, the state has developed definitive guidelines for determining community noise levels and for establishing programs aimed at reducing community exposure to noise levels defined to be adverse. Goals and policies outlined within the Noise Element are designed to reduce the effects of human-caused noise in the community and to improve residents' quality of life by regulating and reducing noise, particularly within residential areas and near such noise-sensitive land uses as residences, hospitals, convalescent and day care facilities, schools, and libraries. The Noise Element also provides direction regarding best practices and strategies to protect City residents and businesses from severe noise levels.

Scope and Content

The Noise Element consists of three sections, which are Background and Structure; Noise Plan/Goals and Policies; and Implementation Plan.

The Background and Structure section presents a brief background on noise science, existing noise contour maps, defines noise standards, and discusses recommended land use and noise control practices for communities. The Goals and Policies section provides an outline of the community's vision through various statements. First, the general direction and broad ideals that capture the desire of the community for limiting noise are stated in goals. Second, potential solutions for decreasing noise in the community are stated in policies. The Implementation Plan outlines an action plan for implementing the Noise Element Goals and Policies, as well as identifying responsible agencies and timelines for implementation.

Section highlights and key facts relevant to noise in San Marcos are highlighted in Table 7-1 below.

Table 7-1
Noise Highlights and Key Facts

The City of San Marcos is a mix of urban and suburban areas, and is subject to numerous noise sources that affect the ambient noise environment, primarily vehicular traffic on major roadways (State Route 78 and major arterials such as County Highway S12 and Mission Road) and rail traffic (North County Transit District Sprinter and freight rail line).
The City of San Marcos is located approximately 2.5 miles from the McClellan-Palomar Airport (Airport), within the Airport Influence Area (AIA), but is entirely outside of the present and future 60 dBA CNEL noise contour for the Airport, and therefore, airport operations do not significantly affect the ambient noise environment of San Marcos.
Noise measurements were conducted within the City at various points of interest and in proximity to major noise sources. These noise measurements will be used to characterize the existing noise environment and avoid noise conflicts with proposed land uses.
The City currently uses specific noise standards adopted by the County of San Diego. A noise ordinance with specific quantitative noise standards will be adopted in the future to control noise levels throughout the community.

7.2 Background and Structure

Measuring and Defining Noise

Evaluating noise is complex. Although sound can be easily measured, the perception of noise levels is subjective and the physical response to sound complicates the analysis of its effects on people and places. Noise levels are measured as decibels (dB) on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, doubling the energy of a noise source (e.g., traffic volume) would not double the noise level.

Because dB is used to measure sound humans do not perceive changes in dB equally from one dB level to another. Based on subjective testing humans cannot perceive changes in noise levels less than 3 dB, a 5 dB change is clearly noticeable, and a 10 dB change is roughly twice as loud or quiet (FTA 2006).

Because the human ear is not equally sensitive to all audible frequencies, a frequency-dependent rating scale was devised to relate noise to human sensitivity. The A-weighted dB (dBA) scale performs this compensation by discriminating against frequencies that are more sensitive to humans. The basis for compensation is the faintest sound audible to the average ear at the frequency of maximum sensitivity. The dBA scale is used by most public agencies for the purpose of regulating environmental noise.

To provide some perspective on the relative loudness of various types of noise, Table 7-2 lists common sources of noise and their approximate noise levels.

Table 7-2
Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock band
Jet fly-over at 1,000 feet	100	
Gas lawn mower at 3 feet	90	
Diesel truck at 50 feet (50 mph)	80	Food blender at 3 feet
Gas lawn mower 100 feet	70	Vacuum cleaner at 10 feet
Heavy traffic at 300 feet	60	Normal speech at 3 feet
Quiet urban daytime	50	Dishwasher in next room
Quiet urban nighttime	40	Large conference room
Quiet suburban nighttime	30	Library
Quiet rural nighttime	20	Bedroom at night
	10	Broadcast/recording studio
Lowest threshold of human hearing	0	Lowest threshold of human hearing

Source: Caltrans 2009

Perception of noise is also sensitive to time and duration as intensity of noise fluctuates over time. Thus, in addition to instantaneous noise levels, sustained levels measured over a period of time are used to assess noise limits and impacts. Noise levels measured over one hour are usually expressed as dBA L_{eq}, the equivalent 1-hour noise level. Time of day is also an important factor for noise assessment; noise levels that may be acceptable during the day may interfere with the ability to sleep

during evening or nighttime hours. Therefore, 24-hour noise levels are used. The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of both the noise source and the environment.

Many metrics have been developed to account for the way humans perceive sound, including the following:

- **Leq (Equivalent Noise Level):** Leq represents an average of the sound energy occurring over a specified period of time. Effectively, the varying sound level over a specified period of time contains the same acoustical energy as a steady-state sound level in that same period.
- **Ldn (Day-Night Noise Level):** The 24-hour Leq with a 10-dB "penalty" applied during nighttime noise-sensitive hours, 10 p.m. through 7 a.m. The Ldn attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.
- **CNEL (Community Noise Equivalent Level):** The cumulative noise exposure in a community during a 24-hour period. Similar to the Ldn described above, but with an additional 5-dB "penalty" for the noise-sensitive hours between 7 p.m. to 10 p.m., which are typically reserved for relaxation, conversation, reading, and watching television. If the same 24-hour noise data are used, the CNEL is typically 0.5 dB higher than the Ldn.
- **Lmax (Maximum Noise Level):** The highest noise level occurring during a specific period of time.

Properly determining and evaluating potential environmental impact on the community is based on assigning the proper noise descriptor. Non-transportation noise (e.g., leaf blowers; heating, ventilation, and air conditioning; and loading docks) are generally analyzed using an hourly standard (Leq) and a maximum standard (Lmax). Transportation noise sources (e.g., vehicular traffic, aircraft overflights, and train pass-bys) occur as variable, individual events throughout the day. Hourly descriptors are not effective at describing transportation noise because it occurs at all hours. Instead, a 24-hour descriptor (Ldn or CNEL) is used to analyze transportation noise sources because the evening and nighttime penalties are applied to reflect increased sensitivity to noise during the evening and nighttime hours.

Transportation noise in the City of San Marcos comes from a variety of sources including State Route 78, major roadways, and rail lines.

Photo credit: AECOM.

Commercial, social, vehicular, and recreational activities all contribute to noise levels in the community.

Photo credit all: City of San Marcos

The Noise Environment

The City of San Marcos is a mix of urbanized and suburban areas, and is subject to numerous noise sources, primarily vehicular traffic on major roadways and rail traffic. The City is also subject to typical urban noise sources such as construction, police and fire department sirens, landscaping equipment, barking dogs, high altitude jet aircraft, and car alarms.

Major noise sources in the City include vehicular traffic on State Route 78, and major arterials (e.g. Rancho Santa Fe Road, San Marcos Boulevard, Las Posas Road, Mission Road, and Twin Oaks Valley Road) throughout the City. Truck traffic, like that prevalent on State Route 78 and major roadways, generates higher noise levels relative to other vehicle types that travel on local roadways. Train traffic on the North County Transit District Sprinter rail line, which is generally oriented parallel to State Route 78, is another major source of noise in the City. Sprinter traffic is limited to daily passenger transit, although the same rail line is periodically used for freight. Existing noise contours are illustrated in Figure 7-1; noise contours are not shown for all streets or street segments as contours are based on traffic generation ADT/LOS analysis data.

