CHAPTER 6 • NOISE ELEMENT

INTRODUCTION

The Noise Element of the General Plan is a planning document which provides a policy framework for addressing potential noise impacts encountered in the planning process.

The content of a Noise Element and the methods used in its preparation have been determined by the requirements of Section 65302 (f) of the California Government Code and by Guidelines for the Preparation and Content of Noise Elements of the General Plan adopted and published by the California Office of Noise Control (ONC) in 1976. The ONC Guidelines require that major noise sources and areas containing noise-sensitive land uses be identified and quantified by preparing generalized noise exposure contours for current and projected conditions.

According to the Government Code requirements, noise exposure information should be included in a Noise Element for the following major noise sources:

1. Highways and freeways
2. Primary arterials and major local streets
3. Railroad operations
4. Aircraft and airport operations
5. Local industrial facilities
6. Other stationary sources

Noise-sensitive uses identified by the Government Code and by the City of Kerman include the following:

1. Residential development
2. Schools
3. Hospitals, nursing homes
4. Churches
5. Libraries

The Noise Element is directed at minimizing future noise conflicts. A noise ordinance, on the other hand, is directed at resolving existing noise conflicts. A noise ordinance may be used to address noise levels generated by existing industrial, commercial,

agricultural and residential uses, which are not regulated by federal or state noise level standards. The regulation of noise sources such as traffic on public roadways, railroad line operations and aircraft in flight is preempted by existing federal and/or state regulations, meaning that such sources generally may not be addressed by a noise ordinance. The Noise Element addresses the prevention of noise conflicts from all of these sources.

Relationship to Other Elements of the General Plan

The Noise Element is related to the Land Use, Housing, Circulation and Open Space Elements of the General Plan. Recognition of the interrelationship of noise and these four mandated elements is necessary to prepare an integrated general plan and to initiate changes which will reduce noise exposure to acceptable levels in areas where noise may presently exceed the levels set forth by the adopted policies of the Noise Element. The relationship between these elements is briefly discussed below:

1. Land Use: An objective of the Noise Element is to provide noise exposure information for use in the Land Use Element. When integrated with the Noise Element, the Land Use Element will show acceptable land uses in relation to existing and projected noise levels.

2. Housing: The Housing Element considers the provision of adequate sites for new housing and standards for housing stock. Since residential land uses are noise-sensitive, the noise exposure information of the Noise Element must be considered when planning the locations of new housing. The State Noise Insulation Standards may influence the locations and construction costs of multi-family dwellings, which should be considered by the Housing Element.

3. Circulation: The circulation system, which is a major source of noise, must be correlated with the Land Use Element. This is especially true for roadways which carry significant numbers of trucks. Noise exposure will thus be a decisive factor in the location and design of new transportation facilities, and in the mitigation of noise produced by existing facilities upon existing and planned land uses.

4. Open Space: Excessive noise adversely affects the enjoyment of recreational pursuits in designated open space, particularly in areas where quiet is a valued part of the recreational experience. Thus, noise exposure should be considered in planning for this kind of open space use. Conversely, open space can be used to buffer noise-sensitive uses from noise sources by providing setbacks and visual screening.

Noise And Its Effects On People

Appendix A provides a discussion of the fundamentals of noise assessment, the effects of noise on people and criteria for acceptable noise exposure, and is a reference for use by

the City during the review of documents or proposals which refer to the measurement and effects of noise.

Definitions

1. A-Weighted Sound Level: All sound levels referred to in this policy document are in A-weighted decibels. A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighting, as it provides a high degree of correlation with human annoyance and health effects.

2. Community Noise Equivalent Level (CNEL): The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.

3. Day/Night Average Sound Level (Ldn): The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.

4. Equivalent Sound Level (Leq): The sound level containing the same total energy as a time varying signal over a given sample period. Leq is typically computed over 1, 8 and 24-hour sample periods.

5. New Development: Projects requiring land use or building permits, but excluding remodeling or additions to existing structures.

6. Noise-Sensitive Land Use: Residential land uses, transient lodging, schools, libraries, churches, hospitals and nursing homes.

7. Outdoor Activity Areas: Patios, decks, balconies, outdoor eating areas, swimming pool areas, yards of dwellings and other areas which have been designated for outdoor activities and recreation.

