Appendix I Noise Modeling

Appendices

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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."

- **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.

- **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	Threshold of human perceptibility
± 5 dB	Clearly noticeable change in noise level
± 10 dB	Half or twice as loud
± 20 dB	Much quieter or louder

Source: Bies, David A. and Colin H. Hansen. 2009. *Engineering Noise Control: Theory and Practice*. 4th ed. New York: Spon Press.

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). 2009, November. Technical Noise Supplement ("TeNS"). Prepared by ICF International.

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). 2004, June. Transportation- and Construction-Induced Vibration Guidance Manual. Prepared by ICF International.

Local Regulations

Print

Brea City Code

CHAPTER 8.20: NOISE CONTROL

Section

§ 8.20.010 DECLARATION OF POLICY.

A. In order to control unnecessary, excessive and annoying sounds emanating from areas of the city, it is hereby declared to be the policy of the city to prohibit such sounds generated from all sources as specified in this chapter.

B. It is determined that certain sound levels are detrimental to the public health, welfare and safety, and contrary to the public interest.

('61 Code, § 7B.1) (Ord. 812, passed - -)

§ 8.20.020 DEFINITIONS.

For the purpose of this chapter, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

AMBIENT NOISE LEVEL. The all-encompassing noise level associated with a given environment, being a composite of sounds from all sources, excluding the alleged offensive noise, at the location and approximate time at which a comparison with the alleged offensive noise is to be made.

CUMULATIVE PERIOD. An additive period of time composed of individual time segments which may be continuous or interrupted.

DECIBEL (dB). A unit which denotes the ratio between two (2) quantities which are proportional to power: the number of decibels corresponding to the ratio or two (2) amounts of power is ten (10) times the logarithm to the base ten (10) of this ratio.

DWELLING UNIT. A single unit providing complete, independent living facilities for one (1) or more persons including permanent provisions for living, sleeping, eating, cooking and sanitation.

EMERGENCY MACHINERY, VEHICLE, OR WORK. Any machinery, vehicle or work used, employed or performed in an effort to protect, provide or restore safe conditions in the community or for the citizenry, or work by private or public utilities when restoring utility service.

FIXED NOISE SOURCE. A stationary device which creates sounds while fixed or motionless, including but not limited to industrial and commercial machinery and equipment, pumps, fans, compressors, generators, air conditioners and refrigeration equipment.

GRADING. Any excavating or filling of earth material, or any combination thereof, conducted at a site to prepare said site for construction or other improvements thereon.

IMPACT NOISE. The noise produced by the collision of one mass in motion with a second mass which may be either in motion or at rest.

MOBILE NOISE SOURCE. Any noise source other than a fixed noise source.

NOISE LEVEL. The “A” weighted sound pressure level in decibels obtained by using a sound level meter at slow response with a reference pressure of twenty (20) micronewtons per square meter. The unit of measurement shall be designated as dB(A).

PERSON. A person, firm, association, co-partnership, joint venture, corporation or any entity, public or private in nature.

RESIDENTIAL PROPERTY. A parcel of real property which is developed and used either in part or in whole for residential purposes, other than transient uses such as hotels and motels.

SIMPLE TONE NOISE. A noise characterized by a predominant frequency or frequencies so that other frequencies cannot be readily distinguished.

SOUND LEVEL METER. An instrument meeting American National Standard Institute's Standard S1.4-1971 for Type 1 or Type 2 sound level meters or an instrument and the associated recording and analyzing equipment which will provide equivalent data.

SOUND PRESSURE LEVEL OF A SOUND, IN DECIBELS. Twenty (20) times the logarithm to the base ten (10) of the ratio of the pressure of the sound to a reference pressure, which reference pressure shall be explicitly stated.

('61 Code, § 7B.2) (Ord. 812, passed - -)

§ 8.20.030 NOISE LEVEL MEASUREMENT CRITERIA.

Any noise level measurements made pursuant to the provisions of this chapter shall be performed using a sound level meter as defined in § 8.20.020.

('61 Code, § 7B.3) (Ord. 812, passed - -)

§ 8.20.040 DESIGNATED NOISE ZONE.

The entire territory of the city is hereby designated as “Noise Zone 1.”

('61 Code, § 7B.4) (Ord. 812, passed - -)

§ 8.20.050 EXTERIOR NOISE STANDARDS.

A. The following noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

NOISE STANDARDS

Noise Zone	*Noise Level*	*Time Period*
1	55 dB(A)	7:00 a.m. - 10:00 p.m.
1	50 dB(A)	10:00 p.m. - 7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dB(A).

B. It shall be unlawful for any person at any location within the city to create any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property, to exceed:

1. The noise standard for a cumulative period of more than 30 minutes in any hour; or

2. The noise standard plus five (5) dB(A) for a cumulative period of more than 15 minutes in any hour; or

3. The noise standard plus ten (10) dB(A) for a cumulative period of more than five (5) minutes in any hour; or

4. The noise standards plus fifteen (15) dB(A) for a cumulative period of more than one (1) minute in any hour; or

5. The noise standard plus twenty (20) dB(A) for any period of time.

C. In the event the ambient noise level exceeds any of the first four (4) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

('61 Code, § 7B.5) (Ord. 812, passed - -)

§ 8.20.060 INTERIOR NOISE STANDARDS.