The nearest airport is the McClellan-Palomar Airport, located approximately 4 miles west of the western City limits. The City has a San Diego County Sheriff's Office (SDSO) helipad located on Santar Place at the northern County Sheriff's headquarters. Helicopter operations are minimal and for emergency purposes only. The helipad is located in an industrial/commercial area with no nighttime sensitive receptors located within 1,200 feet. McClellan-Palomar Airport is a general aviation airport located near the intersection of Palomar Airport Road and El Camino Real in the City of Carlsbad. In 2010, McClellan-Palomar Airport adopted and amended their Airport Land Use Compatibility Plan (ALUCP) to provide for the orderly growth of the Airport and promote compatibility with the surrounding land uses. McClellan-Palomar Airport served 212,023 operations during 2007 (an operation includes one takeoff or one landing)[County 2008]. The 2010 ALUCP utilized the maximum field capacity of 289,100 annual operations for the development of the most recent noise contours. (County 2010).

The City of San Marcos is located entirely outside of the present and future 60 dBA CNEL noise contour for McClellan-Palomar Airport, and therefore, airport operations do not substantially affect the ambient noise environment of San Marcos. Further information regarding the airport is discussed in Chapter 6 Safety Element.

Non-transportation noise sources would include construction projects, industrial areas (located mainly between East Mission Road and State Route 78), residential and commercial heating, ventilation, and air conditioning (HVAC) systems, loading docks, parking areas, commercial/retail centers, event venues (e.g. sports fields, amphitheaters), and any other miscellaneous sources not associated with transportation.

Noise Standards and Land Use Compatibility

Noise Standards

Noise standards have been adopted at the State, County, and City level to protect sensitive land uses from excessive noise exposure. The following noise standards are those currently adopted and enforceable in the City.

State Noise Standards

Title 24 of the California Code of Regulations, also known as the California Building Standards Code, establishes building standards applicable to all occupancies throughout the state. The code provides acoustical regulations for both exterior-to-interior sound insulation as well as sound and impact isolation between adjacent spaces of various occupied units. Title 24 regulations state that interior noise levels generated by exterior noise sources shall not exceed 45 dB Ldn, with windows closed, in any habitable room for general residential uses.

San Marcos Noise Regulation

Currently, San Marcos relies on the San Diego County Noise standards to regulate land use noise compatibility, transportation noise, and non-transportation noise. Utilizing the County's established interior and exterior noise standards, the City can rate compatibility using the terms normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

The City's approach to noise regulation uses the CNEL/L_{dn} noise descriptor, are intended to be applicable for land use designations exposed to noise levels generated by transportation-related sources. Land use compatibility noise exposure limits are generally established as:

- 60 dBA CNEL/L_{dn} for exterior spaces at a majority of land use designations throughout the City.
- 65 dBA CNEL/L_{dn}) are permitted for multiple-family housing and housing in mixed-use contexts.

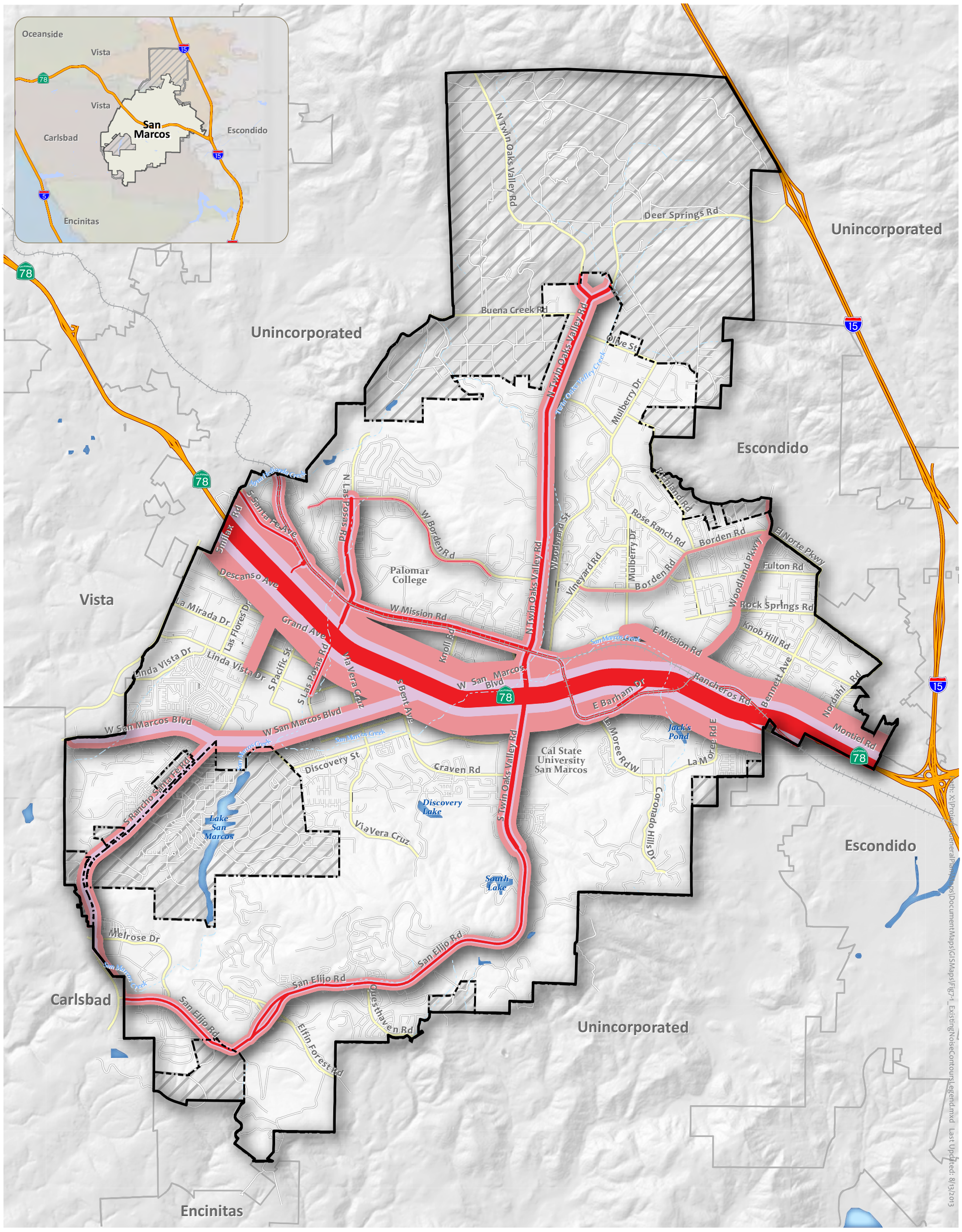
The noise environment is contributed to, by, and effects to some level, all community activities.

Photo credit: City of San Marcos

FIGURE 7-1

City of San Marcos

Existing Noise Contours



Legend

- San Marcos City Limits
- Sphere of Influence
- Planning Area
- Major Hydrologic Features
- Creeks
- Railroad
- Freeway
- Highway
- Major Road
- Minor Road
- 60 CNEL
- 65 CNEL
- 70 CNEL

Note: Noise contours are not shown for all streets or street segments as contours are based on traffic generation ADT/LOS analysis data.

