City of Encinitas General Plan

Noise Element

PUBLIC REVIEW DRAFT

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I. Introduction

Element Purpose

For most people, the usual consequences of noise nuisances are associated with speech and/or communication interference, distractions at home and at work, disturbance of rest and sleep and the disruption of various recreational pursuits. The long-term effects of noise disturbances are widespread and include both psychological as well as physiological effects.

Noise nuisance is also a concern among residents of the city. New development in Encinitas has resulted in a corresponding increase in traffic which, in turn, has resulted in increased levels of noise. A number of areas in the city are experiencing problems from stationary noise sources such as loud music and talking from restaurants and businesses. In addition, there are a number of other intermittent disturbances that can be experienced, such as loud music, barking dogs, emergency response and railway activity.

The State of California recognizes the relationship between noise and noise-sensitive land uses and emphasizes the need to control noise at the local level through land-use regulation. A noise element, as well as other general plan policy and implementing ordinances (Zoning Code, Noise Ordinance, etc.), are effective tools in noise reduction and mitigation. Section 65302(g) of the California Government Code requires that each city have a noise element as part of the General Plan. This Noise Element follows the guidelines adopted by the Office of Noise Control, pursuant to Section 46050.1 of the Health and Safety Code and guidelines published by the Governor's Office of Planning and Research (OPR).

State guidelines are very specific as to the content of the General Plan Noise Element. Government Code, Section 65302(f) states that the Noise Element should be prepared according to guidelines established by the State Department of Health Services. At a minimum, the Government Code requires the element to analyze the noise levels for:

- Highways and freeways;
- Primary arterials and major local streets;
- Passenger and freight on-line railroad operations and ground rapid transit systems;
- Commercial, general aviation, heliport, heli-stop and military airport operations, aircraft over flights, jet engine test stands and all other ground facilities and maintenance functions related to airport operation;
- Local industrial plants, including, but not limited to railroad classification yards; and

- Other ground noise sources, including but not limited to military installations, identified by local agencies as contributing to the community noise environment.

By implementing noise goals and policies, the City of Encinitas seeks to accomplish the following:

- Minimize transportation noise impacts in residential areas and at other noise-sensitive land uses;

- Ensure that residents are protected from harmful and irritating *non-transportation* noise sources to the greatest extent possible; and
- Encourage new developments to incorporate planning and site design techniques that minimize noise encroachment onto sensitive land uses and sensitive habitats.

Element Scope and Organization

The Noise Element is by far the most technical of all the elements included in the General Plan and every effort has been made to clearly define terms, explain measurement techniques and describe the implications of future land use policy on the noise environment. The Noise Element Technical Report prepared as a companion to this element describes in more detail the existing and future noise environment in the city of Encinitas.

After this introduction, the Noise Element is organized into five main parts:

II. Current Conditions

III. Future Noise Conditions

IV. Goals and Policies

V. Noise Mitigation Plan

VI. Figures

This Element quantifies the community noise environment in terms of noise exposure contours. These contours serve as guidelines for the development outlined in the Land Use Element in order to achieve noise-compatible land uses and to provide baseline levels and noise source identification for local noise ordinance enforcement. The Current Conditions section qualitatively and quantitatively presents the existing noise environment within the city. The Future Noise Conditions section qualitatively and quantitatively presents the anticipated future noise environment in the city and identifies and discusses future challenges related to noise and land use planning. The Goals and Policies section outlines the most relevant noise issues affecting the city. The goals are statements of the general direction and broad ideals that capture the desires of the community. The policies

provide potential solutions for avoiding and reducing noise impacts. The Noise Mitigation Plan presents strategies to achieve goals and implement policies.

Related General Plan Goals and Policies

Goals and policies contained in other Elements included in the General Plan will also be effective in reducing noise levels or mitigating the effects of noise. Policies that relate directly or indirectly with those included in this element are identified in Table N-1: Element Relationship Matrix.

TABLE N-1: ELEMENT RELATIONSHIP MATRIX

Noise Element Topic Areas	Land Use	Housing	Circulation	Resource Management	Parks, Recreation and Public Facilities	Public Safety	Public Health
Transportation Noise	X	X	X			X	X
Non-Transportation Noise	X	X				X	X
Land Use Planning	X	X	X	X	X	X	X

Related Plans and Programs

A number of federal and state agencies have prepared guidelines which identify standards and regulations concerning noise mitigation in both the work place and in residences. The California Department of Health Office of Noise Control and the U.S. Department of Housing and Urban Development have identified standards and regulations concerning noise mitigation. Other agencies such as the California Department of Transportation and the Federal Aviation Administration have published regulations and guidelines for assessing noise resulting from activities under their jurisdiction. Key noise standards, regulations and compatibility guidelines pertinent to land use planning and control of the noise environment in Encinitas are summarized below. While all of the standards and regulations that follow may not be applicable to any given project, they are included here to provide a list of noise standards, regulations and guidelines that may affect future land use decisions within the city of Encinitas.

Federal Regulations

Federal Highway Administration (FHWA). For federal or federally supported local highway projects, the FHWA regulations as codified in 23 Code of Federal Regulations (CFR) 772 constitute the federal noise standard. FHWA requires noise abatement if a project approaches or exceeds the Noise Abatement Criteria (NAC) as defined in Table N-2 (23 CFR 772).

TABLE N-2: NOISE ABATEMENT CRITERIA (NAC)
[HOURLY A-WEIGHTED SOUND LEVEL – DECIBELS (dBA)]

Activity Category	$L_{eq}(h)$	$L_{10}(h)$	Description of Activities
A	57 (exterior)	60 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	70 (exterior)	Picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 (exterior)	75 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	-	-	Undeveloped lands.
E	52 (interior)	55 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

Source: 23 CFR 772.
Note: Either $L_{eq}(h)$ or $L_{10}(h)$ (but not both) may be used on a project.

Department of Housing and Urban Development. The Department of Housing and Urban Development (HUD) has established exterior noise goals for siting HUD-supported housing projects. The HUD goals, as specified in 24 CFR 51 Subpart B, establish a basic goal for residential exterior noise levels at 65 dB(A) day–night average sound level (L_{dn}).

Occupational Safety and Health Administration. Under the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA) regulates occupational noise exposure in the workplace. These regulations are codified in 29 CFR 1910.95 and 29 CFR 1926.52 and are addressed and implemented through a construction contractor's or facility's health and safety plan.