A. The following interior noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

INTERIOR NOISE STANDARDS

Noise Zone	*Noise Level*	*Time Period*
1	55 dB(A)	7:00 a.m. - 10:00 p.m.
1	45 dB(A)	10:00 p.m. - 7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dB(A).

B. It shall be unlawful for any person at any location within the city to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property, to exceed:

1. The interior noise standard for a cumulative period of more than five (5) minutes in any hour; or

2. The interior noise standard plus five (5) dB(A) for a cumulative period of more than one (1) minute in any hour; or

3. The interior noise standard plus ten (10) dB(A) for any period of time.

C. In the event the ambient noise level exceeds any of the first two (2) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the third noise limit category the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

('61 Code, § 7B.6) (Ord. 812, passed - -)

§ 8.20.070 SPECIAL PROVISIONS.

The following activities shall be exempted from the provisions of this chapter:

A. Activities conducted on the grounds of any public nursery, elementary, intermediate or secondary school or college.

B. Outdoor gatherings, public dances and shows, provided said events are conducted pursuant to a permit as required by this code.

C. Activities conducted on any park or playground, provided such park or playground is owned and operated by a public entity.

D. Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work.

E. Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday.

F. All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions.

G. Mobile noise sources associated with agricultural operations; provided such operations do not take place between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday.

H. Mobile noise sources associated with agricultural pest control through pesticide application, provided that the application is made in accordance with restricted material permits issued by or regulations enforced by the Agricultural Commissioner.

I. Noise sources, associated with the maintenance of real property, provided said activities take place between 7:00 a.m. and 7:00 p.m. on any day.

J. Any activity to the extent regulation thereof has been preempted by state or federal law.

('61 Code, § 7B.7) (Ord. 812, passed - -)

§ 8.20.080 MOTOR VEHICLE RACING.

It shall be unlawful to conduct motor vehicle racing, testing, timing or similar noise-producing activities at raceways, speedways, off-road vehicle courses, drag strips or other similar places, including, but not limited to, the operation of midget race cars, drag cars, motorcycles, off-road vehicles, and specialty automobiles, between the hours of 11:30 p.m. and 7:00 a.m.

('61 Code, § 7B.8) (Ord. 812, passed - -)

§ 8.20.090 SCHOOLS, HOSPITALS AND CHURCHES.

It shall be unlawful for any person to create any noise which causes the noise level at any school, hospital or church while same is in use to exceed the noise limits as specified in § 8.20.050 proscribed for the assigned noise zone in which the school, hospital or church is located, or which noise level unreasonably interferes with the use of such institutions or which unreasonably disturbs or annoys patients in the hospital, provided conspicuous signs are displayed in three (3) separate locations within one-tenth of a mile of the institution indicating the presence of a school, church or hospital.

('61 Code, § 7B.9) (Ord. 812, passed - -)

§ 8.20.100 AIR CONDITIONING; REFRIGERATION; POOL FILTERS AND FANS.

During the five (5) year period following the effective date of this chapter, the noise standards enumerated in §§ 8.20.050 and 8.20.060 shall be increased eight (8) dB(A) where the alleged offensive noise source is an air conditioning, or refrigeration system, fan, or swimming pool filter, or associated equipment which was installed prior to the effective date of this chapter.

('61 Code, § 7B.10) (Ord. 812, passed - -)

§ 8.20.110 NOISE LEVEL MEASUREMENT.

The location selected for measuring exterior noise levels shall be at any point on the affected property. Interior noise measurements shall be made within the affected dwelling unit. The measurement shall be made at a point at least four (4) feet from the wall, ceiling or floor nearest the alleged offensive noise source and may be made with the windows of the affected unit open.

('61 Code, § 7B.11) (Ord. 812, passed - -)

§ 8.20.120 MANNER OF ENFORCEMENT.

A. The Police Department, the Code Enforcement Officer and their duly authorized representatives are directed to enforce the provisions of this chapter.

B. No person shall interfere with, oppose or resist any authorized person charged with the enforcement of this chapter while such person is engaged in the performance of his or her duty.

('61 Code, § 7B.12) (Ord. 812, passed - -)

NOISE

Studies have identified noise as an environmental pollutant that can have substantial and permanent impacts on human health and general well-being. Not only is noise a health hazard, excessive noise can be a source of annoyance, tension, and discomfort that disrupts everyday activities. Brea aims to substantially reduce noise and its impacts within the urban environment, with a focus on protecting residential neighborhoods, schools, and similar sensitive uses.