0 0.25 0.5 1 Miles

SOURCES OF DATA:
City of San Marcos 9/12 and AECOM, 11/11

Land use adjacencies, compatibility, and relation to streets should be considered for noise conditions.

Photo credit all: AECOM

Higher thresholds are permitted for multiple-family complexes due to location; they are generally located in transitional areas between single-family and commercial districts or in proximity to major arterials and a more integrated mix of residential and commercial activity (accompanied by higher noise levels) is often desired in mixed-use areas closer to transportation corridors. Maximum interior noise level standards are in place for new residential development, requiring that sufficient insulation be provided to reduce interior ambient noise levels to 45 dBA CNEL/ L_{dn}.

The City's existing Noise Ordinance (Chapter 10.24 of the San Marcos Municipal Code) prohibits loud, annoying, or unnecessary noises. It provides definition for and examples of prohibited noise sources but does not establish numeric noise thresholds for transportation related (e.g., vehicle, railroad, aircraft traffic) or non-transportation related (e.g., air conditioner units, loading docks, construction) noise sources. Construction activities are limited to Monday through Friday before 7:00 a.m. and after 6:00 p.m., or on Saturdays before 8:00 a.m. or after 5:00 p.m.

The City intends to formulate and adopt a revised Noise Ordinance that will include numeric noise standards appropriate for the City. Numeric noise standards are more effective tools that can be enforced at the planning, CEQA, implementation, and enforcement project phases to ensure that noise generated in the City remains at acceptable levels.

Land Use Planning

Consideration of the sources and recipients of noise early in the land use planning and development process can be an effective way to reduce the impact of noise on the community. Consideration should be given to both reducing noise in severely impacted areas through rehabilitative improvements and avoiding potential noise impacts through proactive land use planning and design.

Noise generated from automobile use, trucking, airports and rail operations is referred to as **transportation-related noise**, while noise from stationary sources such as commercial establishments, machinery, HVAC systems, compressors and landscape maintenance equipment is typically referred to as **non-transportation noise**. Noise is most problematic when it affects "sensitive receptors". Noise-sensitive land uses typically include residential uses (e.g., single- and multi-family, mobile homes), guest lodging, hospitals, nursing homes and other long-term medical care facilities, parks and outdoor recreational facilities, schools, libraries, churches, and places of public assembly. All of these uses are noise sensitive; however, they are not necessarily sensitive to noise at the same time. A residence would typically be considered sensitive at all times, while a park or school would only be sensitive to noise during the hours of operation, when it is occupied, or used.

The City's updated land use compatibility standards for this Element (Table 7-3) are based first on the General Plan land use designation of the property and secondly on the use of the property. For example, within the Residential land use designation, a multiple-family use exposed to transportation related noise would have an exterior noise standard of 60 dBA CNEL/Ldn. Noise standards for multiple-family and mixed-use land use designations shown in Table 7-4 are higher than those for single-family residential areas reflecting a more urban environment planned for certain areas of the City. The standards shown in Table 7-3 are purposefully general in nature and not every land use type which could be accommodated within each General Plan designation is identified. Application of the noise standards will vary on a case-by-case basis according to location, development type, and associated noise sources.

McClellan-Palomar Airport is 2.5 miles from San Marcos. 65dbl contours from the airport do not reach the City.

Photo credit: AECOM

Table 7-3
Noise and Land Use Compatibility Guidelines for Transportation-related Noise

	Land Use Category	Exterior Noise Level (CNEL)					
		55	60	65	70	75	80
A	Residential—single family residences, mobile homes, senior/age-restricted housing						
B	Residential—multifamily residences, mixed use (residential/commercial)						
C	Lodging—hotels, motels						
D[2]	Schools, churches, hospitals, residential care facility, child care facilities						
E[2]	Passive recreational parks, nature preserves, contemplative spaces, cemeteries						
F[2]	Active parks, golf courses, athletic fields, outdoor spectator sports, water recreation						
G[2]	Office/professional, government, medical/dental, commercial, retail, laboratories						
H[2]	Industrial, manufacturing, utilities, agriculture, mining, stables, ranching, warehouse, maintenance/repair						

Acceptable - Specified land use is satisfactory, based upon the assumption that any buildings involved

Conditionally Acceptable - New construction or development should be undertaken only after a detailed noise analysis is conducted to determine if noise reduction measures are necessary to achieve acceptable levels for land use. Criteria for determining exterior and interior noise levels are listed in Table 7-4, Noise Standards. If a project cannot mitigate noise to a level deemed Acceptable, the appropriate County decision-maker must determine that mitigation has been provided to the greatest extent practicable or that extraordinary circumstances exist.

Unacceptable - New construction or development shall not be undertaken.

Noise Contours and Impacted Areas

Noise contours, based on the location of major noise sources, describe the ambient noise environment within the community. These contours outline areas of equal noise exposure. Information about existing and projected land use development and transportation activity has been used to estimate future noise contours for San Marcos, which are illustrated in Figure 7-2. Noise contours are not shown for all streets or street segments as contours are based on traffic generation ADT/LOS analysis data.

Table 7-4
Noise Standards[1]

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.

(1) Exterior Noise Level compatibility guidelines for Land Use Categories A-H are identified in Table 3.11-6, Noise Compatibility Guidelines.
Note: "Category(ies)" discussed in this table refer to lettered Land Use Category(ies) in Table 7-3 of this Element.

The noise contours are used as a guide for land use and development decisions. Land uses located within contours of 60 dBA or greater may be noise impacted depending on the use. When noise sensitive land uses are proposed within these contours, an acoustical analysis should be required to ensure that the new land use is built within a compatible noise environment. For a project to be approved in a noise impacted area, the analysis must demonstrate that the project is designed to attenuate noise to meet the City's compatibility guidelines as shown in Table 7-3.

The SPRINTER light rail provides a high level of mobility or the community and necessarily contributes some noise to the environment.

Photo credit: AECOM

Transportation Related Noise

San Marcos contains a number of transportation-related noise sources including freeways, major roadways, and rail lines. The most significant noise sources in the City are from car and truck traffic on State Route 78. Truck traffic is prevalent on State Route 78 and major roadways and generates higher noise levels relative to other vehicle types that travel on local roadways. In the future, State Route 78 and other major roadways in the City limits are expected to be expanded and carry more traffic than under current conditions. Construction of an HOV lane on State Route 78 is planned for the year 2020 and would affect the Level of Service capacity of State Route 78. Traffic noise contours shown in Figure 7-2 include increases in future traffic volumes predicted under the Regional Transportation Plan (RTP) and from the Mobility Element of this General Plan, which would include future projects, such as the State Route 78 HOV lane expansion.

Train traffic on the North County Transit District Sprinter rail line, which is generally oriented parallel to State Route 78, is another major source of noise in the City. Currently, Sprinter traffic is limited to daily passenger transit. However, under the RTP the Sprinter line is planned to expand in the San Marcos area. Planned expansions include double tracking and increased service through the San Marcos corridor, which would increase Sprinter noise levels.