State Regulations

California Department of Transportation. The California Department of Transportation (Caltrans) incorporates and implements the FHWA standards and criteria discussed above through their Traffic Noise Analysis Protocol (the "Protocol"[1]) and through the Highway Design Manual[2]. Under Caltrans guidelines for implementing the requirements of 23 CFR 772, a substantial noise increase occurs when the project's predicted worst-hour design-year noise level exceeds the existing worst-hour noise level by 12 dB(A) Leq(h) or more.

California Noise Control Act. The California Noise Control Act of 1973 (California Health and Safety Code Sections 46000 – 46080) was passed to "establish a means for effective coordination of state activities in noise control and to take such action as will be necessary to achieve the purposes of this section (Section 46000(g))" Section 46050.1 of the Act directs the State Office of Noise Control to adopt guidelines for the preparation and content of noise elements required under section 65302 of the State Government Code.

State of California General Plan Guidelines. Appendix C of the State of California General Plan Guidelines[3] contains guidelines for the preparation and content of General Plan noise elements. Exhibit N-1, Noise Compatible Land Use, is taken from Appendix C of the Guidelines. The noise level limits and ranges shown in Exhibit N-1 are intended to be used as guidelines for determining land use compatibility in terms of noise.

Title 24 of the California Code of Regulations. Title 24, Part 2 of the California Code of Regulations (CCR; the California Building Code) specifies interior noise standards relating to the transmission of exterior noise for new hotels, motels, dormitories, apartment houses and dwellings other than detached single-family structures. These standards are specified in Section 1207 of Title 24, Part 2 and are summarized as follows:

> Interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric shall be either the day–night average sound level (L_{dn}) or the community noise equivalent level (CNEL), consistent with the noise element of the local general plan. Worst-case noise levels, either existing or future, shall be used as the basis for determining compliance with this section. Future noise levels shall be predicted for a period of at least 10 years from the time of building permit application. If interior allowable noise levels are met by requiring that windows be unopenable or closed, the design for the structure must also specify a ventilation or air-conditioning system to provide a

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[1] California Department of Transportation. (2006). *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects.* August 14.

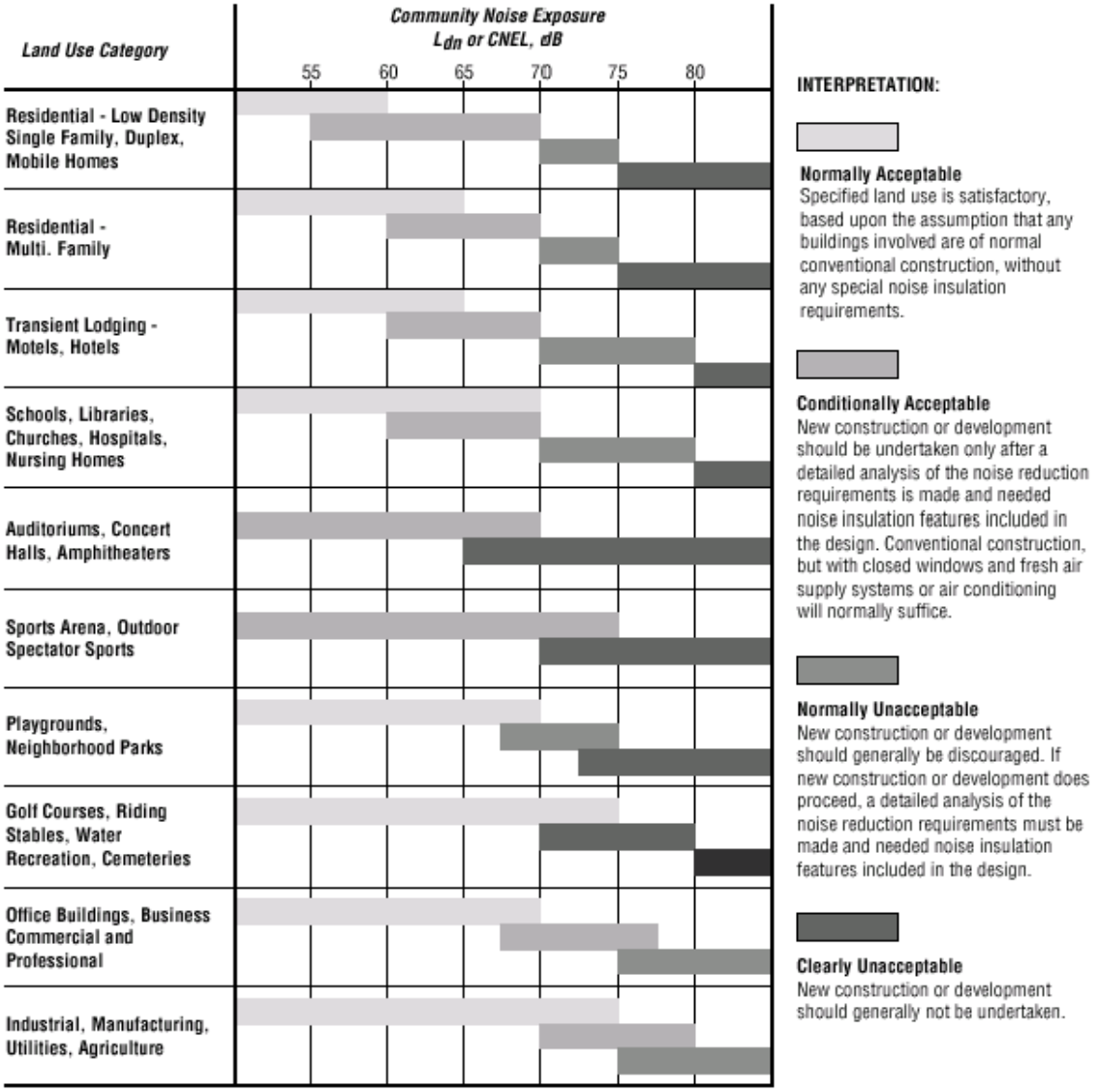
[2] California Department of Transportation. (2009). Highway Design Manual, Sixth Edition. As amended through July 24.

[4] Federal Highway Administration. (2004). FHWA Traffic Noise Model User's Guide (Version 2.5 Addendum). U.S. Department of Transportation, Federal Highway Administration, Washington, D.C. April.

habitable interior environment. The ventilation system must not compromise the dwelling unit or guest room noise reduction.