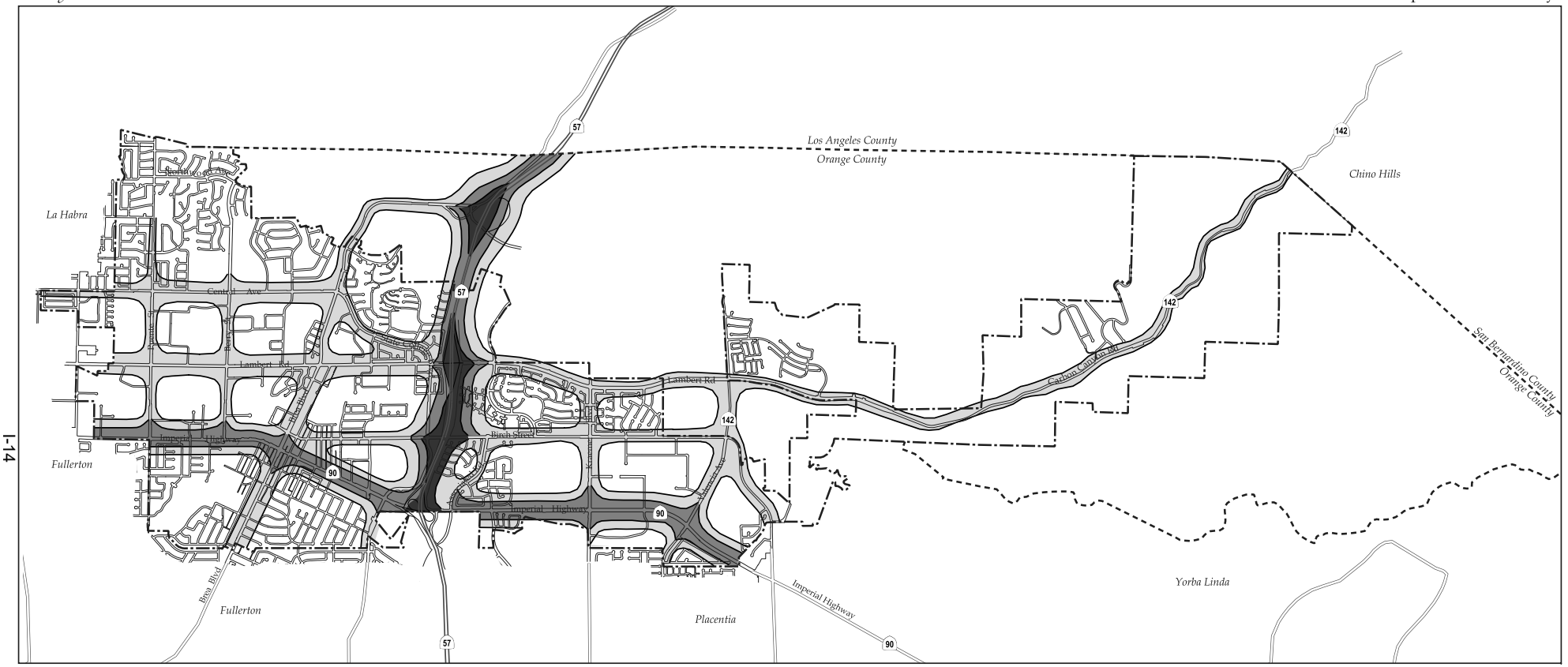
Context

In Brea, street and freeway traffic represent the primary noise sources. Industrial and commercial activity present concerns where adjacent to residential neighborhoods. In addition, mechanical equipment, playgrounds, leaf blowers, and construction equipment are examples of random noise sources that can contribute to neighborhood noise.

Figure PS-5 displays a composite picture of average noise levels in Brea in 2001. As Figure PS-5 illustrates, the loudest noise levels occur along State Highway 57, Imperial Highway, Brea Boulevard, and Valencia Avenue, where truck traffic associated with the Olinda Alpha landfill lumbers past homes and places of business. Lambert Road also experiences loud noise levels due to access to State Highway 57.

Noise and Land Use Compatibility Guidelines

Noise generally is defined as unwanted or intrusive sound. Because noise consists of pitch, loudness, and duration, describing noise with a single unit of measure presents a challenge. The A-weighted decibel scale, or dB(A), has been developed to describe the loudness of a sound or sound environment based on the sensitivity of the human ear. A sound level meter that measures A-weighted decibels has an electrical circuit that allows the meter to have the same sensitivity to sound at different frequencies as the average human ear. Table PS-3 indicates criteria the State has established to reduce adverse noise effects on human health.



Source: Weiland Associates, 2001.

Legend

- City Boundary
- Sphere of Influence

Community Noise Equivalent Level (CNEL) Contours

- Less than 60 CNEL
- 60 to 65 CNEL
- 65 to 70 CNEL
- Greater than 70 CNEL

N, W, E, S — City of Brea General Plan

0 3,000 6,000 9,000 12,000 Feet

0 0.5 1 1.5 2 Miles

BREA GENERAL PLAN

Figure PS-5
Noise Contours (2001)

Table PS-3
State Criteria for Minimizing Adverse Noise Effects on Humans

Objective	dB(A) Range
Prevent Hearing Loss	75-80
Prevent Physiological Effects (Other than hearing loss)	65-75
Prevent Speech Interference	50-60
Address People's Subjective Preference for Noise Control	45-50
Prevent Sleep Interruption	35-45