8. Stationary Noise Source: Any fixed or mobile source not preempted from local control by existing federal or state regulations. Examples of such sources include agricultural, industrial and commercial facilities and vehicle movements on private property.

9. Transportation Noise Source: Traffic on public roadways, railroad line operations and aircraft in flight. Control of noise from these sources is preempted by existing federal or state regulations. However, the effects of noise from transportation sources may be controlled by regulating the location and design of adjacent land uses.

EXISTING AND FUTURE NOISE ENVIRONMENT

Overview of Sources

Based on discussions with City staff, the requirements of the Government Code and field studies conducted during the preparation of this Noise Element, it was determined that traffic on local roadways is a potentially significant source of community noise within the City of Kerman. Roadways of concern include State Routes (SR) 145 (Madera Avenue) and 180 (Whitesbridge Road). The Westside Branch of the Southern Pacific Railroad also passes through the City, and there are two stationary sources which have been identified by the City as potentially-significant sources of noise within the community. Major noise sources identified for study are indicated on Map 8.

Methods Used to Develop Noise Exposure Information

According to the Government Code and ONC Guidelines, noise exposure contours should be developed in terms of the Day-Night Average Level (Ldn) or Community Noise Equivalent Level (CNEL) for transportation-related noise sources. Both of these descriptors represent the weighted energy noise level for a 24-hour day after inclusion of a 10 dB penalty for noise levels occurring at night between the hours of 10:00 p.m. and 7:00 a.m. The CNEL descriptor also includes a penalty of about 4.8 dB for noise levels occurring during the evening hours of 7:00 p.m. and 10:00 p.m. The CNEL descriptor was developed for the quantification of aircraft noise, and its use is required when preparing noise exposure maps for airports within the State of California. The CNEL and Ldn descriptors are generally considered to be equivalent to each other for most community noise environments within 1.0 dB. The Ldn descriptor has been used in this Noise Element to quantify noise from the above-described major noise sources.

Analytical noise modeling techniques were used to develop generalized Ldn contours for existing and future conditions. Analytical noise modeling techniques generally make use of source-specific data, including descriptions of noise-generating equipment or activities, hours of operation, seasonal fluctuations, and average levels of noise from source operations. Analytical methods have been developed for many environmental noise sources, including roadways, railroad line operations, railroad yard operations, industrial plants and aircraft/airport operations. Such methods will produce reliable results as long as data inputs and assumptions are valid for the sources being studied.

The noise exposure information developed during the preparation of the Noise Element does not include all conceivable sources of industrial, commercial or agricultural noise within the City, but rather focuses on the existing sources of noise which have been identified by the City as being significant. As the policies of this Noise Element are applied in the future, it is likely that other potentially-significant sources will be identified.

Roadways

The Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used to develop Ldn contours for SR 145 and SR 180. The FHWA Model is the analytical method currently favored by most state and local agencies, including Caltrans, for highway traffic noise prediction. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles) and heavy trucks (3 or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly Leq values for free-flowing traffic conditions, and is generally considered to be accurate within + 1.5 dB. The model assumes a clear view of traffic with no shielding at the receiver location. To predict Ldn values, it is necessary to determine the hourly distribution of traffic for a typical day and adjust the traffic volume input data to yield an equivalent hourly traffic volume. The Calveno traffic noise emission curves were used as recommended by Caltrans to more accurately calculate noise levels generated by California traffic.

For all roadways being studied, existing (1992) and future (2012) annual average daily traffic (AADT) volumes and percentages of trucks were obtained from Caltrans. The day/night distribution of traffic was determined from hourly traffic counts performed by Caltrans near the intersection of SR 180 and SR 145 during the weeks of April 10, 1992 on SR 145 and June 19, 1993 on SR 180. Vehicle speeds assumed during the traffic noise modeling process were the posted vehicle speeds.

Distances from the center of the roadways to the 60 and 65 dB Ldn contours along with input data used during the traffic noise modeling process are summarized by Table 17.