Title 24, Part 2.5 of the California Code of Regulations (the California Residential Code) applies to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every detached one- and two-family dwelling, townhouse not more than three stories above grade plane in height with a separate means of egress, and structures accessory thereto throughout the State of California. Appendix K of Title 24, Part 2.5 specifies sound transmission requirements that are primarily related to the transmission of interior noise through wall and ceiling assemblies. There are no requirements relating to the transmission of exterior noise to the interior of the buildings.

EXHIBIT N-1: STATE OF CALIFORNIA GUIDELINES FOR NOISE COMPATIBLE LAND USE



Source: State of California. (2003). General Plan Guidelines. Governor's Office of Planning and Research. October.

Local Regulations

City of Encinitas. The City of Encinitas has established goals and policies to limit the effect of noise on sensitive land uses in the Noise Element of the General Plan. These goals and policies are intended to avoid and/or minimize noise impacts throughout the city. They are presented in Section IV, Goals and Policies, of this Noise Element.

For existing development, noise at the property line is regulated through Chapter 9.32 of the Encinitas Municipal Code (Noise Abatement and Control). Section 30.40.010 contains noise performance standards that are generally applied to stationary sources of noise (i.e., noise sources other than transportation related sources) and are stated as the maximum permissible sound level that can be produced by a noise generator at a receiving property boundary. Table N-3 shows the exterior noise limits stated in the Performance Standards ordinance. These limits are enforced through the City's Code Enforcement department.

TABLE N-3: ENCINITAS NOISE ORDINANCE EXTERIOR NOISE LIMITS

	One Hour Average Sound Level [dB(A)]	
Adjacent Zone	7 AM–10 PM	10 PM–7 AM
Residential Zones: low density single family and suburban single family (RR, RR-1, RR-2, R-3, R-5 and R-8)	50	45
Residential Zones: single family, high density single family, high density multiple-family and mobile home park (R-11 RS-11, R-15, R-20, R-25 and MHP)	55	50
Commercial Zones (OP, LLC, LC, GC, L-VSC and VSC)	60	55
Light Industrial Zones (L-I and BP)	60	55

Source: City of Encinitas Municipal Code Chapter Section 30.40.010

In addition it is specified in Section 30.40.010 of the Encinitas Municipal Code that the Title 24 45 dB interior noise standard shall also be applied to single-family dwellings and offices in the City of Encinitas.

Other Noise Guidelines

The Collaborative for High Performance Schools. The Collaborative for High Performance Schools (CHPS) is a non-profit organization dedicated to making schools better places to learn. The CHPS *California 2009 Criteria for New Construction and Major Modernizations* specify that the maximum background noise level in unoccupied classrooms should not exceed 45 dB(A) and strongly recommends designs that would achieve background levels no greater than 35 dB(A).

The Acoustical Society of America and the American National Standards Institute. The Acoustical Society of America (ASA) and the American National Standards Institute (ANSI) have developed *ANSI/ASA S12.60-2010/Part 1 - Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools*. This voluntary standard specifies an interior background one-hour average noise level due to exterior sources of 35 dB(A) in classrooms.

II. Current Conditions

Fundamentals of Noise

Simply stated, noise is unwanted sound. Whether a sound is undesirable is often dependent on the receiver's activity and time of the day. Sound is caused by minute pressure variations in the air—above and below static atmospheric pressure—that are sensed by the human ear. The number of these minute pressure variations over time is referred to as the frequency of the sound. Excessively high noise levels can cause physical injury and adverse psychological effects.

Sound pressures can be measured in units of micro Newtons per square meter ($\mu N/m^2$) called micro Pascals (μPa). One μPa is approximately one hundred billionth of the normal atmospheric pressure. The pressure of a very loud sound may be 200,000,000 μPA or 10,000,000 times the pressure of the weakest audible sound (20 μPa). Because the range of sound pressure variations encountered in the environment is so wide, it is convenient to describe the pressure variation (sound) with logarithmic rather than linear measures. The common measure is the decibel (dB). The decibel is a ratio of pressures. Because decibels are logarithmic, sound levels are not added by simple arithmetic. Two equal noise levels will combine logarithmically to increase the noise level by three decibels.

Sound in the ambient environment is composed of a wide range of frequencies. Because the human ear is not equally sensitive at all frequencies, two different noises that have the same sound pressure level (SPL) may be perceived as having different levels of loudness. Therefore, the SPL is not a measure of the loudness of a sound. In order to obtain levels that more closely approximate the perceived loudness of noise by humans, frequency-weighting of the sound level is used.

The most common frequency-weighting used for assessment of noise in the ambient environment is A-weighting. A-weighting is a frequency correction that often correlates well with the subjective response of humans to noise.

The noise at any given location is a function of the noise produced by the source, the propagation path between the source and the receiver and the sensitivity of the receiver. To reduce noise levels at a sensitive receiver, the only available techniques are to reduce the noise of the source, to interrupt the propagation path between the source and the receiver, or to increase the distance between the source and the receiver. The propagation path is simply the path that the sound travels between its source and the receiver.

The actual impact of noise is not a function of loudness alone. The time of day when noise occurs and the duration of the noise are also important. In addition, most noise that lasts for more than a few seconds is variable in its intensity. Consequently, there are a variety of metrics used to discuss sound and noise levels. Sound varies from instant to

instant. In describing sound, it is necessary to refer to the time over which it occurs. The L_{eq} is the equivalent steady state sound level which in a stated period of time would contain the same acoustical energy as the time-varying sound level during the same period.

Other measures which will be important for this discussion include the community noise equivalent level (CNEL), the sound exposure level (SEL), the maximum noise level (L_{max}) and the level that is exceeded a given amount of time (L_N).

The evaluation of the effects of noise in Encinitas must consider the sound pressure levels to which people will be exposed, the duration of those levels and the time of day at which they occur. While people respond differently to specific noise situations, overall response is primarily a factor of these three main elements.

The most obvious factor affecting noise levels is the distance from a noise source to a receiver. The manner in which noise reduces with distance depends on the following factors:

- Geometric spreading from point and line sources;
- Ground absorption;
- Atmospheric effects and refraction; and
- Shielding by natural and man-made features, noise barriers, diffraction and reflection.

Sound from a small localized source (approximating a "point" source), such as a generator or piece of construction equipment, radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level decreases or drops off at a rate of 6 dB(A) for each doubling of the distance (6 dB(A)/DD).

Traffic noise is not a single, stationary point source of sound. The movement of the vehicles makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval.