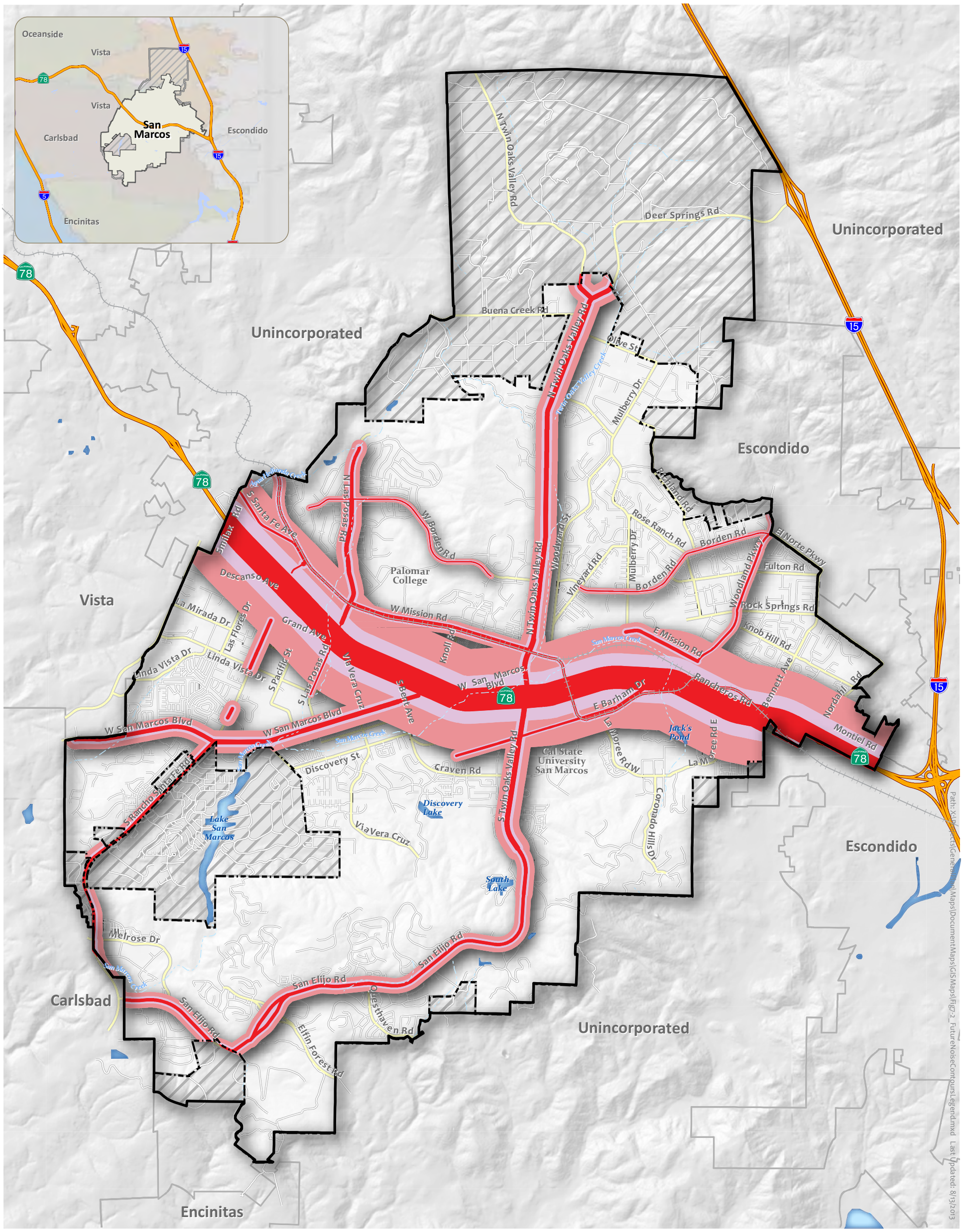
As shown in Figure 7-3, several locations within the City experience ambient noise levels above 60 dBA associated Sprinter and railroad traffic. When proposed projects are in the planning stage for expansion of the railway by the North County Transportation District, these projects should be carefully reviewed by the City for potential rail quiet zones or wayside horn locations due to the proximity of sensitive land (e.g., residential, educational) uses near the train tracks.

Additional transportation noise sources within the City are the SDSO helipad and aircraft over flights from neighboring airports. As stated under the "Noise Environment" section, the McClellan-Palomar Airport existing and future 60 dBA CNEL noise contour would not extend onto the City limits and the SDSO helipad is located 1,200 feet from any residential areas and used for emergency purposes only.