TABLE 17
DISTANCE TO Ldn CONTOURS AND TRAFFIC DATA

	AADT						Distance to Ldn Contours (Ft.) (1)			
							1992		2013	
Roadway	1992	2013	D%/N%1(2)	%MT(3)	%HT(4)	Speed (MPH)	65 dB	60 dB	65 dB	60 dB
SR 180 (Whitesbridge Rd):										
West of First Ave.	6,200	12,500	88/12	3.9	4.9	55	85	182	135	291
First Ave. to Vineland Ave.	6,600	14,250	88/12	3.9	4.9	40	59	127	99	212
East of Vineland Ave.	6,600	14,250	88/12	3.9	4.9	55	88	190	147	317
SR 145 (Madera Ave):										
North of City Limits	9,000	10,700	90/10	7.4	12	55	137	296	154	332
N. City Limits to Kearney Blvd.	17,500	20,800	90/10	7.4	12	35	139	299	156	335
Kearney Blvd. to S.P.R.R.	17,500	20,800	90/10	7.4	12	30	146	314	163	352
South of S.P.R.R.	7,700	11,750	90/10	7.4	12	55	124	267	164	354

(1) Distances are from center of roadways
(2) Day/Night traffic split (day is defined as 7am - 10pm and night as 10 pm - 7 am)
(3) Medium trucks
(4) Heavy trucks

Southern Pacific Railroad

The Westside Branch of the Southern Pacific Railroad passes along the southern edge of the central core of Kerman. According to the S.P.R.R. Trainmaster's office in Fresno, one train per day typically passes through the City. Future estimates of railroad traffic through Kerman were not available from the railroad. Noise levels from railroad operations in Kerman were quantified using the analytical method developed in 1973 by Wyle Laboratories (Wyle Laboratories Report WCR-73-5). This is the method suggested by the California Office of Noise Control for Noise Element studies. Additionally, noise level measurements were conducted at approximately 100 feet from the center of the tracks near the Madera Avenue grade crossing on June 9, 1993.

The Wyle methodology calculates noise exposure based on reference noise level data for various types of trains under different operating conditions, distance from the tracks, speed and the characteristics of the track the trains pass over. According to the Wyle methodology and the frequency of operation provided by the railroad, the 65 and 60 dB Ldn contours would be located approximately 29 and 63 feet, respectively, from the tracks. These distances are generally within the railroad right-of-way. Based on the single train passby monitored on June 9, 1993, maximum noise levels at about 100 feet from the tracks were about 88 dB from the warning horn and 75-80 dB from the passing locomotive and cars. Although noise exposure as defined by the Ldn is not significant from the railroad, some intermittent interruption of activities due to train noise may affect persons located near the tracks.

Major Stationary Noise Sources

The production of noise is an inherent part of many industrial, commercial and agricultural processes, even when the best available noise control technology is applied. Noise production within an industrial or commercial facility or in close proximity to many types of agricultural equipment is controlled indirectly by federal and state employee health and safety regulations (OSHA and Cal-OSHA). However, exterior noise emissions from such operations have the potential to exceed locally acceptable standards at nearby noise-sensitive land uses.

Noise control issues focus upon two objectives: to prevent the introduction of new noise-producing uses in a noise-sensitive area, and to prevent encroachment of noise-sensitive land uses upon existing noise-generating facilities. The first objective can be achieved by applying performance standards to proposed new industrial or other noise generating uses. The second objective can be met by requiring that new noise-sensitive uses in proximity to existing noise sources include receiver-based mitigation measures to ensure compliance with the same performance standards.

Noise exposure information for the major stationary noise sources selected for study was developed from operational data obtained from source operators and from noise level

measurements conducted at reference locations around the noise sources. In discussing future operations with source operators it was apparent that too many variables exist to allow meaningful projections of future activity or noise levels.

Following are discussions of major stationary noise sources which were identified for study. The discussions are intended to provide generalized information concerning the relative noise impacts of each source, and to identify specific noise sources which should be considered in the review of development proposals where potential noise conflicts could result. The following discussions do not represent a comprehensive accounting of all noise sources in the city. It is probable that unidentified industries or other major noise sources exist which generate significant noise levels and could result in noise-related land use conflicts.

A. Helena Chemical Company

The Helena Chemical Company plant is located south of the S.P.R.R. and west of Vineland Avenue. The plant packages and distributes agricultural chemicals. Typical operating hours are 4:00 a.m. to 6:00 p.m., 5 days per week. According to plant management, the major source of noise at the plant which could affect off-site locations is the scrubber used when bulk powder is being unloaded. Powder unloading occurs intermittently, usually 1-2 times per day for about 30 minutes at a time.