When the intervening ground between a line source and a receiver is reflective, such as hardscape, parking lots, or smooth bodies of water, changes in noise levels with distance (drop-off rate) is simply the cylindrical geometric spreading of the line source, or 3 dB(A)/DD. If there is an absorptive ground surface such as soft dirt, grass, or scattered bushes and trees, an excess ground attenuation value of 1.5 dB(A)/DD is normally added to the hard site drop-off rate. When added to the hard site drop-off rate, this results in an overall drop-off rate of 4.5 dB(A)/DD for a line source (7.5 dB(A)/DD for a point source).

In the outdoor environment, a change in noise level is perceived by the average person as follows:

- 3 dB(A): barely perceptible;
- 5 dB(A): readily perceptible; and
- 10 dB(A): perceived as a doubling or halving of noise.

Definitions

The following metrics can be used to describe the potential annoyance that community residents and visitors might experience due to noise:

A-Weighted Sound Level [dB(A)]: An A-weighted sound level is the sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter deemphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and provides good correlation with subjective reactions to noise.

Ambient Noise Level: The combined noise from all sources near and far is the ambient noise level. The ambient noise level is the existing level of environmental noise at a location.

Community Noise Equivalent Level (CNEL): The CNEL is a 24-hour A-weighted decibel average sound level [dB(A) L_{eq}] from midnight to midnight obtained after the addition of 5 dB to sound levels occurring between 7:00 P.M. and 10:00 P.M. and 10 dB to the sound levels occurring between 10:00 P.M. and 7:00 A.M. Adding 5 dB and 10 dB to the evening and nighttime hours accounts for the added sensitivity of humans to noise during these time periods.

The CNEL is often used as a measure of the cumulative noise impact for various land uses, because it correlates well with the results of surveys of annoyance. It also permits comparison with noise impacts from other community sources. Because CNEL is a 24-hour weighted average sound level, it is important to note that the reported CNEL is not a noise level that is actually heard.

Day-Night Average Level (L_{dn}): Similar to the CNEL, the Ldn is a 24-hour, A-weighted decibel average sound level [dB(A) Leq] from midnight-to-midnight, obtained after the addition of 10 dB to sound levels occurring between 10:00 p.m. and 7:00 a.m. Adding 10 dB to the nighttime hours accounts for the added sensitivity of humans to noise during this time period. Like CNEL, because Ldn is a 24-hour weighted average sound level, it is important to note that the reported Ldn is not a noise level that is actually heard.

Decibel (dB): A decibel is the unit for measuring sound pressure level and is equal to 10 times the logarithm (to the base 10) of the ratio of the measured sound pressure squared to a reference pressure (i.e., 20 micro-pascals) squared.

Equivalent-Continuous Sound Level (Average Sound Level [Leq]): The Leq is the level of a steady sound which, in a stated period of time, contains the same acoustical

energy as the actual time-varying sound during the same stated period. Typically, the Leq is reported for one-hour periods and is referenced as Leq(1).

Intrusive Noise: Intrusive noise is that noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, tonal or informational content, and prevailing ambient noise level.

Maximum Noise Level (Lmax): The Lmax is the greatest sound level measured on a sound-level meter during a time interval or event. A sound level meter samples sound at a fixed rate, that is periodically at a regular interval. The maximum noise level measured by the meter depends upon the time constant that the meter is set for. When a meter is set to slow, the time constant is one second; when the meter is set to fast, the time constant is 0.125 second. The shorter the time constant, the faster the response of the meter.

N-percentile-exceeded Sound Level (L_N): The sound level equaled or exceeded by a fluctuating sound level N percent in a stated period of time. For example, the L_{10}(h) is the sound level that is exceeded 10 percent of the time in an hour.

Noise: Noise is any unwanted sound, or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying.

Noise Contours: The lines drawn about a noise source indicating constant or equal level of noise exposure are called noise contours.

Noise Sensitive Land Use: Noise sensitive land uses are land uses associated with indoor and/or outdoor human activities that may be subject to stress and/or significant interference from noise. They include residential (single and multi-family dwellings, mobile home parks, dormitories and similar uses); transient lodging (including hotels, motels, and similar uses); hospitals, nursing homes, convalescent hospitals, and other facilities for long-term medical care; and public or private educational facilities, libraries, churches, and other places of public gathering such as neighborhood parks.

Sound Exposure Level (SEL): The sound exposure level is a measure of single noise events, such as an aircraft flyover or railway activity. It is the A-weighted sound level integrated over the duration of the event and normalized to one second. Because the total energy of an event is normalized to a one-second period, regardless of the length of the event, it is useful for comparing single events. Louder events have a greater SEL than quieter ones, and events that last longer in time have a greater SEL than do shorter ones.

Given the equal energy principal outlined above, the SEL can provide a basis for evaluating the relative effect of different noise events, factoring out the duration of the event. It should be noted, however, that the reported SEL is not a noise level that is actually heard, but the result of a calculation that places all the energy of an event into a single one-second period.

Existing Noise Sources

Noise levels within Encinitas are generally dominated by traffic-generated noise. In order to provide a qualitative assessment of existing noise levels throughout the city, a series of 15 short-term (30-minute) daytime noise measurements were made adjacent to circulation roadways throughout the city. The measurement locations were chosen in order to characterize the existing daytime ambient noise conditions adjacent to various circulation roadways. The locations of the measurements and corresponding noise measurement results are described in Table N-4.

Measured short-term daytime noise levels ranged from approximately 66 to 83 dB(A) L_{eq} with the loudest levels occurring in the more urbanized portions of the city. As a general rule of thumb, for transportation noise, L_{dn} and CNEL values are typically 1.5 to 2 dB greater than the measured daytime hourly L_{eq}. Therefore, based on the noise measurements, existing noise levels adjacent to the Circulation Element roadways exceed 65 CNEL at all measured locations. As indicated, existing noise levels throughout much of the city are primarily due to traffic on area roadways. In localized areas, noise levels are also affected by railway noise. A brief discussion of the various noise sources follows.

Traffic

Traffic noise occurs adjacent to every roadway and is directly related to the volume, speed and mix of vehicles on a given roadway.

Noise generated by existing traffic was modeled using emissions factors with algorithms based on the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) Version 2.5.[4] The TNM algorithms calculate noise levels at selected receiver locations using input parameter estimates such as projected hourly average traffic volumes; vehicle mix, distribution and speed; roadway lengths and gradients; distances between sources, barriers and receivers; and shielding provided by intervening terrain, barriers and structures. The predicted results based on the emissions factors and algorithms are generally conservative.