FIGURE 7-2

City of San Marcos

Future Noise Contours

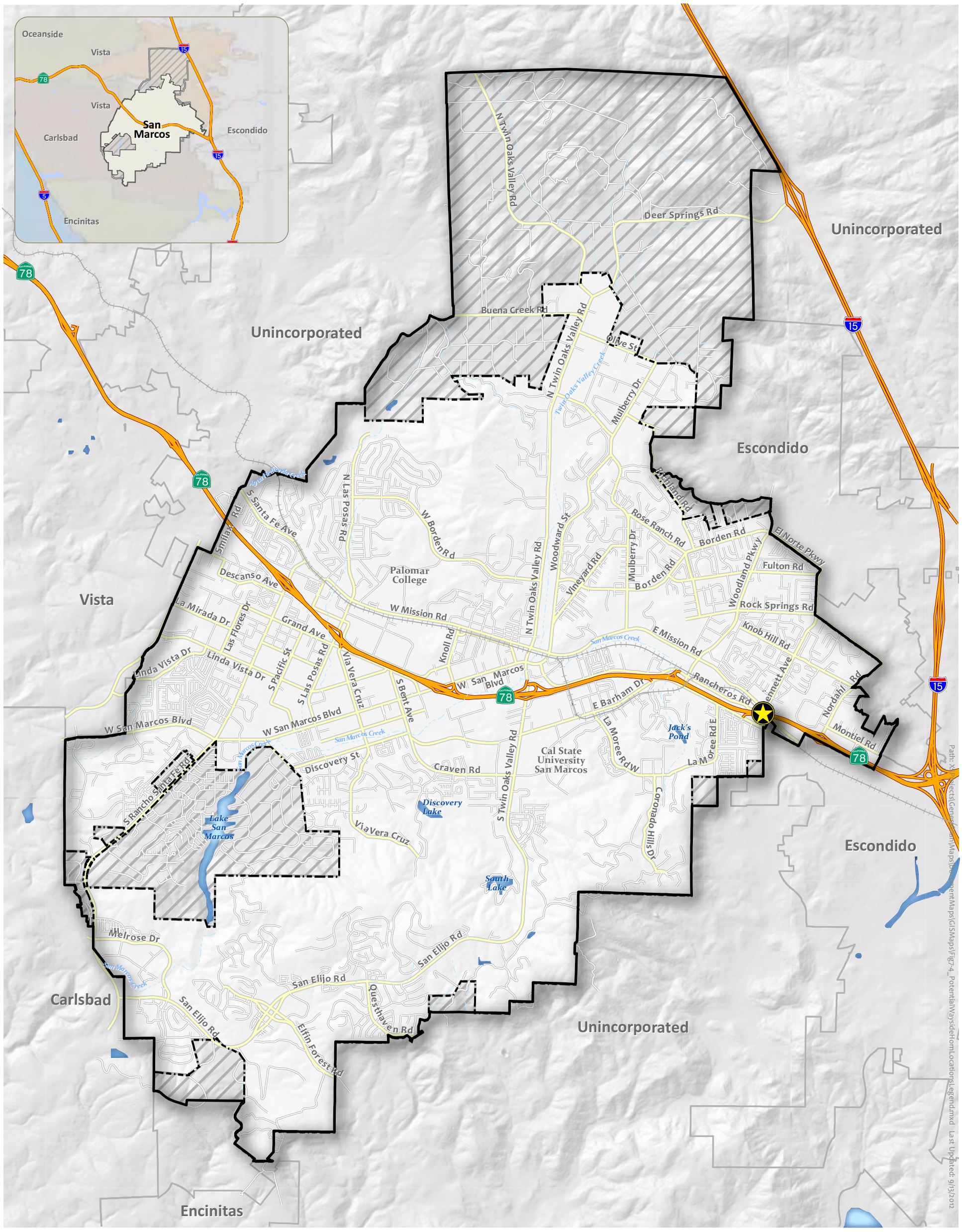


- San Marcos City Limits
- Sphere of Influence
- Planning Area
- Major Hydrologic Features
- Creeks
- Railroad
- Freeway
- Highway
- Major Road
- Minor Road
- 60 CNEL
- 65 CNEL
- 70 CNEL

Note: Noise contours are not shown for all streets or street segments as contours are based on traffic generation ADT/LOS analysis data.

0 0.25 0.5 1 Miles

SOURCES OF DATA:
City of San Marcos 9/12 and AECOM, 11/11



7 NOISE ELEMENT

FIGURE 7-3

City of San Marcos

Potential Wayside Horn Location

- San Marcos City Limits
- Sphere of Influence
- Planning Area
- Major Hydrologic Features
- Creeks
- Railroad
- Freeway
- Highway
- Major Road
- Minor Road
- Potential Wayside Horn Location

0 0.25 0.5 1 Miles

SOURCES OF DATA:
City of San Marcos 9/12 and AECOM, 11/11

The City has little direct control over noise produced by individual cars and trucks since the State is responsible for regulating motor vehicle noise. The most effective way for the City to ensure that transportation noise does not affect the community is by implementing effective traffic flow and mitigation strategies when roadways, intersections, and other roadway improvement projects are being designed at the local level. On the land use side, the City can proactively enforce standards during the design review process for new development or redevelopment of potential noise-affected properties. During this stage, the City can work with the project applicant to identify potential impacts and reasonable project design features. These features can include, but not be limited to, noise-sensitive site design, landscaping, use of natural topography, and the design and construction of noise barriers. Small noise reductions can also be achieved by use of setbacks, landscaping and architectural design.

Sound walls may not be desirable in some cases, such as intersections in commercial areas where visibility and access are important. Additionally, effective acoustical design features in new development can provide additional interior noise reduction.

Non-Transportation Related Noise

In addition to transportation related noise, excessive noise generated by non-transportation sources, such as commercial and industrial uses, and restaurants and bars (nightlife), have the potential to impact sensitive receptors and standards for these land uses vary based on property zoning. Noise is also associated with construction activity, manufacturing or business operations, and everyday activities in San Marcos neighborhoods, such as leaf blowing, dog barking, and lawn mowing. Analysis of potential noise impacts during the site design review process, compliance with CEQA, and enforcement of the City noise ordinance are the best means to protect sensitive receptors from non-transportation noise.

When reviewing proposed projects, the City should consider noise generation and potential impacts to surrounding development. New development can be made compatible with the noise environment by using noise and land use compatibility standards and the Future Noise Contour Diagram (see Figure 7-2) as a guide for planning and development decisions. During the project design review process, the City can work with the project applicant to Identify of potential impacts and reasonable mitigation measures. For example, the City can require an acoustical analysis for projects that will potentially generate noise that would affect sensitive receptors. These mitigation measures can include, but not be limited to, acoustically treated and/or quiet designs for furnaces, fans, motors, compressors, valves, pumps and other mechanical equipment. The City may also require limited delivery hours and/or hours of operation in order to reduce impacts to adjacent sensitive uses. In addition, all City departments must comply with State and federal OSHA standards. Any new equipment or vehicles purchased by the City will comply with local, State and federal noise standards.

7.3 Noise Plan

Certain areas of San Marcos are subject to high levels of noise from one or more of the following sources: freeways and arterial roadways, construction activities and machinery in industrial areas, railroads, and aircraft. All of these noise sources impact the quality of life within the City. Considering noise sources in the planning process, identifying the noise impacts of potential development and transportation projects, and planning accordingly are effective methods of minimizing the impacts of noise on residents. The goals, policies, and implementation programs of the Noise Element address three issues: (1) noise and land use compatibility; (2) transportation related noise; and (3) non-transportation related noise including construction, maintenance, and nuisance noise.

Noise and Land Use Compatibility

Connection to Guiding Themes
A Healthy and Safe Community

Land use directly affects noise compatibility. Consideration of the sources and recipients of noise early in the land use planning and development process can be an effective way to reduce the impact of noise on the community. Consideration should be given to both reducing noise in severely impacted areas through rehabilitative improvements, through re-use and/or redevelopment, and avoiding potential noise impacts through effective land use planning and design. Future and proposed land uses should be compatible with existing and forecasted future noise levels. Incompatible land use noise generators should incorporate noise attenuation and/or control measures as part of project design to reduce noise levels to an acceptable interior level or lower, as required by state regulations (CCR Title 24) for residential uses.

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.

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

Policy N-1.3: Incorporate design features into residential land use projects that can be used to shield residents from excessive noise. Design features may include, but are not limited to: berms, walls, and sound attenuating architectural design and construction methods.

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.

Mixed Use Development

Policy N-1.6: Require the design and construction of buildings to reduce the effect of commercial noise within indoor areas of residential components of the mixed-use development.

Policy N-1.7: Through site planning techniques, noise reduction features, and enforcement, minimize non-residential noise impacts on residential uses.

Policy N-1.8: Ensure residents in mixed-use developments located adjacent to commercial or retail related land uses are notified that they could be affected by noise from adjacent uses.

Transportation Related Noise

Connection to Guiding Themes
A Healthy and Safe Community

Transportation related noise primarily comes from three sources in San Marcos. Vehicular traffic is the most common source of noise experienced throughout the City of San Marcos. Primary sources of traffic noise include State Route 78 and major arterials. Train noise currently experienced within the City results from the locomotive engines and warning horns associated with rail operations. These daily operations tend to produce periodic high short-term noise levels that can be a source of annoyance to nearby sensitive uses. Although no airports or airfields are located in San Marcos, noise generated by aircraft overflights can be noticeable through the central portion of the City. Aircraft operations associated with McClellan-Palomar Airport, and the Camp Pendleton Marine Corp Air Station, and the Sheriff's helipad use the airspace above the City in arrival and departure operations.

Goal N-2

Control transportation-related noise from traffic, rail, and aviation sources near noise sensitive land uses.

Vehicular Traffic Noise

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

Policy N-2.2: Promote coordinated site planning and traffic control measures that reduce traffic noise on noise-sensitive land uses.