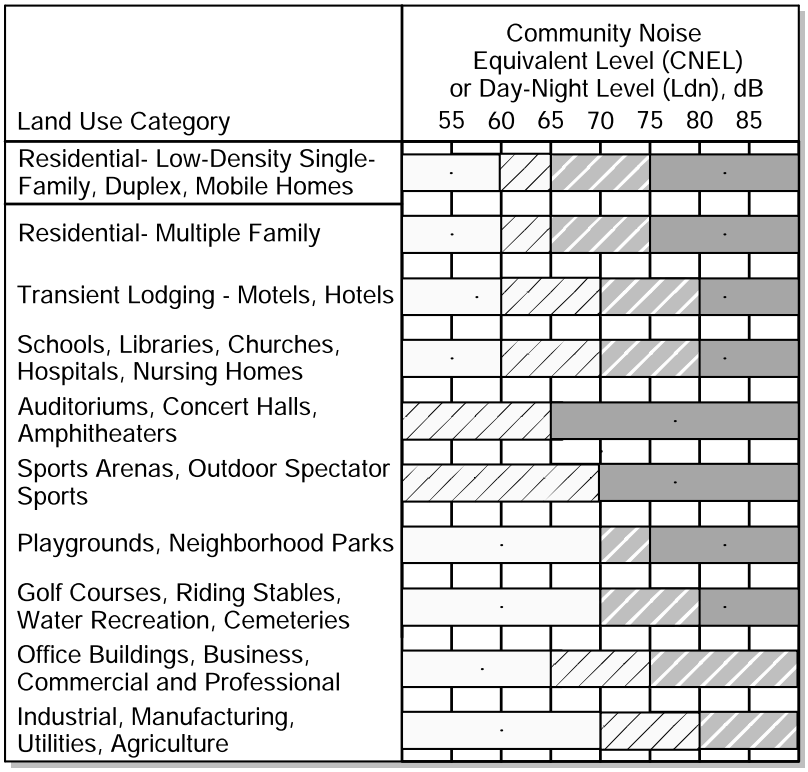
Source: California General Plan Guidelines, 2000.

The dB(A) descriptor only reports noise from a single source or combination of sources at a point in time. To allow a more comprehensive description of a noise environment, federal and State agencies have established noise and land use compatibility guidelines that use averaging approaches to noise measurement. Two measurement scales commonly used in California are the Community Noise Equivalent Level (CNEL) and the day-night level (Ldn). To account for increased human sensitivity at night, the CNEL level includes a 5-decibel penalty on noise during the 7:00 A.M. to 10:00 P.M. time period and a 10-decibel penalty on noise during the 10:00 P.M. to 7:00 A.M. time period. The Ldn level includes only the 10 decibel weighting for late-night noise. These values are nearly identical for all but unusual noise sources.

The City will use land use compatibility standards when planning and making development decisions in order to ensure that noise producers do not adversely affect sensitive receptors.

The City's primary goal with regard to community noise is to minimize the exposure of residents to unhealthful or excessive noise levels to the extent possible. To this end, the noise/land use compatibility guidelines in Figure PS-6, based on cumulative noise criteria for outdoor noise, are used to review development proposals and to identify and mitigation measures necessary to avoid or minimize impacts, including traffic noise impacts, a new use may have on established uses.

Figure PS-6
Noise/Land Use Compatibility



Nature of the noise environment where the CNEL or Ldn level is:

Below 55 dB
Relatively quiet suburban or urban areas, no arterial streets within 1 block, no freeways within 1/4 mile.

55-65 dB
Most somewhat noisy urban areas, near but not directly adjacent to high volumes of traffic.

65-75 dB
Very noisy urban areas near arterials, freeways or airports.

75+ dB
Extremely noisy urban areas adjacent to freeways or under airport traffic patterns. Hearing damage with constant exposure outdoors.

Normally Acceptable
Specified land use is satisfactory, based on the assumption that any buildings are of normal conventional construction, without any special noise insulation requirements

Conditionally Acceptable
New construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features included in design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Normally Unacceptable
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in design.

Clearly Unacceptable
New construction or development should generally not be undertaken.

The Community Noise Equivalent Level (CNEL) and Day-Night Noise Level (Ldn) are measures of the 24-hour noise environment. They represent the constant A-weighted noise level that would be measured if all the sound energy received over the day were averaged. In order to account for the greater sensitivity of people to noise at night, the CNEL weighting includes a 5-decibel penalty on noise between 7:00 p.m. and 10:00 p.m. and a 10-decibel penalty on noise between 10:00 p.m. and 7:00 a.m. of the next day. The Ldn includes only the 10-decibel weighting for late-night noise events. For practical purposes, the two measures are equivalent for typical urban noise environments.

Noise Contours and Noise Impact Areas

The use of noise contours based on the major noise sources can describe the noise environment for the community. Noise contours outline areas of equal noise exposure. Future noise contours have been estimated using information about existing and projected land use development and transportation activity.

The projected noise contours and noise impact areas for Brea are displayed in Figure PS-7. These contours will serve as a guide for land use and development decisions. Contours of 60 dB(A) or greater define noise impact areas. An acoustical analysis must be prepared when noise sensitive land uses are proposed within noise impact areas. The analysis must show that the project is designed to attenuate noise to meet the City's noise standards in order to receive approval. If the project design does not meet the noise standards, mitigation can be recommended in the analysis. If the analysis demonstrates that the noise standards can be met by implementing the mitigation measures, the project can be approved conditioned upon implementation of the mitigation measures.

Transportation Related Noise

Transportation activity is the primary source of noise in Brea. The three major sources of transportation related noise are:

- Traffic on the Orange Freeway (SR-57)
- Commercial truck traffic associated with the Olinda Alpha landfill on Valencia Avenue and Imperial Highway
- Automobile traffic on Brea Boulevard, Brea Canyon Road, Central Avenue, and Lambert Road

Residential neighborhoods bordering the Orange Freeway are subject to loud noise levels. Properties directly adjacent to the freeway can experience decibels as high as 70 to 75 dB(A). Sound attenuation walls, landscaped buffers, and dirt mounds all help to reduce the sound intensity of the freeway. Figure PS-7 illustrates the projected noise contours along the freeway.