TABLE N-4: SHORT-TERM NOISE MEASUREMENTS

	Location	Date	Duration (Minutes)	Average Noise Level [dB(A)]	Noise Source	Distance from Roadway Centerline (ft)	Noise Level at 50 feet from Source [dB(A)]
1.	La Costa Ave. east of Seabreeze Court	1/14/11	30	71.3	La Costa Avenue	21	63.8
2.	Saxony Road south of Quail Hollow Drive	4/23/10	30	65.7	Saxony Road and Quail Hallow Drive	11	52.6
3.	Leucadia Blvd. west of I-5	4/23/10	30	68.8	Leucadia Boulevard	24	62.4
4.	N. Coast Hwy. 101 between Jupiter St. & Jason St.	4/23/10	30	72.7	North Coast Hwy 101	36.5	69.9
5.	S. Coast Hwy. 101 between F St. and G St.	4/23/10	30	66.9	South Coast Hwy 101 and W. G Street	44.25	65.9
6.	Encinitas Blvd. between Rodney Ave. & Village Park Way	4/20/10	30	75.8	Encinitas Boulevard	43.5	74.6
7.	Encinitas Blvd. between Sweet Alice Ln. & Seeman Dr.	4/20/10	30	71.4	Encinitas Boulevard	47	70.8
8.	Santa Fe Dr. between I-5 and S. Coast Hwy. 101	4/23/10	30	74.4	Santa Fe Drive	20	66.4
9.	Lone Jack Rd. south of Bella Collina	4/20/10	30	67.0	Lone Jack Road	16	57.2
10.	Birmingham Dr. east of I-5 between Playa Riviera Dr. & Legaye Dr.	4/20/10	30	67.2	Birmingham Drive	19.5	59.0
11.	El Camino Real between Cerro St. and Calle Ryan	4/20/10	30	74.1	El Camino Real	54.5	74.9
12.	S. Rancho Santa Fe Rd. between 7th St. & 8th St.	4/20/10	30	73.2	South Rancho Santa Fe Road	18.5	64.6
13.	Via Cantebria near Via Ultimo	4/20/10	30	73.2	Via Cantebria	32	69.4
14.	MacKinnon Ave . andI-5	4/23/10	30	83.3	MacKinnon Avenue and I-5	17.5	74.2
15.	Near the San Diego Northern Railway & San Elijo Ave.	4/23/10	30	60.5	San Elijo Avenue, Coaster and South Coast Highway 101	60	62.1

The analysis of the roadway noise environment in the city was prepared assuming that the topography was flat with no intervening terrain or buildings between sensitive land uses and the roadways. Because there are no obstructions assumed, in most cases predicted noise levels are higher than would actually be expected to occur. In actuality, buildings and other obstructions along roadways shield distant receivers from traffic noise to some degree.

Existing traffic noise levels were estimated for the Circulation Element roadways indicated by the City. Existing traffic volumes were provided by the city.[5] Traffic speeds used in the analysis were those specified for the roads in the SANDAG traffic forecast model[6].

Traffic mix data chosen for this analysis were based on typical mix data for area roadways. Except for I-5, the traffic mix was assumed to be 90 percent automobiles, 3 percent medium trucks, 2 percent heavy trucks, 2 percent buses and 3 percent motorcycles. The traffic mix data used for I-5 were assumed to be 95.5 percent automobiles, 2.2 percent medium trucks and 2.3 percent heavy trucks, and were obtained from the California Department of Transportation (Caltrans).[7] I-5 has a posted speed limit of 65 mph through the city. These traffic mixes are anticipated to result in conservatively high predicted noise levels.

The day, evening and nighttime traffic distribution for all roadways was assumed to be 77 percent daytime traffic, 10 percent evening traffic and 13 percent nighttime traffic.

Figure N-1 presents existing noise contours relative to the Circulation Element roadways throughout the city, which as stated are based upon the conservative assumption of hard, flat site conditions.

It should be noted that at any specific location the actual existing noise level will depend upon not only the source noise, but the nature of the path from the source to the receiver. Buildings, walls and other barriers will reduce direct line of sight noise levels. However, as indicated above, this analysis assumes flat-site conditions with no intervening barriers, resulting in a worst-case scenario. Therefore, actual noise levels at a specific location would generally be less than those shown in Figure N-1. Intervening barriers, resulting in a worst-case scenario and actual noise levels at a specific location would generally be less than those shown in Figure N-1.

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[5] Vurbeff, Scott. (2010). Circulation Element Roadways GIS Layer. October.

[6] San Diego Association of Governments. (2010). Transportation Forecast Information Center. Accessed December from website at http://gis.sandag.org/tficsr11/.

[7] Caltrans. (2008). Annual Average Daily Truck Traffic on the California State Highway System. Compiled by Traffic Data Branch Division of Traffic Operations. September.

Railway Operations

Factors that influence overall rail noise include the train speed, train horns, type of engines, number of railcars, track conditions (e.g., use of concrete or wooden cross ties, welded versus jointed track, etc.), the intermittent nature of train events, time of day and sound walls or other barriers. The interaction of steel wheels and rails generates the primary noise associated with rail traffic, with engine noise comprising a shorter term, secondary effect. Rail/wheel noise comes from three types of sources: 1) rolling noise due to continuous rolling contact; 2) impact noise when wheels encounter a rail joint, turnout, or crossover; and 3) squeal generated by friction on tight curves. To help address the rail noise associated with rail joints, rails are often welded together and concrete ties are used to hold the rails in place of wooden ties.

The San Diego Northern Railway (SDNR) mainline runs through the western portion of the city and is utilized by Burlington Northern Santa Fe Railway (BNSF) freight trains, Amtrak and North San Diego County Transit Development Board commuter trains ("The Coaster"). Projected railroad operations were obtained from various sources. Generally, freight operations occur at all hours of the day and night, while passenger rail operations are concentrated within the daytime and evening periods. Trains can generate high, relatively brief, intermittent noise events. Train noise is an environmental concern for sensitive uses located along rail lines and in the vicinities of switching yards and at roadway-rail crossings (there are no switching yards within the city).

The CNEL for the freight and passenger train traffic noise was calculated using the method described in Assessment of Noise Environments around Railroad Operations prepared by Wyle Laboratories Research Staff[8]. The model uses parameters such as train speed and length, the number of train operations per day and the grade and characteristics of the train tracks. Noise levels were calculated for both the locomotive and the train cars.