Policy N-2.3: Advocate the use of alternative transportation modes such as walking, bicycling, mass transit, and non-combustible engine vehicles to reduce traffic noise.

Policy N-2.4: Encourage the installation, maintenance, and renovation of freeway and highway rights-of-way buffers and sound walls through continued cooperation with the California Department of Transportation (Caltrans) and SANDAG.

Policy N-2.5: Examine the applicability and noise reduction capabilities of cost effective alternative roadway surfaces, such as rubberized asphalt.

Train Noise

Policy N-2.6: Support noise-compatible land uses along rail corridors.

Policy N-2.7: Require noise-reducing design features as part of any sensitive use proposed near rail corridors.

Policy N-2.8: Evaluate the use of wayside horns near areas where rail crossings intersect public roads to reduce noise impacts from train horns.

Aircraft Noise

Policy N-2.9: Provide input to the San Diego County Airport Authority as appropriate to control airport noise.

Non-Transportation Related Noise

Connection to Guiding Themes
A Healthy and Safe Community

Commercial and industrial land uses have the potential to generate noise that can be considered intrusive to sensitive land uses. Depending on the type of activities associated with a commercial or industrial operation, noise sources could involve mechanical equipment, loading and unloading of vehicles and trucks, as well as amplified or unamplified communications. The level and intrusiveness of the noise generated also vary depending on the size of the facility, type of business, hours of operation, and location relative to noise-sensitive land uses.

Another source of non-transportation noise comes from construction operations and maintenance vehicles, such as refuse trucks and parking lot sweepers, which generate noise throughout the City. Although these types of noise sources tend to be short term, temporary, and limited, they can be a source of annoyance, especially during the late night or early morning hours.

Goal N-3

Control non-transportation-related noise from commercial, industrial, construction, and other sources on noise sensitive land uses.

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.

CHAPTER 10.24 NOISE

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, or exceeds the noise limits set forth in Section 20.300.070(F) of this Code. 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; Ord. No. 2017-1446, 7-25-2017)

(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.

10.24.020 Definitions and Examples of Prohibited Noise.

(a) ***Prohibited Noise*** means any sound that disturbs a reasonable person of normal sensitivities, or is plainly audible as further defined in this section, or the noise limits set forth in Section 20.300.070(F) of this Code. Where no specific distance is set forth for the determination of audibility, references to noise disturbance shall be deemed to mean plainly audible at a distance of 200 feet from the real property line of the source of the sound, if the sound occurs on privately owned property, or from the source of the sound, if the sound occurs on public right-of-way, public space or other publicly owned property.

(Ord. No. 2008-1300; 2-26-08; Ord. No. 2017-1446, 7-25-2017)

(b) The following described noises are hereby declared to be in violation of this chapter; this list is deemed illustrative and shall not be deemed or construed in any degree or way to be an exclusive or all-inclusive list of the noises prohibited by this chapter, it being the intent and purpose of this chapter to include and prohibit all noises of the character described in Section 10.24.010. References to "adjacent" or "neighboring" residences or units in this subsection (b) shall mean those residences or units located next to or in close proximity to the source of the noise, and no specific distance standard for audibility shall be required for such locations.

(Ord. No. 2008-1300; 2-26-08)

(1) **Horns and other signaling devices.** The sounding of any horn or signaling device on any automobile, motor vehicle or any other vehicle on any street or public street except as a danger warning; the creation by means of any such signaling device of any unreasonably and unnecessarily loud or harsh

sounds; the sounding of any such signaling device for an unnecessarily or unreasonably long period of time; or the use of any horn, whistle or other device operated by engine exhaust.

(2) **Motor vehicle noises.** Any loud or annoying noise made by any motor vehicle and not reasonably necessary to the operation thereof under the circumstances, including, but not limited to, noise caused by screeching of tires; racing or accelerating the engine, except in the course of repair or adjustment thereof between the hours of 7:00 a.m. and 10:00 p.m.; backfiring the engine; or the emission of exhaust from the engine tail pipe or muffler.

(3) **Stereos, TVs, Radios and Phonographs.** The using, operating or playing, or the permitting to be played, used or operated, any stereo, radio receiving set, musical instrument, phonograph, television set or any like machine or device that produces or reproduces sound, in such manner as to disturb at any time, the peace, quiet and comfort of the neighboring inhabitants, with louder volume than is necessary for convenient hearing for the person or persons who are in the room, vehicle, chamber or place in which the machine or device is operated and who are voluntarily listening thereto. The operation of any such machine or device between the hours of 10:00 p.m. and 7:00 a.m. in such a manner as to be plainly audible by inhabitants or occupants of any adjacent or neighboring residential properties or units, or plainly audible at a distance of 50 feet from any non-residential building, structure, vehicle or place in which it is located, shall be prima facie evidence of a violation of this subsection.

(Ord. No. 2008-1300, 2-26-08)

(4) **Loudspeakers or amplifiers for advertising.** The using, operating or playing, or permitting to be played, used or operated, any radio receiving set, musical instrument, phonograph, loudspeaker, sound amplifier or other machine or device for the producing or reproducing of sound, which casts sound upon the streets for the purpose of commercial or political advertising, or attracting the attention of the public to any building, structure or attraction between the hours of 10:00 p.m. and 7:00 a.m.

(5) **Yelling or shouting.** Loud or raucous yelling, shouting, hooting, whistling or singing in the public streets or in public places, or any other place, so as to annoy or disturb the quiet, comfort or repose of persons in any office or inhabitants or occupants of any neighboring or adjacent dwelling, hotel, apartment building or other kind of residence. The occurrence of such conduct between the hours of 10:00 p.m. and 7:00 a.m. shall be prima facie evidence of a violation of this subsection.

(Ord. No. 2008-1300; 2-26-08)

(6) **Animals or birds.** The keeping of animals or birds which, by causing frequent or long, continued noise plainly audible by inhabitants or occupants of any adjacent or neighboring residential properties or units, or plainly audible at a distance of 50 feet from any non-residential building or structure, shall be presumed to disturb the comfort or repose of any person or persons in the vicinity and shall be prima facie evidence of a violation of this subsection; however, nothing in this subsection shall be construed as applying to occasional noises emanating from a legally operated kennel, animal hospital or veterinary clinic, humane society or pound.

(Ord. No. 2008-1300; 2-26-08)

(7) **Noise in proximity to schools, courts, churches or hospitals.** The creation of any excessive noise on any street adjacent to a school, institution of learning, church or court while such facilities are in use, or adjacent to any hospital which unreasonably interferes with the work of the institution or which disturbs or unduly annoys patients of the hospital; however, this subsection shall not apply unless conspicuous signs are displayed in such streets indicating that there is located in the vicinity a school, hospital, court or church.

(8) **Hawkers and peddlers.** The shouting or crying of peddlers, hawkers or vendors, so as to disturb the peace and quiet of the neighborhood.

(9) **Erection or demolition of buildings,** excluding owner resident additions or remodeling, and the grading and excavation of land including the use of blasting, the start up and use of heavy equipment such as dump trucks and graders and the use of jack hammers except on week days Monday through Friday between the hours of 7:00 a.m. and 6:00 p.m. and on Saturdays 8:00 a.m. to 5:00 p.m. The City Manager may waive any or all of the provisions of this subsection in cases of urgent necessity, or in the interest of public health and safety. The provisions of this subsection may also be waived or modified pursuant to a Conditional Use Permit or other development entitlement processed and issued in accordance with the applicable City requirements and procedures.

