

# VIII. Noise

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## A. INTRODUCTION

The extent of exposure of the population to noise constitutes a major component of overall quality of life in the community. The Noise Element sets forth the City's goals and policies regarding the control of environmental noise and the protection of citizens from excessive noise exposure.

## B. BACKGROUND

The following information does not attempt to fully describe all principles and data related to noise generation, but rather provides a setting for the goals and policies of this Element.

### **BASIC CONCEPTS OF ENVIRONMENTAL NOISE**

Noise is commonly defined as unwanted sound. Environmental noise is a part of modern society – noise from transportation vehicles, machinery, and amplified sound. People can tolerate a certain amount of noise, but excessive levels become a nuisance and can ultimately result in hearing impairment.

Noise level or intensity is measured in decibels (dB), and ranges from 0 dB at the threshold of hearing to 140 dB, which is the threshold of pain. The sensitivity of human hearing decreases at extremely low and high frequencies and this is taken into account by the “A-weighted” decibel scale, which is sometimes expressed as “dBA.” All references to decibels in this document refer to the A-weighted decibel scale. In evaluating noise increases, it is important to know that a 3 dB change in noise level is just noticeable to the human ear, a 5 dB change is easily noticeable, and a 10 dB increase is perceived as a doubling of loudness.

Since community noise levels vary continuously, a variety of noise metrics (i.e., descriptors) were created to describe the time-varying character of environmental noise. One of the most common metrics is the average (equivalent) sound level, or  $L_{eq}$ . The  $L_{eq}$  is the average A-weighted sound level during a stated time period (often a one-hour period).

To evaluate community noise impacts, a descriptor was developed to account for human sensitivity to noise during the nighttime (sleeping) hours and to account for the overall lower community noise levels encountered at night. This descriptor is called the  $L_{dn}$  (or DNL); the  $L_{dn}$  represents a 24-hour average sound level with a 10 dB penalty added for nighttime noise between the hours of 10:00 p.m. and 7:00 a.m.

For suburban/rural highways and most roadways, the average noise level during the peak traffic periods (i.e., rush hour) is approximately equal to the  $L_{dn}$ . For urban highways, the  $L_{dn}$  is typically one to two dB higher than the peak hour  $L_{eq}$ .

**HOW LOUD IS LOUD?  
Sound Level in Decibels (dBA)**

Jet takeoff (200')	<b>120</b>	Threshold of pain
Rock music band	<b>110</b>	
Jackhammer (25')	<b>100</b>	
Motorcycle accelerating (25')	<b>90</b>	
Power lawn mower (20')	<b>80</b>	
Steady urban traffic (25')	<b>70</b>	
Normal conversation (3')	<b>60</b>	
Daytime street, no nearby traffic	<b>50</b>	
Inside average residence	<b>40</b>	
Inside quiet home	<b>30</b>	
Rustling leaves	<b>20</b>	
Mosquito (3')	<b>10</b>	
	<b>0</b>	Threshold of hearing

Every increase of 10 dB doubles the perceived loudness of noise. For example, a motorcycle accelerating (90 dB) seems twice as loud as a power lawn mower (80 dB).

## **NOISE IN SAN MATEO**

A noise measurement survey was conducted in San Mateo during September 2008 to determine noise levels throughout the community. The results are represented as a contour map in Figure N-1. The noise contours show lines of equal sound level, but the contours are conservative since the shielding effect of buildings and local topography is not taken into account when creating the noise contours. Noise exposure in San Mateo is dominated by traffic and the Southern Pacific (SPRR)/Caltrain rail line. Aircraft activity associated with San Francisco International Airport does not significantly affect noise levels in San Mateo, although some neighborhoods in the northeastern portion of the City are impacted by the airport approach path. Localized noise sources include the San Mateo County Fairgrounds (when events are being held). Generally, noise created by manufacturing uses does not have a major impact on the community, although occasional complaints are received from neighbors immediately adjacent to the manufacturing sites.

The noise contour map is used to determine the suitability of land uses for different types of development, depending upon the extent of noise exposure in the area. The City of San Mateo has developed a list of “noise-sensitive” uses (see Tables N-1 and N-2), which include residential dwellings, schools, hospitals, hotels, and outdoor recreation areas. These uses should ideally be located in areas not exceeding 60 dB ( $L_{dn}$ ) and 65 dB ( $L_{eq}$ ) for outdoor recreational uses, but this is not reasonable in San Mateo where existing noise levels exceed 60 dB ( $L_{dn}$ ) in all but a few of the western portions of the City (see Figure N-1). “Noise-sensitive” land uses could be located in areas having noise levels between 60 and 70 dB ( $L_{dn}$ ) if noise mitigating construction measures are used to reduce interior sound levels to 45 dB ( $L_{dn}$ ) or below as required by the State Building Code for multi-family dwellings, and extended by the City of San Mateo to new single-family dwellings. Exterior sound levels for new multi-family common open space should be reduced to below 67 dB ( $L_{dn}$ ). For parks or playgrounds, the exterior sound level should be reduced to 65 dB ( $L_{eq}$ ) during the noisiest hour; this can be accomplished by locating these spaces away from noise sources or buffering them by the placement of buildings between the noise source and the open space.