Noise exposure levels for a single train pass-by are expressed in terms of the Single Event Noise Exposure Level (SENEL). The SENEL is a logarithmic measure of the time integrated energy of a single event (in this case, a single train pass-by). The total SENEL for a single train pass-by is determined by adding the individual SENELs for the engines and cars.

Amtrak and Coaster operations in the vicinity of the project were obtained from current published schedules. Freight operations were obtained from the BNSF Director of Public Affairs. The average numbers of rail operations during the daytime, evening and nighttime hours are estimated as shown in Table N-5. Then the total SENEL for each type of rail operation is calculated. The resulting SENELs are weighted according to the time of day of the operation and then added together to determine the resulting CNEL for the rail line.

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[8] Swing, Jack W., and Donald B. Pies. (1973). Assessment of Noise Environments Around Railroad Operations. Wyle Laboratories, report WCR 73-5. July.

TABLE N-5: PROJECTED RAILROAD OPERATIONS (NUMBER OF TRAIN OPERATIONS PER PERIOD)

Operation	Freight	Amtrak	Coaster
Day	2	9	14
Evening	0	1	1
Night	4	0	3
Average Number of Engines	3	1	1
Average Number of Cars	60	7	5
Speed (mph)	50	90	55

The existing rail line operations presented in Table N-5 were used in the Wyle Laboratories model to estimate the noise levels due to the railroad operations. The tracks within the city are assumed to be level (no grade).

The resulting noise levels due to train operations are shown in Table N-6 for distances of 100, 200, 400, 800, 1,000, 1,100 and 1,200 feet from the tracks. These noise levels assume flat-site conditions and do not include any attenuation or shielding provided by barriers or buildings.

TABLE N-6: RAILROAD OPERATION NOISE LEVELS

Distance (Feet)	100	200	400	800	1000	1100	1200
CNEL	75.6	71.6	65.6	59.6	57.6	56.6	55.6

Other Sources of Noise

Other sources of noise within the study area are due to the normal activities associated with a given land use. For example, within residential areas, noise sources may include dogs, landscaping activities and parties. Sources of noise in commercial areas may include car washes, drive-through fast food restaurants and auto repair facilities. Sources of noise in industrial and manufacturing areas may include heavy machinery, truck loading/unloading and quarry operations. Noises from these types of activities are considered normal environmental noises that are expected to be generated by these types of land uses. The noise abatement and control ordinance and the performance standards ordinance of the Encinitas Municipal Code generally regulate excessive noises resulting from such activities.

There are no major industrial uses within the city, nor are there any airports or air fields. The nearest airport to the city is the McClellan–Palomar Airport, located approximately 2.7 miles north of the northern city boundary. The 60 CNEL contour due to aircraft operations at the McClellan–Palomar Airport lies well to the north of the city. As a result, aircraft noise in the city is intermittent and generally only a minor contributor to the average ambient noise levels.

III. Future Noise Environment

Not provided with this release. To be provided when the technical study is complete. Future noise environment analysis will include maps N-2 and N-3: Noise Exposure – Future Conditions (Maps A and B).

IV. Goals and Policies

Future noise levels, to a great extent, will be determined by the type, intensity and location of future development in addition to new roadway construction. The primary source of noise in the city will continue to be vehicular traffic traveling on Interstate-5 and major arterials. Another relatively consistent source of noise is railway traffic through the city. New development will result in increased traffic locally and regionally and may even require widening of existing roadways and construction of new roadways in select locations. For this reason, it is imperative that noise considerations be taken into account in future land use planning.

The Noise Element goals and policies are organized under the following thematic headings:

- Transportation Noise Sources
- Non-Transportation Noise Sources
- Land Use Planning

Transportation Noise Sources

Transportation noise sources including vehicular, aircraft and train noise, is the most dominant source of noise experienced throughout the city and has the potential to diminish the quality of life for its citizens. Interstate 5 and other city-wide arterials (such as Coast Highway 101, Encinitas Boulevard, Rancho Santa Fe Road, etc.) are all high traffic volume roadways that generate traffic noise levels well above 65 CNEL as discussed above. Traffic noise is dependent on vehicle volume, speed, flow and fleet mix, as well as distance from the roadway to the receiver. The following Noise Element policies are intended to: minimize excessive noise along transportation routes; direct truck traffic to designated roadways; designate appropriate land uses adjacent to transportation corridors; include noise reduction measures in project design when feasible; and to continue to work with Caltrans and the local railroad operators to minimize freeway and rail noise and vibration impacts.

GOAL 1: Minimize impacts resulting from transportation noise sources.

Policies

1.1 **Acceptable Noise Levels.** Establish the maximum acceptable noise levels for exterior use areas located on noise-sensitive lands, considering community character based on distance from major roadways as defined in Table N-7. These levels recognize the varying ambient noise levels associated with the degree of existing urbanization and infrastructure and account for community character as suggested in the State guidelines. Figure N-4 illustrates the approximate areas throughout the city where each of these noise limits would be applied and is intended for use as a planning tool when evaluating future projects.

A. New Development

TABLE N-7: EXTERIOR USE AREA NOISE LIMITS

Noise sensitive exterior use area location:	Max allowed CNEL
Within 500 feet of the nearest travel way of a freeway, including freeway ramps	70
Within 300 feet of the nearest travel way of a Circulation Element Roadway or railway, or between 500 and 1,000 feet of the near edge of a freeway	65
All other lands	60

B. Roadway and Other Transportation Projects

- Ensure that noise generated by the roadway or transportation project does not exceed the limits specified in Table N-7 above at exterior use areas located on adjacent noise sensitive lands.

For the purposes of this policy, the following definitions apply:

- Exterior Use Area

  a) For single-family residential projects, the exterior use area is identified as private usable space.

  b) For multi-family residential projects, the exterior use area means all areas that are considered group or private usable space.

  c) For the residential component of mixed use projects, the primary exterior use areas will be encouraged to be designed away from streets; however, balconies and other similar use areas will be allowed for design purposes and outdoor use areas without meeting exterior noise requirements.

- Group Usable Space
  - Usable exterior open areas that are intended for common use by occupants or tenants of a development, that is privately owned and maintained or under the purview of a public agency. Group usable space typically includes swimming pools, recreation courts, patios and open landscaped areas intended for outdoor activities.