Commercial trucks associated with the Olinda Alpha landfill contribute to excessive noise levels via the Orange Freeway, Imperial Highway, and Valencia Avenue to connect with the landfill. Commercial trucks are not permitted to access Valencia Avenue via Lambert Road, minimizing some of the noise impacts to adjacent residential neighborhoods. Olinda Alpha is slated to close in the year 2013; however, the County of Orange is investigating extending the life of the landfill much further.

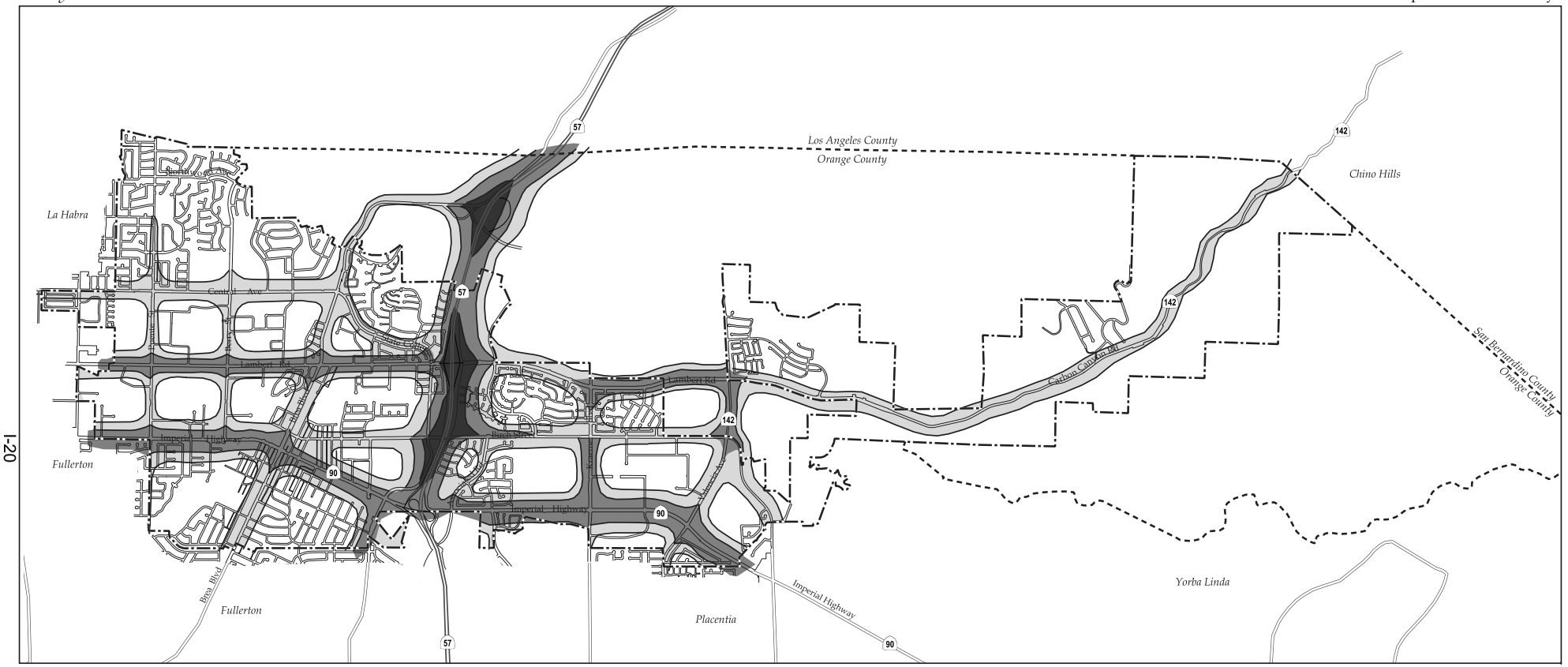
New residential development has been recently constructed at the northeast corner of Valencia Avenue and Carbon Canyon Road just south of the Olinda Alpha landfill entrance. Dense planting of deciduous and evergreen trees as well as a sound attenuation wall were set within the landscaped area to minimize the impacts to residential properties directly abutting Valencia Avenue.

Proposed residential land uses have also been designated for both sides of Valencia Avenue south of Lambert Road/Carbon Canyon Road. Residential, school, and park uses are proposed for the Hartley Research Center. Careful planning and mitigation within these areas will protect these sensitive uses from excessive noise levels.

Noise levels along Brea Boulevard, Brea Canyon Road, Central Avenue, and Lambert Road are above average and can impact sensitive uses adjacent to these streets.

Traffic noise depends primarily on the speed of traffic and the percentage of truck traffic. The primary source of noise from automobiles is high-frequency tire noise, which increases with speed. In addition, trucks and older automobiles produce engine and exhaust noise.

The most efficient and effective means of controlling noise from transportation systems is to reduce noise at the source. However, the City has little direct control over noise produced by transportation sources because State noise regulations preempt local regulations. Because the City cannot control noise at the source, City noise programs focus on reducing the impact of transportation noise at reception sites. During the planning stages of the development process, potential impacts from transportation noise will be identified and mitigation measures will be required as needed to meet City noise standards.



Source: Weiland Associates, 2001.

Legend

- City Boundary
- Sphere of Influence

Community Noise Equivalent Level (CNEL) Contours

- Less than 60 CNEL
- 60 to 65 CNEL
- 65 to 70 CNEL
- Greater than 70 CNEL

N, W, E, S — City of Brea General Plan

0 3,000 6,000 9,000 12,000 Feet

0 0.5 1 1.5 2 Miles

BREA GENERAL PLAN

Figure PS-6
Future Noise Contours

Sound attenuation walls and limits on speed help to shield residential neighborhoods from automobile noise on Imperial Highway.