The areas of greatest noise impact in San Mateo, where 70 dB ( $L_{dn}$ ) is exceeded and are therefore unsuitable for the location of new “noise-sensitive” uses, are in the residential neighborhoods adjacent to the Bayshore Freeway (US 101) and the SPRR/Caltrain rail corridor (see Figure N-1). Narrow portions adjacent to SR 92 and El Camino Real (SR 82) also exceed the City's guidelines. The projected cumulative noise increases in the year 2030 are shown in Figure N-2, and are very similar to existing conditions, with noise increases generally due to traffic increases.

## **MITIGATING NOISE IMPACTS**

Noise mitigation measures fall into two general categories: physical mitigation and administrative regulation. Physical mitigation involves reducing the noise level, ideally at the source, through methods such as enclosing a noisy piece of equipment with a barrier or by substituting quieter machinery. Reduction in the overall community sound level can also occur

by limiting noise exposure of receivers to roadways and railways. This can be accomplished by installing sound walls, using sound-absorbing building materials, and through careful site planning (e.g., orienting buildings away from the noise source and eliminating narrow corridors open to the noise source). The walls and windows of a building typically reduce noise by approximately 20 dB. Noise barriers, such as sound walls and earthen berms provide varying reductions of noise, depending on their height and size. A solid wall that just breaks the line-of-sight between the noise source and receiver attenuates noise by 5 dB.

If noise cannot be reduced at the source as described above, the distance between the source and the receiver can be increased to attenuate the noise. A doubling of the distance from a fixed noise source (e.g., an air conditioning unit, train engine, or whistle) results in a 6 dB decrease in noise level; a doubling of distance from a linear source (e.g., a highway or roadway) results in a 3 dB decrease. Vegetation does little to reduce noise – a densely planted strip 50 feet wide is needed to reduce noise by 5 dB.

Administrative regulation reduces noise generation by limiting the operating hours or duration of the noise source, regulating locations where a noisy activity may occur, or enforcing State standards that limit noise emissions, such as automobile and boat muffler requirements.

**TABLE N-1  
NOISE SENSITIVE LAND-USE COMPATIBILITY GUIDELINES FOR  
COMMUNITY NOISE ENVIRONMENTS<sup>1</sup>  
Day-Night Average Sound Level (L<sub>dn</sub>), Decibels**

<b>Land-Use Category</b>	<b>Normally Acceptable<sup>2</sup></b>	<b>Conditionally Acceptable<sup>3</sup></b>	<b>Normally Unacceptable<sup>4</sup></b>
Single-Family Residential	50 to 59	60 to 70	Greater than 70
Multi-Family Residential	50 to 59	60 to 70	Greater than 70
Hotels, Motels, and Other Lodging Houses	50 to 59	60 to 70	Greater than 70
Long-Term Care Facilities	50 to 59	60 to 70	Greater than 70
Hospitals	50 to 59	60 to 70	Greater than 70
Schools	50 to 59	60 to 70	Greater than 70
Multi-Family Common Open Space Intended for the Use and Enjoyment of Residents	50 to 67	--	Greater than 67

**TABLE N-2  
NOISE GUIDELINES FOR OUTDOOR ACTIVITIES  
Average Sound Level (L<sub>eq</sub>), Decibels**

<b>Land Use Category</b>	<b>Normally Acceptable<sup>2</sup></b>	<b>Conditionally Acceptable<sup>3</sup></b>	<b>Normally Unacceptable<sup>4</sup></b>
Parks, Playgrounds	50 to 65*	--	Greater than 65*

<sup>1</sup> These guidelines are derived from the California Department of Health Services, Guidelines for the Preparation and Content of the Noise Element of the General Plan, 2003. The State Guidelines have been modified to reflect San Mateo's preference for distinct noise compatibility categories and to better reflect local land-use and noise conditions. It is intended that these guidelines be utilized to evaluate the suitability of land-use changes only and not to determine cumulative noise impacts. Land uses other than those classified as being "noise sensitive" are exempt from these compatibility guidelines.