- Private Usable Space
  - Usable exterior space intended for the use of the occupants of a single dwelling that may include yards, decks, patios and balconies.

1.2 Traffic Noise Generation. Review actions or projects that may have traffic noise generation potential to determine what impact they may have on existing land uses. If a project would cause an increase in traffic noise levels to a sensitive use, the policy of the City of Encinitas is:

a. If ambient noise without project or action does not exceed applicable limit specified in Policy 1.1, an increase in traffic generated noise (readily perceptible) up to the applicable noise limits specified in Policy 1.1 is considered acceptable.

b. If ambient noise without project or action exceeds applicable limit specified in Policy 1.1, traffic generated noise related to the project or action must not cause a noticeable increase in noise levels - 3 dB(A) or higher - at affected exterior use areas.

1.3 Vehicle Mufflers. Enforce the provisions in Sections 27150 and 27151 of the California State Motor Vehicle Code to further improve the noise environment in the City

of Encinitas. These sections require that all vehicles be equipped with a properly maintained muffler and that exhaust systems not be modified.

1.4 **Truck Traffic.** Limit truck traffic in residential and commercial areas to designated truck routes. Limit construction, delivery and through truck traffic to designated routes. Distribute maps of approved truck routes to City traffic officers.

1.5 **Noise Mitigation.** Include noise mitigation measures in the design of new roadway projects when feasible. Examples include barriers, traffic-calming measures and roadway materials.

1.6 **Barriers along I-5.** Work with Caltrans to facilitate construction of noise attenuation barriers along I-5 where appropriate and desirable to protect adjacent sensitive land uses.

1.7 **Barrier Design along the I-5:** Barriers along the I-5 shall be designed to reflect the low-density residential character along the freeway and reflect the established I-5 Scenic Corridor standards.

1.8 **Impacts from Railways.** Work with responsible agencies, the Burlington Northern Santa Fe Railway (BNSF) and the North San Diego County Transit Development Board to reduce noise and vibration impacts to the extent possible from the railways to nearby sensitive land uses.

1.9 **Ground-Borne Vibration.** Ensure that new development adjacent to the rail line adequately addresses ground-borne vibration associated with railway operations.

1.10 **Noise Barrier Design.** Noise barriers are to be designed and landscaped to reflect the community character, blend into the surrounding environment and inhibit graffiti. Certain elements of aesthetic design should be evaluated and considered in the design process dependent on whether the barrier surface is being seen from the roadway or from its adjacent land uses. Long walls/expanses shall be discouraged. Barriers and barrier transitions that are earth berm with textured walls and off-sets (to break up lengthy walls) shall be encouraged. Landscaping shall be incorporated into all noise barrier designs to soften the visual impact.

1.11 **Noise Barrier Height:** Noise barriers can exceed fence height requirements provided that it is appropriately landscaped, consistent with community character and surrounding features and barrier design implements the City's Design Review Guidelines and other General Plan policies. Noise barriers should be combined with earth mounds.

Non-Transportation Noise Sources

Non-transportation noise sources are commonly referred to as stationary noise sources. Stationary noise sources found in residential areas, schools and parks may include generators, motors, appliances, air conditioners, lawn and garden equipment and power tools. Industrial and manufacturing facilities and their associated activities can also be stationary noise sources. All of these noise sources can be disruptive and irritating and at times, disruptive to normal sleep patterns. The following goals and policies are intended to minimize impacts to sensitive receivers by establishing noise level limits, encouraging design measures to avoid potential impacts and requiring measures to reduce construction related noise.

GOAL 2: Ensure that residents are protected from harmful and irritating non-transportation noise sources to the greatest extent possible.

Policies

2.1 Quantitative Noise Ordinance. Maintain the ~~a~~ quantitative noise ordinance that has been established by the City to resolve neighborhood conflicts and to control unnecessary noise in the City of Encinitas. Examples of the types of noise sources that can be controlled through the use of a quantitative noise ordinance are noisy mechanical equipment such as swimming pool and hot tub pumps, amplified music in commercial establishments, etc.

2.2 Noise Mitigation in Design. Ensure inclusion of noise mitigation measures in the design and operation of new and existing development.

2.3 Construction Noise Impacts. Require development projects to minimize construction noise impacts to neighboring properties in accordance with City regulations.

2.4 Disturbance of the Peace. Through disturbance of the peace complaints, enforce noise issues such as barking dogs, parties, loud music and the like.

Land Use Planning

Land use planning is an important tool to protect people living and working in the city from an excessive noise environment. Certain land uses are associated with higher noise levels and others are more sensitive to noise. Noise associated with industrial, commercial and mixed commercial areas can be intrusive to more noise sensitive land uses, including residences, hospitals, convalescent and day care facilities, schools and libraries. Noise producing and noise-sensitive land uses should be either sufficiently separated or sufficiently buffered from one another to ensure that sensitive uses are not exposed to unacceptable noise levels; and proposed land uses should be compatible with existing and forecasted future noise levels. The following goals and policies are intended to encourage good planning practices to avoid or minimize noise impacts related to incompatible land uses. Some of these practices include site design (strategic location and orientation of sources, receivers and intervening buildings), setbacks, barriers and architectural treatments (i.e., acoustic-rated windows).

GOAL 3: Incorporate noise considerations into land use planning.

Policies

3.1 **Title 24.** Apply Title 24 of the California Code of Regulations, Part 2, associated with noise insulation standards (e.g., 45 dB interior noise standard), to single-family dwellings.

3.2 **Cooperation with Developers.** Encourage cooperation between developers, responsible agencies and City departments to address potential noise issues associated with land use proposals and projects.

3.3 **High Noise Areas.** Encourage the location of sensitive land uses, such as residential uses, away from high noise areas.

3.4 **Noise Analysis.** Assess the potential for future projects and land use decisions to expose sensitive receivers to elevated noise levels.

- Require projects that would potentially expose exterior use areas to noise levels in excess of the criteria stated in Policy 1.1 to prepare an acoustical analysis demonstrating that noise levels at the exterior use area will be within acceptable limits.
- Analyze interior noise levels, where appropriate, such as with projects required to comply with the Title 24 noise standards.
- Incorporate noise abatement or mitigation features into the project as needed and ensure features are incorporated into all appropriate pre-construction plans and implemented.

3.5 **Retrofitting.** Encourage retrofitting of existing noise impacted sensitive receivers, such as homes and schools, with noise reducing features and materials as remodeling or expansion occurs.