Noise levels measured on June 19, 1993 from the scrubber were 50-52 dB north of the S.P.R.R. along California Avenue and approximately 50 dB directly east of the plant at Vineland Avenue. Since there was a row of rail cars parked on a siding between the plant and the California Avenue monitoring site, it is likely that noise levels could be higher than measured in this area. The closest existing noise-sensitive land uses to the Helena Chemical Company plant are single-family homes located along California Avenue to the north of the plant and a single family home and a church located on the east side of Vineland Avenue directly east of the plant.

Source: Mr. John Brandon, Plant Manager, Helena Chemical Company

Community Noise Survey

A community noise survey was conducted within the City during June 1993 to document background noise levels in areas where noise-sensitive land uses are located. Short-term monitoring was conducted at 4 sites once during rush hour conditions (7:00 a.m. - 9:00 a.m. or 4:00 p.m. - 6:00 p.m.) and once during mid-day conditions (9:00 a.m. - 4:00 p.m.) Continuous noise monitoring was conducted at a fifth site to record the variation of noise levels through a full 24-hour period. The data collected during the survey included the Leq and observed maximum noise levels. Noise monitoring sites, measured noise levels and estimated Ldn values at each site are described by Table 18. Hourly variations in

noise levels at the long-term monitoring site are shown in Table 19. Monitoring site locations are shown on Map 8.

Review of data summarized in Table 18 and depicted by Table 19 indicated that existing background noise levels within the City of Kerman are relatively quiet. An exception to this occurred during the 24-hour measurement period at Site 5 between the hours of 5:00 p.m. and 7:00 p.m. However, it is believed that these levels were caused by yard or car maintenance work in close proximity to the microphone, and that such levels are not typical of noise-sensitive areas within the community. To preserve quiet conditions, noise level standards and policies have been adopted to prevent degradation of the existing noise environment as much as possible.

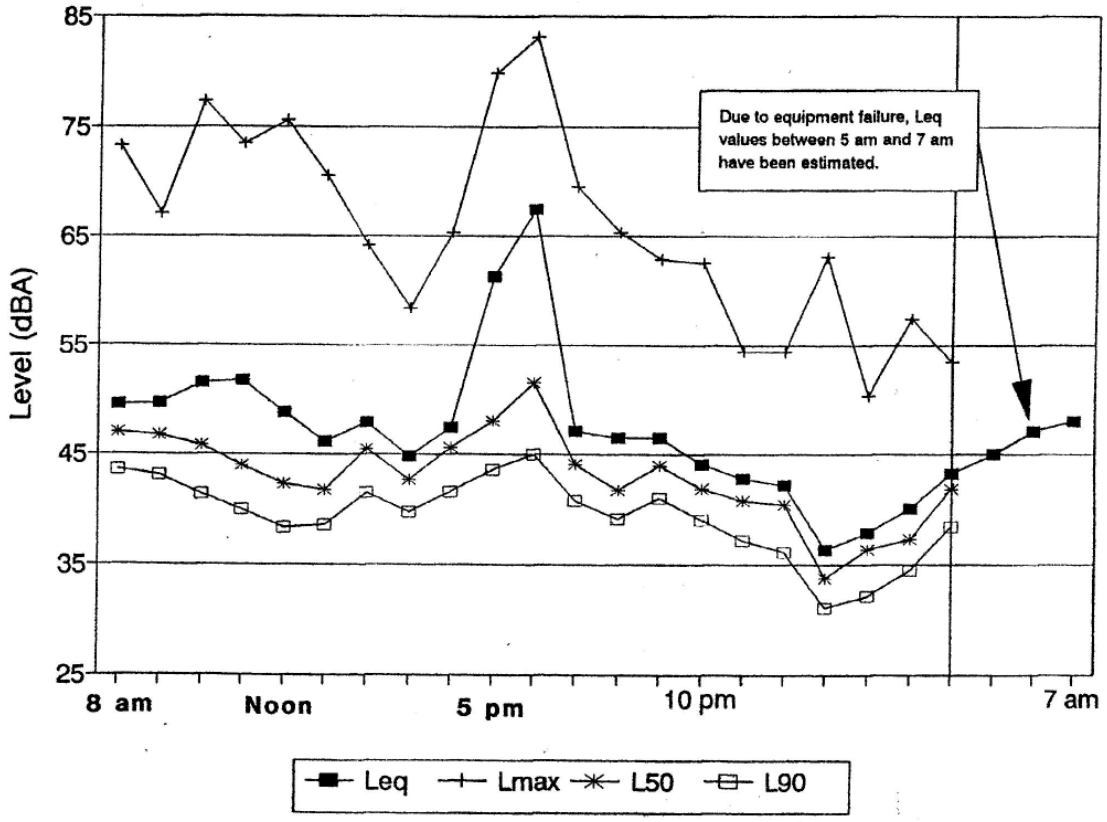
TABLE 18
SUMMARY OF COMMUNITY NOISE SURVEY DATA

