
9. NOISE

This EIR chapter describes the existing noise environment in the project area, anticipated changes in that noise environment as a result of the project-facilitated development, and related significant adverse noise impacts and mitigation needs. The technical analyses for this EIR chapter were conducted by the EIR acoustical consultants, Illingworth & Rodkin, Inc.

9.1 SETTING

9.1.1 Fundamentals of Acoustics

(a) Definitions of Noise. Noise is defined as unwanted sound. The effects of noise can range from interference with sleep, concentration, and communication, to physiological stress, and at higher noise levels, hearing loss.

Sound levels are usually measured and expressed in decibels (dB), with 0 dB corresponding roughly to the threshold of hearing. The term "decibels" and other related technical terms are defined in Table 9.1.

(b) Human Sensitivity to Noise. The method commonly used to quantify environmental noise involves measurement of all frequencies of sound, with an adjustment to reflect the fact that human hearing is less sensitive to low and high frequencies than to midrange frequencies. This measurement adjustment is called "A" weighting. A noise level so measured is called an A-weighted sound level (dBA).¹ Examples of typical A-weighted noise levels in the environment and industry are provided in Table 9.2.

Environmental noise fluctuates in intensity over time. Therefore, time-averaged noise level computations are typically used to quantify noise levels and determine impacts. The two average noise level descriptors most commonly used are L_{dn} and CNEL. L_{dn} , the day/night average noise level, is the 24-hour average, with a 10 dBA penalty added for nighttime noise (10:00 PM to 7:00 AM) to account for the greater human sensitivity to noise during this period. CNEL, the community equivalent noise level, is similar to L_{dn} , but adds a five dBA penalty to evening noise (7:00 PM to 10:00 PM).

¹In practice, the level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve.

Table 9.1
DEFINITIONS OF ACOUSTICAL TERMS

<u>Term</u>	<u>Definitions</u>
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
L_{01} , L_{10} , L_{50} , L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 PM to 10:00 PM and after addition of 10 decibels to sound levels in the night between 10:00 PM and 7:00 AM.
Day/Night Noise Level, L_{dn}	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 PM and 7:00 AM.
L_{max} , L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Single-Event Noise Exposure Level (SEL)	The sound exposure level of a single noise event (such as an aircraft flyover or a train passby) measured over the time interval between the initial and final times for which the sound level of the single event exceeds the background noise level.

SOURCE: Illingworth & Rodkin, Inc.

Table 9.2
TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT AND INDUSTRY

<u>At a Given Distance from Noise Source</u>	<u>A-Weighted Sound Level in Decibels</u>	<u>Noise Environments</u>	<u>Subjective Impression</u>
	140		
Civil Defense Siren (100')	130		
Jet Takeoff (200')	120		Pain Threshold
	110	Rock Music Concert	
Pile Driver (50')	100		Very Loud
Ambulance Siren (100')			
	90	Boiler Room	
Freight Cars (50')		Printing Press Plant	
Pneumatic Drill (50')	80	In Kitchen With Garbage Disposal Running	
Freeway (100')			
	70		Moderately Loud
Vacuum Cleaner (10')	60	Data Processing Center	
		Department Store	
Light Traffic (100')	50	Private Business Office	
Large Transformer (200')			
	40		Quiet
Soft Whisper (5')	30	Quiet Bedroom	
	20	Recording Studio	
	10		Threshold of Hearing
	0		

SOURCE: Illingworth & Rodkin, Inc.

One way of anticipating a person's subjective reaction to a new noise is to compare the new noise with the existing noise environment to which the person has become adapted, i.e., the so-called "ambient" noise level. With regard to increases in A-weighted noise levels, knowledge of the following relationships will be helpful in understanding this EIR chapter:

- Except in carefully controlled laboratory experiments, a change of one dBA cannot be perceived.
- Outside of the laboratory, a three dBA change is considered a just-perceivable difference.
- A change in noise level of at least five dBA is required before any noticeable change in community response would be expected.
- A 10 dBA increase is subjectively heard as approximately a doubling in loudness, and would almost certainly cause an adverse change in community response.

(b) Structural Attenuation. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed.

(c) Typical Noise Levels. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, those facing major roadways and freeways typically need special glass windows.