3.6 **Other Jurisdictions.** Establish and maintain coordination among city, county and state agencies involved in noise abatement and other agencies to reduce noise generated from sources outside the City's jurisdiction.

V. Noise Mitigation Plan

In some situations it is necessary to construct noise-sensitive developments in noisy areas. The following discussion of noise reduction strategies is intended to provide an overview of the kinds of steps that can be taken to reduce or eliminate noise impacts. Noise control engineering is a complex discipline. Any proposed solutions to noise problems must not interfere with structural, architectural or building code requirements. Noise mitigation measures should also be assessed against other community values such as open space, aesthetics and maintenance problems. Each project has its own special problems, and mitigation measures which are cost-effective for one project may not be for another. Regardless of the measures employed for a project, mitigation is always cheaper and generally more effective if it is included during the design phase of a project.

Noise Reduction Strategies

The measures or combinations of measures used to mitigate noise fall into five major categories:

- Site Planning
- Architectural Layout
- Noise Barriers
- Construction Modifications
- Source Control

Site Planning

Proper site planning to reduce noise impacts is the first area that should be investigated for a given project. By taking advantage of the natural shape and terrain of the site, it is often possible to arrange the buildings and other uses in a manner which will reduce and possibly eliminate noise impact. Site planning techniques to address noise impacts include, but are not limited to:

- Increasing the distance between the noise source and the receiver;
- Placing non-noise sensitive land uses such as parking lots, maintenance facilities and utility areas between the source and the receiver;
- Using non-noise sensitive structures such as garages to shield noise-sensitive areas; and
- Orienting buildings to shield outdoor spaces from a noise source.

Architectural Layout

In many cases noise reduction requirements can be met by giving attention to the layout of noise-sensitive spaces. Bedrooms, for example, will be considerably quieter if placed on the side of the housing facing away from the freeway. Similarly, balconies facing freeways should be avoided. Quiet indoor spaces can be provided next to a noisy highway by creating a U-shaped development which faces away from the highway. Proper architectural layout can often eliminate the need for costly construction modifications.

Noise Barriers

Noise barriers or walls are commonly used to reduce noise levels from ground transportation noise sources and industrial sources. Noise barriers serve a dual purpose in that they can reduce the noise level both outdoors and indoors.

To be effective, a noise barrier must be massive enough to prevent significant noise transmission through it and high enough and long enough to shield the receiver from the noise source. A safe minimum surface weight for a noise barrier is 3.5 pounds/square foot (equivalent to 3/4-inch plywood), and the barrier must be carefully constructed so that there are no cracks or openings. To be effective, a barrier must interrupt the line-of-sight between the noise source and the receiver. To illustrate this relationship, consider a flat area with a housing tract next to a road. If there are no diesel trucks on the road, a 7-foot high barrier will reduce the traffic noise by about 8 dB(A). If there are trucks, then the noise from the trucks will be reduced only by about 4 dB(A). The reason is that the stacks of the diesel trucks will be visible above the barrier and the direct noise path will not be completely interrupted.

Another important and often overlooked consideration in the design of noise barriers is the phenomenon of "flanking." Flanking is a term used to describe the manner by which a noise barrier's performance is compromised by noise passing around the end of a barrier. Short barriers regardless of height provide essentially no reduction in the overall noise level. The effects of flanking can be minimized by bending the wall back from the noise source at the ends of the barrier.

In addition to meeting acoustical requirements, noise barriers must be evaluated for possible maintenance problems, aesthetic and environmental considerations, safety conflicts and cost. Overall, noise barriers can have a visual impact on the community and, as such, need to be designed to reflect the community and General Plan policies (e.g., Scenic Corridor policies), and soften the overall appearance of the barrier.

Construction Modifications

If site planning, architectural layout, noise barriers, or a combination of these measures does not achieve the required noise reduction for the building, it will be necessary to modify the building's construction. Indoor noise levels from exterior sources are controlled by the noise reduction characteristics of the building shell. The walls, roof, ceilings, doors, windows and other penetrations are all determinants of the structure's overall noise reduction capabilities.

In general, windows and doors are the acoustical weak links in a building. Often all that is required is that the windows be sealed on the noisy side of the building and an alternative means of ventilating the building provided. Beyond this, thicker windows or double-glazed windows will be required. Doors should not be located on the side of the building facing a noise source. If they are, they should be solid-core doors and should be equipped with an appropriate acoustical door gasket. In cases in which more noise reduction is required, the ceiling/roof and/or the walls must be modified to provide the required noise reduction. The actual modifications will depend on the amount of noise reduction required.

Source Control

Source control involves reducing noise levels at the source. For roadway projects this could include reducing posted speed limits or using alternative roadway surface materials that reduce tire noise. For land development projects this could include altering the hours of operation or selecting mechanical equipment that produce low noise levels, or through architectural design (e.g., enclose or partially enclose loading bays/docks for after-hour deliveries or enclose trash dumpsters).

Other Noise Considerations

If the noise source is aircraft or helicopters, people are generally annoyed at a lower average sound level than for surface transportation sources. Recent studies have shown that aircraft noise at a given CNEL is more annoying than traffic noise at the same CNEL. Residential developments should be strongly discouraged where the exterior CNEL exceeds 55 dB due to aircraft. If residential uses are allowed in areas in which the CNEL exceeds 55 dB, then interior noise levels should be controlled so that maximum instantaneous noise levels do not exceed 50 dB in bedrooms or 55 dB in other rooms. Residential construction should not be allowed in areas where the CNEL exceeds 65 dB from aircraft.

The indoor noise level as required by the State of California Noise Insulation Standards must not exceed a CNEL of 45 dB in multi-family dwellings. This indoor criterion should also be the maximum acceptable indoor noise level in single-family homes (Policy 3.6).

Appropriate interior noise levels in commercial, industrial and office buildings are a function of the use of space. For example, the noise level in private offices should generally be quieter than for data processing rooms. Interior noise levels in offices generally should be maintained at 45 dB or less. Acoustical designs to achieve this level

should be demonstrated by the project sponsor in sufficient detail to satisfy City staff and OSHA requirements.

The guidelines are not intended to be applied reciprocally. In other words, if an area currently is below the desired noise standard, an increase in noise up to the maximum should not necessarily be allowed. The impact of a proposed project on an existing land use should be evaluated in terms of the potential for adverse community response, based on a significant increase in existing noise levels (increase in 3 dB(A), regardless of the compatibility guidelines (see Policy 1.1).