Site #	Location	Level, dBA Ld	Ln	Lmax (Source)	Ldn
1	East end Stanislaus Ave.	48	35-45	56 (Traffic)	47-51*
2	LDS Church Parking Lot	47	35-45	58 (Traffic)	46-50*
3	Between Kearney Ave. & G St.	52	35-45	62 (Trucks)	51-55*
4	Rotary Park	47	35-45	57 (Construction)	47-51*
5**	15418 W. "C" St.	57	43	84 (Unknown)	56

Ld = Average Leq for two 15 minute samples obtained between 7:00 a.m. and 10:00 p.m. except for Site 5 where 24-hour monitoring was conducted.
Ln = Estimated Leq for the nighttime hours of 10:00 p.m. and 7:00 a.m. based upon 24 hour monitoring conducted at Site 5.
* Ldn estimated from Ld and Ln
** 24 hour monitoring site and actual measured noise level data. Refer to Figure 2 for a description of hourly noise levels.

Source: Brown-Buntin Associates

TABLE 19
HOURLY NOISE LEVELS
15418 W. "C" Street



NOISE ELEMENT GOALS

The goals of the City of Kerman Noise Element are:

1. TO PROTECT THE CITIZENS OF THE CITY FROM THE HARFUL AND ANNOYING EFFECTS OF EXPOSURE TO EXCESSIVE NOISE.

2. TO PROTECT THE ECONOMIC BASE OF THE CITY BY PREVENTING INCOMPATIBLE LAND USES FROM ENCROACHING UPON EXISTING OR PLANNED NOISE-PRODUCING USES.

3. TO PRESERVE THE TRANQUILITY OF RESIDENTIAL AREAS BY PREVENTING NOISE-PRODUCING USES FROM ENCROACHING UPON EXISTING OR PLANNED NOISE-SENSITIVE USES.

4. TO EDUCATE THE CITIZENS OF THE CITY CONCERNING THE EFFECTS OF EXPOSURE TO EXCESSIVE NOISE AND THE METHODS AVAILABLE FOR MINIMIZING SUCH EXPOSURE.

POLICIES AND ACTION PROGRAMS

The following policies and action plans have been adopted by the City of Kerman to accomplish the goals of the Noise Element:

Transportation Noise Sources:

1. POLICY: New development of noise-sensitive land uses shall not be permitted in areas exposed to existing or projected future levels of noise from transportation noise sources which exceed 60 dB Ldn in outdoor activity areas or 45 dB Ldn in interior spaces.

ACTION:

a. The City shall review new public and private development proposals to determine conformance with the policies of this Noise Element.

b. Where the development of a project may result in land uses being exposed to existing or projected future noise levels exceeding the levels specified by the policies of the Noise Element, the City shall require an acoustical analysis early in the review process so that noise mitigation may be included in the project design. For development not subject to environmental review, the requirements for an acoustical analysis shall be implemented prior to the issuance of a building permit. The requirements for the content of an acoustical analysis are given in Appendix B.

2. POLICY: Noise created by new transportation noise sources, including roadway improvement projects, shall be mitigated so as not to exceed 60 dB Ldn within outdoor activity areas and 45 dB Ldn within interior spaces of existing noise-sensitive land uses.

ACTION: *a. The City shall develop and employ procedures to ensure that noise mitigation measures required pursuant to an acoustical analysis are implemented in the development review and building permit processes.*

b. The City shall request the California Highway Patrol, the sheriff's office and the police department to actively enforce the California Vehicle Code sections relating to adequate vehicle mufflers and modified exhaust systems.

Stationary Noise Sources:

1. POLICY: New development of noise-sensitive land uses shall not be permitted where the noise level from existing stationary noise sources exceeds the noise level standards of Table III.