9.1.2 Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noise of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA L_{dn} . Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} , and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses.

Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed.

Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, those facing major roadways and freeways typically need special glass windows.

9.1.3 Existing Noise Environment

The existing noise environment in the project area primarily consists of transportation noise sources, including vehicular traffic along El Camino Real, Mathilda Avenue, other local arterial and collector roadways traversing the area, trains along the CalTrain line near Evelyn Avenue, and noise generated by aircraft associated with Moffett Federal Airfield (MFA). Several monitoring surveys of the existing central area noise environment have been completed in the project area by Illingworth & Rodkin, Inc., including surveys conducted during the preparation of the update to the City of Sunnyvale General Plan Noise Sub-Element, the Sunnyvale Town Center Mall Modifications Project EIR, and the Sunnyvale Redevelopment Plan Amendment EIR. Based on the results of these noise monitoring surveys for previous projects in the area, the predominant noise sources affecting the project area are CalTrain, Mathilda Avenue, and El Camino Real. These sources generate L_{dn} noise levels ranging from about 70 to 74 dBA at a distance of 50 feet. Other local arterial and collector roadways traversing the project area generate noise levels ranging from approximately 60 to 70 dBA L_{dn} at a distance of 50 feet from the roadway. Noise levels throughout the project area would be expected to range from about 55 dBA L_{dn} in the quietest residential areas, to 70 to 74 dBA L_{dn} in areas adjoining CalTrain, Mathilda Avenue, and El Camino Real. Section 9.3 (Impacts and Mitigation Measures) of this chapter discusses projected future noise levels and includes an illustration of projected noise contours in the project area (Figure 9.1).

9.2 PERTINENT PLANS AND POLICIES

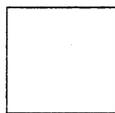
9.2.1 City of Sunnyvale General Plan

The *Environmental Management Element, Noise Sub-Element* (adopted 1997) of the City of Sunnyvale General Plan addresses issues of land use compatibility, transportation noise, and community noise, and establishes policies and standards for evaluating the compatibility of proposed land uses with the on-site noise environment. The "Noise Guidelines for Land Use Planning" (Table 2 in the *Noise Sub-Element*, included herein as Table 9.3) state that commercial land uses (e.g., offices, commercial businesses) are "normally acceptable" in a noise environment with an L_{dn} of 70 dBA, and that residential land uses are "normally acceptable" in a noise environment with an L_{dn} of 60 dBA.

The *Noise Sub-Element* also includes the following goals, policies, and action statements pertinent to consideration of the noise impacts of the proposed project:

Table 9.3
 STATE OF CALIFORNIA AND CITY OF SUNNYVALE NOISE GUIDELINES FOR LAND USE
 PLANNING

Land Use Category	Exterior Noise Exposure L _{dn} or CNEL, dB					
	55	60	65	70	75	80
Residential, Hotels, and Motels						
Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds						
Schools, Libraries, Museums, Hospitals, Personal Care, Meeting Halls, Churches						
Office Buildings, Business Commercial, and Professional						
Auditoriums, Concert Halls, Amphitheaters						
Industrial, Manufacturing, Utilities and Agriculture						



NORMALLY ACCEPTABLE
 Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special insulation requirements.



CONDITIONALLY ACCEPTABLE
 Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.



UNACCEPTABLE
 New construction or development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

SOURCE: City of Sunnyvale General Plan, *Environmental Management Element, Noise Sub-Element*, Table 2, adopted 1997.

- *Maintain or achieve a compatible noise environment for all land uses in the community. (Goal 3.6A, p. 55)*
- *Prevent significant noise impacts from new development by applying state noise guidelines and Sunnyvale Municipal Code noise regulations in the evaluation of land use issues and proposals. (Policy 3.6A.1, p. 55)*
- *Apply the Sunnyvale Municipal Code noise regulations in the evaluation of land uses and proposals. Acoustical analysis may be required to determine if mitigation measures shall be required for the new development. If required, mitigation measures shall be incorporated into the new development that bring the proposed development into conformance with the noise regulations in the Sunnyvale Municipal Code. (Action Statement 3.6A.1a, p. 55)*
- *Comply with the "Noise and Land Use Compatibility Guidelines" for the compatibility of land uses with their noise environments.... (Action Statement 3.6A.1c, p. 55)*
- *Use Table 3.6A.1d to determine if proposed development results in a "significant noise impact" on the existing development. (Action Statement 3.6A.1d, p. 56)*