Non-Transportation Related Noise

When reviewing a proposed industrial, commercial, or public project, noise generation and potential impacts to surrounding development are considered in accordance with CEQA. Specific attention should be given to non-residential proposals adjacent to residential neighborhoods. An acoustical analysis is required for projects that will generate noise potentially affecting sensitive receptors. Where significant impacts are identified, mitigation measures are required. Common mitigation measures that could be applied when reviewing projects include acoustically treated and quiet design: 1) furnaces, 2) fans, 3) motors, 4) compressors, and 5) valves and pumps. The City may also require limited delivery hours and hours of operation to minimize impacts on adjacent residential users or other sensitive receptors.

Goals and Policies

Certain areas of Brea are subject to high levels of noise. This in turn can reduce the quality of life within these neighborhoods. Consideration of noise sources in the planning process and identification of who that noise impacts is an effective method of minimizing the impacts of noise on residents. Areas already impacted by noise can explore different noise attenuation and rehabilitative improvements.

Goal PS-9	Minimize the impact of point source noise and ambient noise levels throughout the community.

Policy PS-9.1 Evaluate the need to require acoustical studies for development proposals that address both direct and indirect, particularly traffic, noise impacts, and require such studies, with appropriate mitigation included, as warranted.

Policy PS-9.2 Ensure that the noise standards set forth in the Municipal Code reflect standards most appropriate for Brea.

Policy PS-9.3 Ensure that acceptable noise levels are maintained near schools, hospitals, convalescent homes, and other noise sensitive areas in accordance with the City's Municipal Code and noise standards contained in the General Plan.

Policy PS-9.4 Employ creative methods of reducing noise pollution in the City.

Policy PS-9.5 Avoid placing high-noise activity centers near residential areas.

Goal PS-2	Minimize the impacts of transportation-related noise.

Policy PS-2.1 Reduce transportation noise by imposing traffic restrictions where necessary.

Policy PS-2.2 Work with the counties of Orange and Los Angeles to include noise mitigation measures in the design of new roadway projects.

Goal PS-3	Minimize noise impacts from sources other than transportation.

Policy PS-3.1 Require the inclusion of noise mitigation measures, techniques, and design features in the planning, design, and construction of future development and redevelopment projects.

Policy PS-3.2 Require that mixed-use structures be designed to prevent transfer of noise and vibration from commercial/retail to residential use.

Policy PS-3.3 Minimize stationary noise sources and noise emanating from construction activities and special events.

Policy PS-3.4 Require that new non-residential development plan delivery areas away from existing residential areas.

Policy PS-3.5 Continue active enforcement to limit commercial and industrial delivery hours adjoining residential areas.

Implementation Guide

See Section XXIII of the Implementation Guide for action programs.

CONSTRUCTION NOISE CALCULATIONS

Roadway Construction Noise Model (RCNM),Version 1.1

Report dat ########
Case Description:

		---- Receptor #1 ----		
	Baselines (dBA)			
Descriptior	Land Use	Daytime	Evening	Night
Foundatior	Residential	60	55	60

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pumps	No	50		80.9	815	0
Dump Truck	No	40		76.5	815	0

	Calculated (dBA)		Results Noise Limits (dBA)					
			Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Pumps	56.7	53.7	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	52.2	48.2	N/A	N/A	N/A	N/A	N/A	N/A
Total	56.7	54.8	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

	Noise Limit Exceedance (dBA)				
Day		Evening		Night	
Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A
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 dat ########
Case Description:

		---- Receptor #1 ----		
	Baselines (dBA)			
Descriptior	Land Use	Daytime	Evening	Night
Grading/Ex	Residential	60	55	60

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	815	0
Front End Loader	No	40		79.1	815	0
Dump Truck	No	40		76.5	815	0
Dump Truck	No	40		76.5	815	0

	Calculated (dBA)		Results					
			Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	56.5	52.5	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	54.9	50.9	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	52.2	48.2	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	52.2	48.2	N/A	N/A	N/A	N/A	N/A	N/A
Total	56.5	56.4	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

	Noise Limit Exceedance (dBA)				
Day		Evening		Night	
Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
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 dat ########
Case Description:

		---- Receptor #1 ----		
	Baselines (dBA)			
Descriptior	Land Use	Daytime	Evening	Night
Interior/Ex	Residential	60	55	60

			Equipment				
			Spec	Actual	Receptor	Estimated	
	Impact		Lmax	Lmax	Distance	Shielding	
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)	
Compressor (air)	No	40		77.7	815	0	

			Results					
	Calculated (dBA)		Noise Limits (dBA)					
			Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)	53.4	49.4	N/A	N/A	N/A	N/A	N/A	N/A
Total	53.4	49.4	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

	Noise Limit Exceedance (dBA)				
Day		Evening		Night	
Lmax	Leq	Lmax	Leq	Lmax	Leq
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 dat ########
Case Description:

		---- Receptor #1 ----		
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Utility	Residential	60	55	60

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	815	0

		Results							
		Calculated (dBA)		Noise Limits (dBA)					
				Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator		56.5	52.5	N/A	N/A	N/A	N/A	N/A	N/A
	Total	56.5	52.5	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