(Ord. No. 2008-1300; 2-26-08)

(10) **Late Night Disturbances** that are plainly audible by inhabitants or occupants of any adjacent or neighboring residential properties or units, or are plainly audible at a distance of 50 feet, that occur on week days, Monday through Friday, between the hours of 10:00 p.m. and 7:00 a.m. the following day, and/or on weekends, Saturday through Sunday, between the hours of 11:00 p.m. and 7:00 a.m. the following day, shall be prima facie evidence of violation of this subsection.

(Ord. No. 2008-1300; 2-26-08)

10.24.030 Assessment of Sound.

Any law enforcement officer, code enforcement officer, or other official designated by the City Manager or designee who hears a noise or sound that is plainly audible, as defined in Section 10.24.020, in violation of this chapter, may enforce this chapter and shall assess the noise or sound according to the following standards:

(Ord. No. 2008-1300; 2-26-08)

(a) The primary means of detection shall be by means of the official's normal hearing faculties, not artificially enhanced.

(Ord. No. 2008-1300; 2-26-08)

(b) The official shall first attempt to have a direct line of sight and hearing to the vehicle or real property from which the sound or noise emanates so that the official can readily identify the offending source of the sound or noise and the distance involved. If the official is unable to have a direct line of sight and hearing to the vehicle or real property from which the sound or noise emanates, then the official shall confirm the source of the sound or noise by approaching the suspected vehicle or real property until the official is able to obtain a direct line of sight and hearing, and confirm the source of the sound or noise that was heard at the place of the original assessment of the sound or noise.

(Ord. No. 2008-1300; 2-26-08)

(c) The official need not be required to identify words, song titles, artists, or lyrics in order to establish a violation.

(Ord. No. 2008-1300; 2-26-08)

10.24.040 Defenses.

In any prosecution for a violation of this chapter, it shall be a sufficient defense that the noise of which complaint is made resulted from reasons beyond the control of the person charged with making the noise, unless the noise is due to a reparable or otherwise curable cause which was not diligently cured or repaired; that it was necessary to make the noise to prevent injury to persons or property or that the creation or emission of the noise was done by or with a device, such as a horn, siren or muffler, installed and operated pursuant to State law and meeting the requirements thereof.

(Ord. No. 2008-1300; 2-26-08)

10.24.050 Violation—Enforcement and Penalties.

(a) A violation of this chapter shall be an infraction and shall be punished as prescribed in Section 1.12.010.

(Ord. No. 2008-1300; 2-26-08)

(b) A violation of this chapter shall be a public nuisance and, upon direction to do so by the City Council, the City Attorney shall proceed to abate the nuisance.

(Ord. No. 2008-1300; 2-26-08)

(c) Joint and Several Responsibility. In addition to the person causing the offending sound, the owner, tenant or lessee of property, or a manager, overseer or agent, or any other person lawfully entitled to possess the property from which the offending sound is emitted at the time the offending sound is emitted, shall be responsible for compliance with this chapter if the additionally responsible party knows or should have known of the offending noise disturbance. It shall not be a lawful defense to assert that some other person caused the sound. The lawful possessor or operator of the premises shall be responsible for operating or maintaining the premises in compliance with this chapter and may be cited regardless of whether or not the person actually causing the sound is also cited. Notwithstanding the foregoing, an owner, manager, overseer or agent of property from which offending sound is emitted and who does not reside on such property shall not be cited for violation of the provisions of this chapter unless such owner, manager, overseer or agent has previously been informed in writing by a law enforcement officer, code enforcement officer, or other official designated by the City Manager or designee of the existence of an offending noise disturbance on the property, and such disturbance continues or occurs again.

(Ord. No. 2008-1300; 2-26-08)

Section 20.300.070 Performance Standards

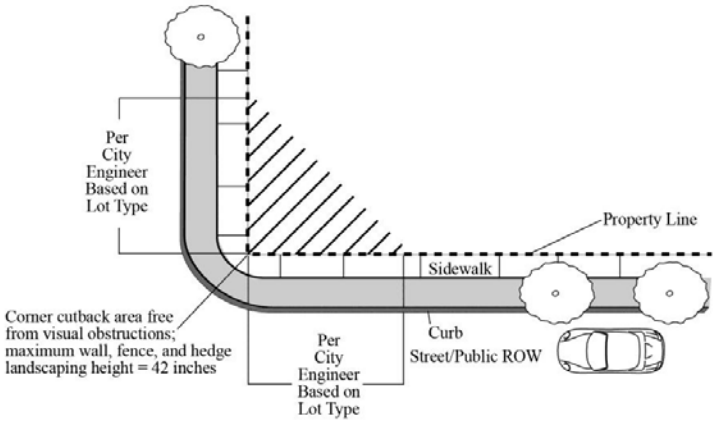
A. **Hazardous Materials and Waste**. The U.S. Environmental Protection Agency (EPA), the California Department of Health Services (DHS), the California Department of Toxic Substances Control (DTSC), and the County of San Diego identify hazardous materials and prescribe handling, use, and disposal practices. Pursuant to the provision of California Health and Safety Code Section 25135.7(c)(3), this section authorizes EPA, California EPA, and the County of San Diego Hazardous Materials Division to enforce federal and state laws regarding the handling, transportation, and disposal of hazardous materials within the jurisdiction of the City, and, specifically, to implement the following:

- The provision of Article 3.5 of Chapter 6.5 of Division 20 of the California Health and Safety Code relating to Hazardous Waste Management Plans within the City.
- The provisions of the San Diego County Hazardous Waste Management Plan within the City.

1. To protect the health and welfare of the residents and business community of San Marcos, the use, storage, manufacturing, and disposal of hazardous materials shall be regulated and monitored according to the standards established by these federal, state, and local agencies.

2. A risk management and prevention program, together with an inventory statement that is in accordance with federal, state, and local laws, shall be prepared for all structures and land uses using materials identified as hazardous by federal, state, and local agencies, as applicable.

Figure 20.300-4
Line of Sight per the City Engineer



3. The use and storage of flammable or explosive materials shall comply with the fire prevention code of the City and all applicable ordinances. No open burning is permitted unless a written permit for such activity has been issued by the local Air Quality Management District.

4. No liquid or solid waste or similar material that may contaminate water supplies, interfere with bacterial processes in sewage treatment, or otherwise cause the emissions of dangerous or offensive elements shall be discharged into the public sewer or private disposal system, except in accordance with the requirements of the City's Public Works Code and other applicable regulations.

5. No activity that emits dangerous levels of radioactivity shall be permitted at any time.

6. The approving authority for any permit or other land use approval, including, without limitation, building permits, for a hazardous waste facility, shall ensure compliance with federal and state requirements and local zoning standards, and may impose any appropriate conditions, as follows:

   a. Determined reasonably necessary to comply with the San Diego County Hazardous Waste Management Plan.

   b. For the issuance of such permit or approval, which the approving authority determines are reasonably necessary to protect the public health, safety, or welfare.

   c. Nothing in this section shall be construed to preclude an approving authority from denying an application, permit, or other land use approval for which the approving authority finds is contrary to the public health, safety, or welfare.