<sup>2</sup> Normally Acceptable – Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

<sup>3</sup> Conditionally Acceptable – New construction should be undertaken only after a detailed analysis of the noise reduction requirement is conducted and needed noise insulation features included in the design.

<sup>4</sup> Normally Unacceptable – New construction should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

\* Average Sound Level (L<sub>eq</sub>) for peak hour.

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## C. GOALS AND POLICIES

### GOALS AND POLICIES

**GOAL 1:** Protect “noise sensitive” land uses from excessive noise levels.

#### POLICIES:

**N 1.1: Interior Noise Level Standard.** Require submittal of an acoustical analysis and interior noise insulation for all “noise sensitive” land uses listed in Table N-1 that have an exterior noise level of 60 dB ( $L_{dn}$ ) or above, as shown on Figure N-1. The maximum interior noise level shall not exceed 45 dB ( $L_{dn}$ ) in any habitable rooms.

**N 1.2: Exterior Noise Level Standard.** Require an acoustical analysis for new parks, play areas, and multi-family common open space (intended for the use and the enjoyment of residents) that have an exterior noise level of 60 dB ( $L_{dn}$ ) or above, as shown on Figure N-1. Require an acoustical analysis that uses peak hour  $L_{eq}$  for new parks and play areas. Require a feasibility analysis of noise reduction measures for public parks and play areas. Incorporate necessary mitigation measures into residential project design to minimize common open space noise levels. Maximum exterior noise should not exceed 67 dB ( $L_{dn}$ ) for residential uses and should not exceed 65 dB ( $L_{eq}$ ) during the noisiest hour for public park uses.

#### Implementation of N 1.1 and N1.2: Interior and Exterior Noise Level Standards.

As part of the development review process, an acoustical analysis is required for all new project types listed on Tables N-1 and N-2 when the site noise levels exceed the noise level standards established in the General Plan. Mitigation measures to reduce both exterior and interior noise to acceptable levels are required as part of the analysis, and are incorporated into the conditions of project approval.

Lead: Planning Division reviews General Plan and consults with Building Division on scope of analysis. Building Division approves content of final report and administers conditions of project approval. (Ongoing)

Most of San Mateo has existing noise levels that exceed the normally acceptable levels for “noise-sensitive” uses. Since the majority of the City is within the “conditionally acceptable” range of between 60 dB and 70 dB ( $L_{dn}$ ), some form of noise mitigation will have to be incorporated into building and site design for new “noise-sensitive” land uses. While the State currently requires that multi-family dwellings in areas exceeding 60 dB ( $L_{dn}$ ) incorporate mitigation measures to achieve an interior sound level of 45 dB ( $L_{dn}$ ), the City of San Mateo will

extend this requirement to single-family dwellings. In most cases, the necessary sound attenuation can be accomplished with sound-rated double-pane windows.

A few of San Mateo's residential neighborhoods that border highways, El Camino Real (SR 82), and the railway line are subject to sound levels exceeding 70 dB ( $L_{dn}$ ), which is in the “normally unacceptable” range for “noise-sensitive” uses. Rather than precluding new residential development in these areas, the City will require that building construction techniques be utilized that reduce interior sound to 45 dB ( $L_{dn}$ ) or less.

Also of concern are outdoor recreation areas in new parks and schools. The City will require a feasibility study to determine whether measures to reduce exterior sound levels, such as sound walls, sheltering open space areas from noise sources by building walls, and placement of active use areas away from noise sources are feasible. Particular attention should be paid to the design of sound barriers so they are visually pleasing; this can often be accomplished through extensive landscape screening.

**GOAL 2:** Minimize unnecessary, annoying, or unhealthful noise.

**POLICIES:**

**N 2.1: Noise Ordinance.** Continue implementation and enforcement of the City's existing noise control ordinance: a) which prohibits noise that is annoying or injurious to neighbors of normal sensitivity, making such activity a public nuisance, and b) restricts the hours of construction to minimize noise impact.

**Implementation of N 2.1: Noise Ordinance.**

Noise nuisances, as defined in the City's Municipal Code, are abated through a standardized enforcement process, which includes referral to the Housing and Advisory Appeals Board. This includes noise generated by building construction and equipment at unauthorized times.

Lead: Code Enforcement Division. (Ongoing)

Enforcement of a noise control ordinance can reduce nuisance noise generated by commercial uses or from residential sources such as amplified music, parties, leaf blowers, or barking dogs. Construction activities also generate substantial short-term noise impacts, which can be limited to specified hours and days of the week.