	Noise Limit Exceedance (dBA)				
Day		Evening		Night	
Lmax	Leq	Lmax	Leq	Lmax	Leq
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 dat ########
Case Description:

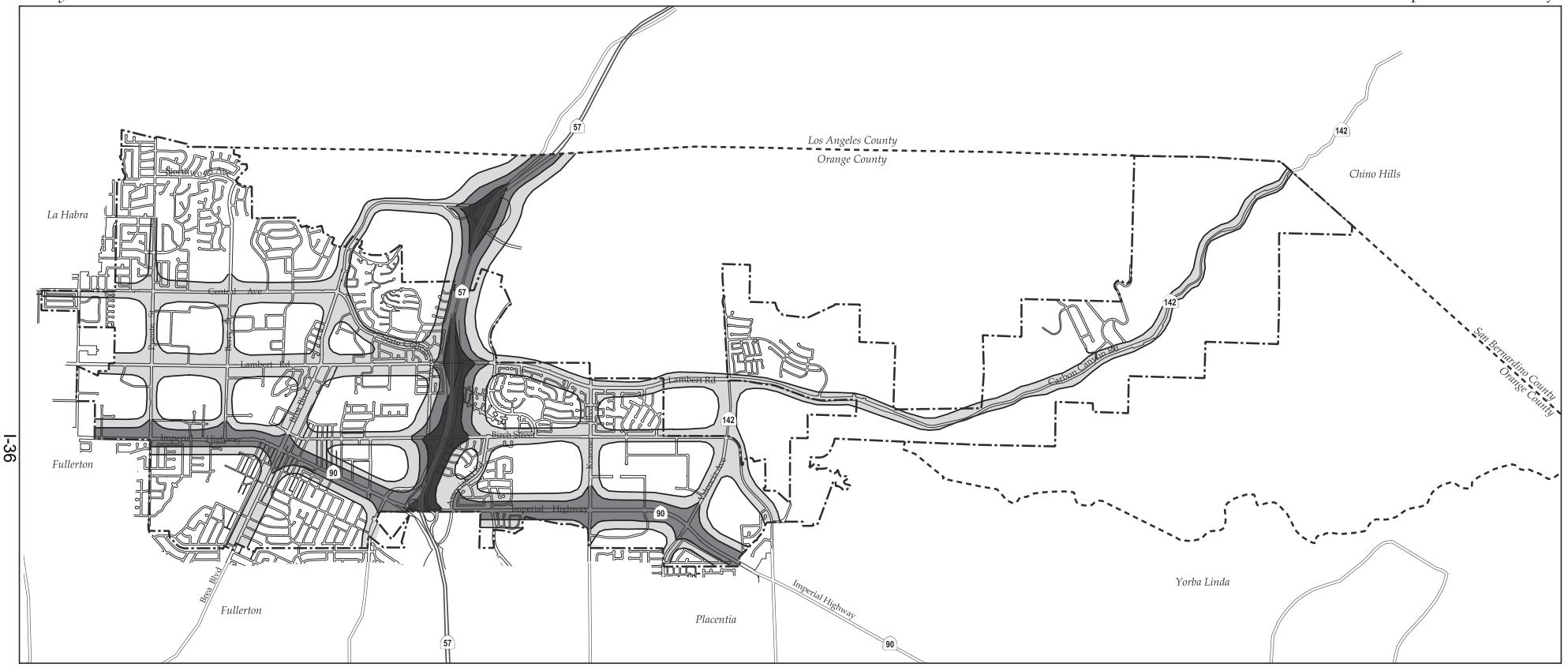
		---- Receptor #1 ----		
	Baselines (dBA)			
Descriptior	Land Use	Daytime	Evening	Night
Vertical Bu	Residential	60	55	60

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Man Lift	No	20		74.7	815	0

	Calculated (dBA)		Results Noise Limits (dBA)					
			Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Man Lift	50.5	43.5	N/A	N/A	N/A	N/A	N/A	N/A
Total	50.5	43.5	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

	Noise Limit Exceedance (dBA)				
Day		Evening		Night	
Lmax	Leq	Lmax	Leq	Lmax	Leq
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A



Source: Weiland Associates, 2001.