ACTION: *a. The City shall not permit projects that exceed allowable decibel levels established by this Element.*

b. The City shall enforce the State Noise Insulation Standards (California Code of Regulations, Title 24) and Chapter 35 of the Uniform Building Code (UBC) concerning interior noise exposure for multi-family housing, hotels and motels.

2. POLICY: Noise created by new proposed stationary noise sources or existing stationary noise sources which undergo modifications that may increase noise levels shall be mitigated so as not to exceed the noise level standards of Table 20 on lands designated for noise-sensitive uses. This policy does not apply to noise levels associated with agricultural operations.

ACTION: *a. The City shall develop and employ procedures to monitor compliance with the policies of the Noise Element after completion of projects where noise mitigation measures have been required.*

b. The City shall periodically review and update the Noise Element to ensure that noise exposure information and specific policies are consistent with changing conditions within the City and with noise control regulations or policies enacted after the adoption of this element.

TABLE 20
MAXIMUM ALLOWABLE NOISE EXPOSURE - STATIONARY SOURCES 1

	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly Leq, dB	50	45
Maximum level, dB	70	65

1 As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property line noise mitigation measures.

APPENDIX A

NOISE AND ITS EFFECTS ON PEOPLE

Fundamentals of Noise Assessment:

Noise is often defined simply as unwanted sound, and thus is a subjective reaction to characteristics of a physical phenomenon. The descriptors of community noise in current use are the results of many years of effort to translate objective measurements of sound into measures of subjective reaction to noise. Before elaborating on these descriptors, it is useful to discuss some fundamental concepts of sound.

Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and hence are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second, now called Hertz (Hz) by international agreement.

The speed of sound in air is approximately 770 miles per hour, or 1,130 feet/second. Knowing the speed and frequency of a sound, one may calculate its wavelength, the physical distance in air from one compression of the atmosphere to the next. An understanding of wavelength is useful in evaluating the effectiveness of physical noise control devices such as mufflers or barriers, which depend upon either absorbing or blocking sound waves to reduce sound levels.

To measure sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel (dB) scale was devised.
The decibel scale uses the hearing threshold as a point of reference, defined as 0 dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range. Use of the decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in levels (dB) correspond closely to human perception of relative loudness.

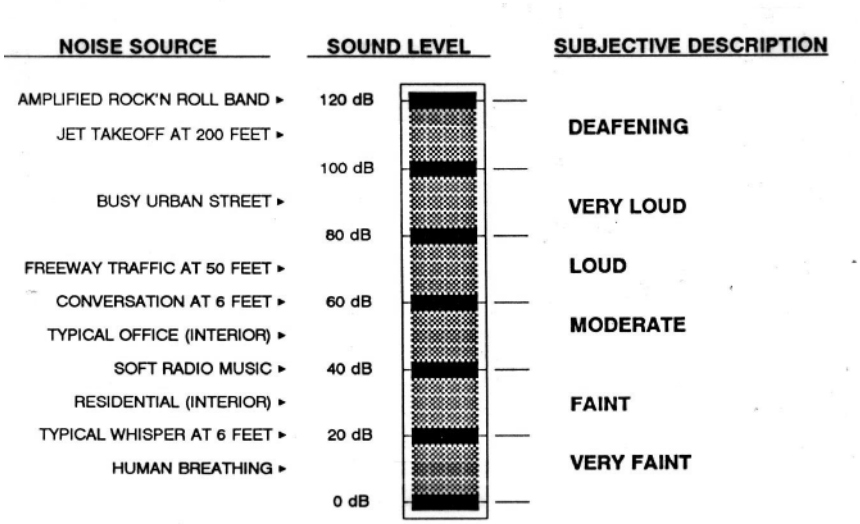
The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. In the range of usual environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighting the frequency response of a sound level measurement device (called a sound level meter) by means of the standardized A-weighting network. There is a strong correlation between A-weighted sound levels and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. Figure A-1 illustrates typical A-weighted sound levels due to recognizable sources.
It is common to describe community noise in terms of the "ambient" noise level, which is defined as the all-encompassing noise level associated with a given noise environment.