B. **Colors and Materials.** Colors and materials of all building elements approved during permitting or Site Development Plan Review shall be maintained. The entire project shall be subject to repeat review if approved colors and/or materials are modified.

C. **Line of Sight.** Development and structures in all Zones shall maintain the line-of-sight triangle as established by the City Engineer. Line-of-sight geometry shall be shown on applicable plans during permit and review and shall comply with the Sight Distance Minimum Standards, established by the Engineering Division (see Figure 20.300-4).

D. **Electrical Disturbances.** No activity shall be permitted if it causes electrical disturbance that affects the operation of equipment located beyond the property line. Radio, television, and microwave transmitters shall be suitably wired, shielded, and controlled so that they do not emit electrical waves or impulses that may affect other electronic devices or equipment.

E. **Noise.** These regulations aim to prohibit unnecessary, excessive, and annoying noises from all sources, as certain noise levels are detrimental to the health and welfare of individuals. The standards of this section and of Chapter 10.24 Noise of the Municipal Code apply to all land uses in all Zones unless otherwise specified.

(Ord. No. 2017-1446, 7-25-2017)

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 five (5) feet above the ground and ten (10) 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 noise measurement is made.

(Ord. No. 2017-1446, 7-25-2017)

2. No person shall create or allow the creation of exterior noise that causes the noise level to exceed the noise standards established by Table 20.300-4. Increases in allowable noise 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
Exterior Noise Standards by Zone

Zone	Allowable Noise Level (dBA Leq) Measured from the Property Line
Single-Family Residential (A, R-1, R-2)[1, 2]	

7 a.m. to 10 p.m. (daytime)	60
10 p.m. to 7 a.m. (overnight)	50
Multifamily Residential (R-3)[1, 2]	
7 a.m. to 10 p.m. (daytime)	65
10 p.m. to 7 a.m. (overnight)	55
Commercial (C, O-P, SR)[3]	
7 a.m. to 10 p.m. (daytime)	65
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

Notes:

1. For single-family detached dwelling units, the "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.
2. 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.
3. For non-residential noise sensitive land uses, exterior noise level is defined as noise measured at the exterior area provided for public use.

(Ord. No. 2017-1446, 7-25-2017)

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

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

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

F. **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.

G. **Odor.** Any process that creates or emits odors, gases, or other odorous matter shall comply with standards set by the San Diego Air Pollution Control District.

1. No use shall be permitted to emit continuous, frequent, or repetitive odorous gases such as to be perceptible at any lot line of the site. An odor emitted no more than fifteen (15) minutes in any one (1) day shall not be deemed as continuous, frequent, or repetitive.

CONSTRUCTION NOISE MODELING

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 01/13/2025
Case Description: SMUS-07 Demolition

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Reference Distance Receptor at 50 ft	Residential	65.0	60.0	55.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	50.0	3.0
Backhoe	No	40		77.6	50.0	3.0
Front End Loader	No	40		79.1	50.0	3.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Concrete Saw	86.6	79.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	74.6	70.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	76.1	72.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	86.6	80.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 01/13/2025
Case Description: SMUS-07 Site Preparation

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Reference Distance Receptor at 50 ft	Residential	65.0	60.0	55.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85.0		50.0	3.0
Front End Loader	No	40		79.1	50.0	3.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Grader	82.0	78.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	76.1	72.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	82.0	79.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 01/13/2025
Case Description: SMUS-07 Grading

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Reference Distance Receptor at 50 ft	Residential	65.0	60.0	55.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85.0		50.0	3.0
Backhoe	No	40		77.6	50.0	3.0
Front End Loader	No	40		79.1	50.0	3.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Grader	82.0	78.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe	74.6	70.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	76.1	72.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	82.0	79.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 01/13/2025
Case Description: SMUS-07 Light Pole Installation

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Reference Distance Receptor at 50 ft	Residential	65.0	60.0	55.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	50.0	3.0
Pickup Truck	No	40		75.0	50.0	3.0

Results

		Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment		Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane		77.6	69.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pickup Truck		72.0	68.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	77.6	71.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 01/13/2025
Case Description: SMUS-07 Paving

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Reference Distance Receptor at 50 ft	Residential	65.0	60.0	55.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Paver	No	50		77.2	50.0	3.0
Roller	No	20		80.0	50.0	3.0
Front End Loader	No	40		79.1	50.0	3.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Paver	74.2	71.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	77.0	70.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	76.1	72.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	77.0	76.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 01/13/2025
Case Description: SMUS-07 Architectural Coating

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Reference Distance Receptor at 50 ft	Residential	65.0	60.0	55.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	50.0	3.0

Results

Equipment	Calculated (dBA) Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq	Noise Limit Exceedance (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax	Night Leq
Compressor (air)	74.7	70.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	74.7	70.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

SMUS-07 - Construction Noise Modeling Attenuation Calculations

Levels in dBA Leq

Phase	RCNM Reference Noise Level	Receptor to North	Receptor to East	Receptor to Southeast	Receptor to West
Distance in feet	*50*	*365*	*235*	*325*	*175*
Demolition	81	64	68	65	70
Site Prep	79	62	66	63	68
Grading	80	63	67	64	69
Distance in feet	*50*	*450*	*125*	*200*	*400*
Field Light Installation	72	53	64	60	54

Attenuation calculated through Inverse Square Law: Lp(R2) = Lp(R1) - 20Log(R2/R1)

SMUS-07 - Vibration Damage Attenuation Calculations

Levels, PPV (in/sec)

Distance in feet	**Vibration Reference Level at *25 feet***	**Receptor to North** *260*	**Receptor to East** *125*	**Receptor to South** *375*	**Receptor to West** *470*
Vibratory Roller	0.21	0.006	0.019	0.004	0.003
Clam shovel	0.202	0.006	0.018	0.003	0.002
Static Roller	0.05	0.001	0.004	0.001	0.001
Hoe Ram	0.089	0.003	0.008	0.002	0.001
Large Bulldozer	0.089	0.003	0.008	0.002	0.001
Caisson Drilling	0.089	0.003	0.008	0.002	0.001
Loaded Trucks	0.076	0.002	0.007	0.001	0.001
Jackhammer	0.035	0.001	0.003	0.001	0.000
Small Bulldozer	0.003	0.000	0.000	0.000	0.000

SMUS-07- Vibration Annoyance Attenuation Calculations

Levels in VdB

Equipment		**Receptor to North**	**Receptor to East**	**Receptor to South**	**Receptor to West**
Distance in feet	**Vibration @ 25 ft**	*260*	*125*	*375*	*425*
Vibratory Roller	94.0	63.5	73.0	58.7	57.1
Static Roller	82.0	51.5	61.0	46.7	45.1
Hoe Ram	87.0	56.5	66.0	51.7	50.1
Large Bulldozer	87.0	56.5	66.0	51.7	50.1
Caisson Drilling	87.0	56.5	66.0	51.7	50.1
Loaded Trucks	86.0	55.5	65.0	50.7	49.1
Jackhammer	79.0	48.5	58.0	43.7	42.1
Small Bulldozer	58.0	27.5	37.0	22.7	21.1