Legend

- City Boundary
- Sphere of Influence

Community Noise Equivalent Level (CNEL) Contours

- Less than 60 CNEL
- 60 to 65 CNEL
- 65 to 70 CNEL
- Greater than 70 CNEL

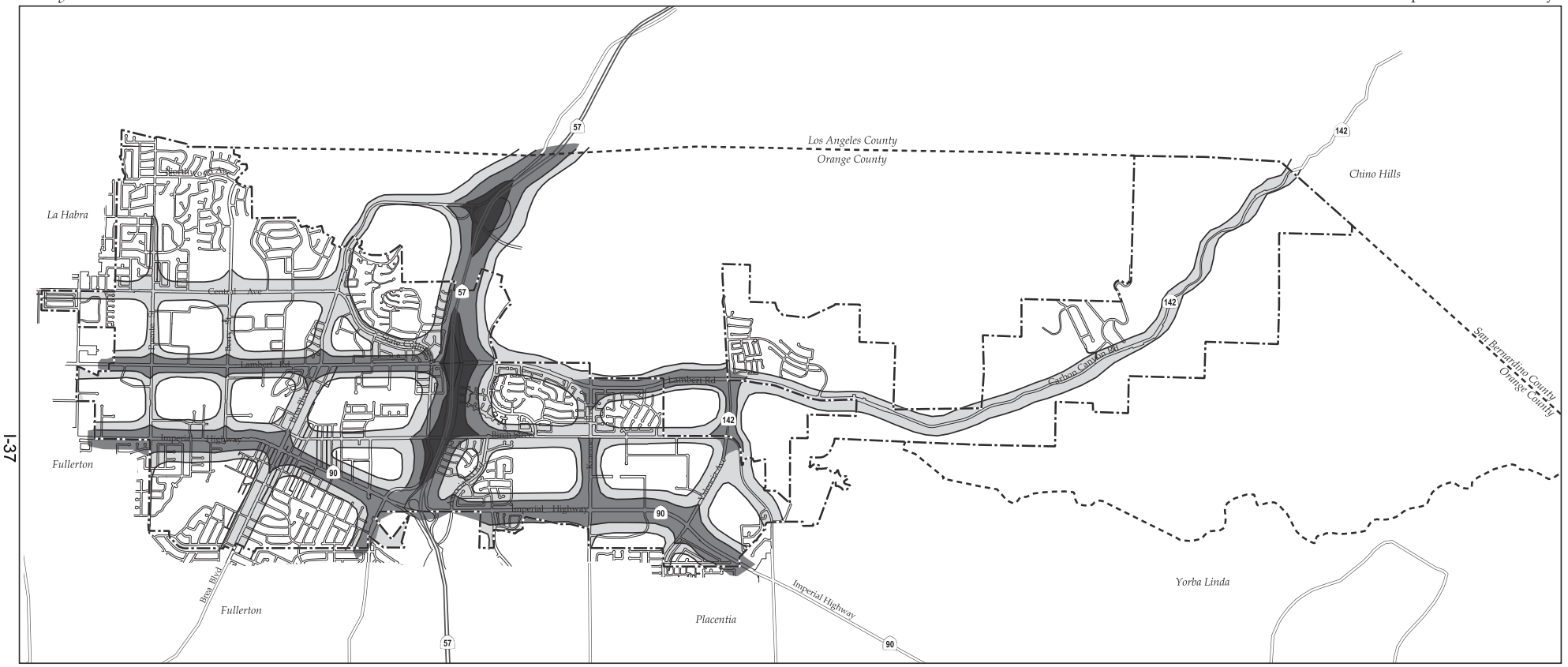
N, W, E, S — City of Brea General Plan

0 3,000 6,000 9,000 12,000 Feet

0 0.5 1 1.5 2 Miles

BREA GENERAL PLAN

Figure PS-5
Noise Contours (2001)



Source: Weiland Associates, 2001.

Legend

- City Boundary
- Sphere of Influence

Community Noise Equivalent Level (CNEL) Contours

- Less than 60 CNEL
- 60 to 65 CNEL
- 65 to 70 CNEL
- Greater than 70 CNEL

N W E S City of Brea General Plan

0 3,000 6,000 9,000 12,000 Feet

0 0.5 1 1.5 2 Miles

BREA GENERAL PLAN

Figure PS-6
Future Noise Contours

TRAFFIC NOISE INCREASE CALCULATIONS

ADT VOLUMES
MERCURY APARTMENTS, BREA

	Roadway Segment	Total Project	Existing	Existing With Project	Year 2021 Cumulative Without Project	Year 2021 Cumulative With Project	Buildout Without Project	Buildout With Project	Noise Increase Due to Project (dBA)	Cumulative Increase (dBA)	Cumulative Increa due to project (dBA)
A	Lambert Road, west of Berry Street	65	31,643	31,708	36,146	36,211	37,953	38,018	0.008912	0.576717	0.007803
B	Lambert Road, east of Berry Street	163	34,197	34,360	39,125	39,288	41,081	41,244	0.020651	0.582068	0.018056
C	Lambert Road, east of Brea Boulevard	163	36,788	36,951	41,309	41,472	43,374	43,537	0.019200	0.501288	0.017103
D	Lambert Road, east of State College Boulevard	163	58,979	59,142	65,199	65,362	68,459	68,622	0.011986	0.434293	0.010844
E	Berry Street, north of Mercury Lane	229	10,898	11,127	11,225	11,454	11,786	12,015	0.090313	0.125791	0.087708
F	Brea Boulevard, north of Birch Street	0	26,822	26,822	30,385	30,385	31,904	31,904	0.000000	0.541681	0.000000
G	Birch Street, east of Brea Boulevard	33	17,612	17,645	19,733	19,766	20,720	20,753	0.008130	0.492971	0.007257
H	Berry Street, south of Mercury Lane	424	10,819	11,243	11,144	11,568	11,605	12,029	0.166951	0.123761	0.162172
I	Brea Boulevard, south of Birch Street	33	26,800	26,833	31,272	31,305	32,836	32,869	0.005344	0.669445	0.004581
J	Imperial Highway, west of Berry Street	98	50,663	50,761	54,915	55,013	61,663	61,761	0.008393	0.349352	0.007743
K	Imperial Highway, east of Berry Street	327	55,508	55,835	59,905	60,232	64,937	65,264	0.025509	0.329208	0.023642
L	Imperial Highway, east of Brea Boulevard	229	52,625	52,854	56,595	56,824	62,839	63,068	0.018858	0.314539	0.017537
M	Imperial Highway, east of State College Boulevard	196	71,271	71,467	77,567	77,763	80,700	80,896	0.011927	0.366675	0.010960

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