A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (Leq), which is the sound level corresponding to a steady-state A-weighted sound level containing the same total energy as a time-varying signal over a given time period (usually one hour). The Leq is the foundation of the composite noise descriptors such as Ldn and CNEL, and shows very good correlation with community response to noise.

Two composite noise descriptors are in common use today: Ldn and CNEL. The Ldn (day-night average level) is based upon the average hourly Leq over a 24-hour day, with a +10 decibel weighting applied to nighttime (10:00 p.m. to 7:00 a.m.) Leq values. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were subjectively twice as loud as daytime exposures. The CNEL (Community Noise Equivalent Level), like Ldn, is also based upon the weighted average hourly Leq over a 24-hour day, except that an additional 4.77 decibel penalty is applied to evening (7:00 p.m. to 10:00 p.m.) hourly Leq values.

The CNEL was developed for the California Airport Noise Regulations, and is applied specifically to airport/aircraft noise assessment. The Ldn scale is a simplification of the CNEL concept, but the two will usually agree, for a given situation, within 1 dB. Like the Leq, these descriptors are also averages and tend to disguise variations in the noise environment. Because Ldn and CNEL presume increased evening or nighttime sensitivity, they are best applied as criteria for land uses where nighttime noise exposures are critical to the acceptability of the noise environment, such as residential developments.

TABLE 21
EXAMPLES OF NOISE LEVELS



Noise in the community has often been cited as being a health problem, not in terms of actual physiological damage, such as hearing impairment, but in terms of inhibiting general well-being and contributing to undue stress and annoyance. The health effects of noise in the community arise from the interference with human activities such as sleep, speech, recreation, and tasks demanding concentration or coordination. When community noise interferes with human activities or contributes to stress, public annoyance with the noise source increases, and the acceptability of the environment for people decreases. This decrease in acceptability and the threat to public well-being is the basis for land use planning policies directed towards the prevention of exposure to excessive community noise levels. There are also economic effects of community noise: reduction in property values, inefficiency in the workplace and lost hours due to stress.

To control noise from existing fixed sources, many jurisdictions have adopted community noise control ordinances. Such ordinances are intended to abate noise nuisances and to control noise from existing sources. They may also be used as planning tools if applied to the potential creation of a nuisance, or to potential encroachment of sensitive uses upon noise-producing facilities. Community noise control ordinances are generally designed to resolve noise problems on a short-term basis (usually by means of hourly noise level criteria), rather than on the basis of 24-hour or annual cumulative noise exposures.

Criteria for Acceptable Noise Exposure:

The Guidelines for the Preparation and Content of the Noise Element of the General Plan, includes recommendations for exterior and interior noise level standards to be used by local jurisdictions to identify and prevent the creation of incompatible land uses due to noise. The State Guidelines contain a land use compatibility table which describes the compatibility of different land uses with a range of environmental noise levels in terms of Ldn or CNEL. An exterior noise environment of 50 to 60 dB Ldn or CNEL is considered to be "normally acceptable" for residential uses according to those guidelines. The recommendations in the State Guidelines also note that, under certain conditions, more restrictive standards may be appropriate. As an example, the standards for quiet suburban and rural communities may be reduced by 5 to 10 dB to reflect lower existing outdoor noise levels.

The U.S. Environmental Protection Agency (EPA) also prepared guidelines for community noise exposure in the publication Information on the Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. These guidelines are based upon assumptions regarding acceptable noise levels which consider occupational noise exposure as well as noise exposure in the home. The guidelines recognize an exterior noise level of 55 dB Ldn as a goal to protect the public from hearing loss, activity interference, sleep disturbance and annoyance. The EPA notes, however, that this level is not a regulatory goal, but is a level defined by a negotiated scientific consensus without concern for economic and technological

feasibility or the needs and desires of any particular community. The EPA and other governmental agencies have adopted suggested land use compatibility guidelines which indicate that residential noise exposures of 55 to 65 dB Ldn are within acceptable limits.