**N 2.2: Minimize Noise Impact.** Protect all “noise-sensitive” land uses listed in Tables N-1 and N-2 from adverse impacts caused by the noise generated on-site by new developments. Incorporate necessary mitigation measures into development design to minimize noise impacts. Prohibit long-term exposure increases of 3 dB ( $L_{dn}$ ) or greater at the common property line, or new uses which generate noise levels of 60 dB ( $L_{dn}$ ) or greater at the property line, excluding existing ambient noise levels.

“Noise-sensitive” land uses, such as residential neighborhoods, hotels, hospitals, schools, and outdoor recreation areas must be protected from new development that causes discernable increases in noise levels as a result of on-site activities. Noise generators such as machinery or parking lots must be mitigated through physical measures or operational limits.

**N 2.3: Minimize Commercial Noise.** Protect land uses other than those listed as “noise sensitive” in Table N-1 from adverse impacts caused by the on-site noise generated by new developments. Incorporate necessary mitigation measures into development design to minimize noise impacts. Prohibit new uses that generate noise levels of 65 dB ( $L_{dn}$ ) or above at the property line, excluding existing ambient noise levels.

Commercial and industrial areas typically tolerate higher noise levels than residential neighborhoods. However, some control is necessary for new development within non-residential areas so that exceptionally noisy uses are restricted.

**Implementation of N 2.2 and N 2.3: Minimize Noise.**

Where the potential exists for noise impacts inconsistent with these policies, a noise report identifying noise impacts and mitigation measures is required as part of the development review process. Mitigation measures are then incorporated as conditions of the project approval.

Lead: Planning Division reviews the General Plan and consults with the Building Division on the scope of the analysis. The Building Division approves the content of the final report and administers the conditions of project approval. (Ongoing)

**N 2.4: Traffic Noise.** Recognize projected increases in ambient noise levels resulting from traffic increases, as shown on Figure N-2. Promote the installation of noise barriers along highways where “noise-sensitive” land uses listed in Table N-1 are adversely impacted by unacceptable noise levels [60 dB ( $L_{dn}$ ) or above]. Require adequate noise mitigation to be incorporated into the widening of SR 92 and US 101. Accept noise increases on El Camino Real at existing development, and require new multi-family development to provide common open space having a maximum exterior noise level of 67 dB ( $L_{dn}$ ).

**Implementation N 2.4: Traffic Noise.**

Sound walls have been constructed along US 101. Preliminary design work has not yet started on the widening of SR 92; however, the issue of sound walls will be addressed during both the design and environmental review phases of the project. Noise standards for development along El Camino Real are imposed on a case-by-case basis consistent with this policy's guidelines. New multi-family developments are required to comply with exterior noise standards as part of the development review process for consistency with the State Building Code.

Lead: The Public Works Department coordinates sound wall construction with Caltrans. Planning and Building Divisions coordinate the review and application of conditions of approval for new development regarding compliance with this policy. (Ongoing)

The City recognizes that traffic will increase during the next 20 years, and that mitigating traffic noise is very difficult, except in certain instances. The installation of sound walls along highways is supported as an effective means of reducing this major impact. Sound walls are not appropriate, however, in residential neighborhoods or along major streets due to their visual impact and the need for street access points, which diminishes the effectiveness of the barriers.

**N 2.5: Railroad Noise.** Promote the installation of noise barriers along the railroad corridor where “noise-sensitive” land uses are adversely impacted by unacceptable noise levels [60 dB ( $L_{dn}$ ) or greater]. Promote adequate noise mitigation to be incorporated into any rail service expansion or track realignment. Study the need of depressing the rail line to eliminate at-grade crossings or other mitigation measures to decrease noise levels prior to substantial expansion of the rail service.

**Implementation N 2.5: Railroad Noise.**

The Joint Powers Authority has completed a study of electrification of the rail lines, and has adopted a policy for its implementation. Electrification of the rail line, in conjunction with the elimination of at-grade crossings, would greatly reduce railroad noise impacts. Installation of noise barriers is analyzed on a project-by-project basis for development adjacent to the railroad. Noise impacts were also considered in the examination of alignment alternatives in the railroad corridor study.

Lead: The Public Works Department coordinates with the Joint Powers Authority on railroad alignment. The Planning and Building Divisions coordinate the review and application of conditions of approval for new development adjacent to the rail corridor regarding noise impacts. (Ongoing)

Another noise source that can be mitigated is the railroad corridor. The City supports the installation of sound walls along the rail line. If substantial increases in rail service occur as projected in the Circulation Element, the need for both noise mitigation and grade separation of the rail line and streets will increase. To achieve both objectives, the City and the Joint Powers Authority should consider depressing the rail line, particularly in the Downtown.