For control of noise nuisances, a community noise control ordinance is the most appropriate tool. The State Office of Noise Control has prepared a Model Community Noise Control Ordinance which contains recommended noise standards in terms of "time-weighted" sound levels. The time-weighting concept allows discrimination of both short- and long-term noise exposures, and sets allowable levels for each. The Model recommends more stringent standards for residential land uses than for commercial and industrial, with the most stringent standards recommended for "rural suburban" situations. The primary exterior noise standard for rural residential uses is 50 dB in the daytime hours (7 a.m. to 10 p.m.), and 40 dB at night. The standard is expressed in terms of the level exceeded for 30 minutes of an hour, equivalent to the median level, or L50. This ordinance format is successfully applied in many California cities and counties. The U.S. Environmental Protection Agency has also prepared a Model Community Noise Control Ordinance using the "Equivalent A-weighted Sound Level" (Leq) as the means of defining allowable noise level limits. The EPA model contains no specific recommendations for local noise level standards, but reports a range of Leq values as adopted by various local jurisdictions. The mean daytime noise standard reported by the EPA is 56.75 dB (Leq); the mean nighttime noise standard is 51.76 dB (Leq). This ordinance format has been successfully applied by the City and County of San Diego and by many other jurisdictions looking for a simplified approach to the enforcement of a local noise control ordinance.

In addition to the A-weighted noise level, other factors should be considered in establishing criteria for noise sensitive land uses. For example, sounds with noticeable tonal content such as whistles, horns, or droning or high-pitched sounds may be more annoying than the A-weighted sound level alone will suggest. Many noise standards apply a penalty, or correction, of 5 dB to such sounds. The effects of unusual tonal content will generally be more of a concern at nighttime, when residents may notice the sound in contrast to previously-experienced background noise.

Because many rural residential areas experience very low noise levels, residents may express concern about the loss of "peace and quiet" due to the introduction of a sound which was not audible previously. In very quiet environments, the introduction of virtually any change in local activities will cause an increase in noise levels. A change in noise level and the relative loss of "peace and quiet" is the inevitable result of land use or activity changes in such areas. Audibility of a new noise source and/or increases in noise levels within recognized acceptable limits are not usually considered to be significant noise impacts, but these concerns should be addressed and considered in the planning and environmental review processes.

Table 22 is commonly used to show expected public reaction to changes in environmental noise levels. This table was developed on the basis of test subjects'

reactions to changes in the levels of steady-state pure tones or broad-band noise, or to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dB, the usual range of voice and interior noise levels. It is probably not directly applicable to public perception of identifiable intrusive noise sources in very quiet environments because of the difference in frequency content between background noise sources and intrusive sounds, as well as the fact that the absolute amount of energy required to make a given change in sound pressure level is much smaller at low noise levels than at higher levels. Table 22 should therefore only be applied in a general manner to show the relationship between changes in sound energy, sound pressure levels and subjective reaction.

The comparisons of subjective reaction outlined in Table 22 are not applicable to noise exposures which are very quiet or very loud. For example, a whisper which is increased by 10 decibels, e.g., from 20 dB to 30 dB, remains a whisper, and would still be described as quiet. In contrast, an increase in the noise level of a diesel locomotive from 90 dB to 100 dB would be a change from a loud noise to a very loud noise. Thus the subjective reaction to a 10 dB change in either case may be different, even though the change in level is the same.

TABLE 22
SUBJECTIVE REACTION TO CHANGES IN NOISE LEVELS OF SIMILAR SOURCES

Increase in Sound Pressure Level, dB	Relative Increase in Acoustical Energy	Subjective Reaction
1	1.26 times	Minimum Detectable Change (Lab)
3	2 times	Usually Noticeable Change
5	3.2 times	Definitely Noticeable Change
10	10 times	Twice as Loud as Before

APPENDIX B

REQUIREMENTS FOR AN ACOUSTICAL ANALYSIS

An acoustical analysis prepared pursuant to the Noise Element shall:

A. Be the financial responsibility of the applicant.

B. Be prepared by a qualified person experienced in the fields of environmental noise assessment and architectural acoustics.

C. Include representative noise level measurements with sufficient sampling periods and locations to adequately describe local conditions and significant noise sources. Where actual field measurements cannot be conducted, all sources of information used for calculation purposes shall be fully described.

D. Estimate existing and projected (20 years) noise levels and compare those levels to the adopted policies of the Noise Element. Projected future noise levels shall take into account noise from planned streets, highways and road connections.

E. Recommend appropriate mitigation to achieve compliance with the adopted policies of the Noise Element, giving preference to proper site planning and design over mitigation measures which require the construction of noise barriers or structural modifications to buildings which contain noise-sensitive land uses.

F. Estimate noise exposure after the prescribed mitigation measures have been implemented.