(NOTE: Table 3.6A.1d is included as Table 9.4 in this EIR section. As indicated in Table 9.4, significant noise impacts are determined by measuring the increase in the L_{dn} of existing development that would result from new development. A noise impact is defined as "significant" if: (1) "normally acceptable" L_{dn} noise levels would increase by more than 5 dBA, but remain within "normally acceptable" levels; (2) "normally acceptable" L_{dn} noise levels would increase by more than 3 dBA and exceed "normally acceptable" levels; or (3) a L_{dn} that exceeds "normally acceptable" noise levels would increase by more than 3 dBA.

- *Use the CEQA and the discretionary permit processes to protect existing land uses from significant noise impacts due to new development. Acoustical analysis required as part of the CEQA or discretionary permit process, master plans, and/or design review shall determine if significant noise impacts occur from proposed development on existing land uses. If significant noise impacts occur, then mitigation measures shall be required to minimize the impact of the new development on existing land uses. (Action Statement 3.6A.1e, p. 56)*
- *Enforce and supplement state laws regarding interior noise levels of residential units. (Policy 3.6A.2, p. 57)*
- *Enforce Title 24 Noise Insulation Requirements for all new hotels, motels, apartments, condominiums, group care homes, and all other dwellings, except single-family detached homes. (Action Statement 3.6A.2a, p. 57)*

Table 9.4
THRESHOLDS FOR SIGNIFICANT NOISE IMPACTS

<u>L_{dn} of Existing Development</u> ¹	<u>Significant Noise Impact (Increase in L_{dn} of Existing Development from New Development)</u>
"Normally Acceptable" ²	More than 5 dBA, but noise levels still in the "Normally Acceptable" category
"Normally Acceptable"	More than 3 dBA and the noise level exceeds the "Normally Acceptable" category
Exceeds "Normally Acceptable"	More than 3 dBA

SOURCE: City of Sunnyvale General Plan, Environmental Management Element, Noise Sub-Element, Table 3.6A.1d, adopted 1997.

¹ The L_{dn} shall be measured at any point along the property line shared by the proposed development and existing land uses.

² "Normally Acceptable" as defined by the State of California "Noise and Land Use Compatibility Guidelines," summarized in the *Noise Sub-Element* of the City of Sunnyvale General Plan.

- *Apply Title 24 Noise Insulation Requirements to all new single-family detached homes. (Action Statement 3.6A.2b, p. 57)*
- *Attempt to achieve a maximum instantaneous noise level of 50 dBA in bedrooms and 55 dBA in other areas of residential units exposed to train or aircraft noise, where the exterior L_{dn} exceeds 55 dB. (Action Statement 3.6A.2c, p. 57)*
- *Preserve and enhance the quality of neighborhoods by maintaining or reducing the levels of noise generated by transportation facilities. (Goal 3.6B, p. 58)*
- *Refrain from increasing or reduce the noise impacts of major roadways. (Policy 3.6B.1, p. 58)*
- *Maintain or achieve acceptable limits for the levels of noise generated by land use operations and single events. (Goal 3.6C, p. 62)*
- *Regulate land use operation noise. (Policy 3.6C.1, p. 62)*
- *Apply conditions to discretionary land use permits which limit hours of operation, hours of delivery, and other factors which affect noise. (Action Statement 3.6C.1b, p. 62)*

9.2.2 City of Sunnyvale Noise Ordinance

Chapter 19.24 (Operating Standards) of the Sunnyvale Municipal Code contains the City's Noise Standards. Code section 19.24.020(b) specifically regulates operational noise. The ordinance states:

Operational noise shall not exceed 75 dBA at any point on the property line of the premises upon which the noise or sound is generated or produced; provided, however, that the noise or sound level shall not exceed 50 dBA during the nighttime (10:00 PM to 7:00 AM) or 60 dBA during the daytime at any point on adjacent residentially zoned property.

The Sunnyvale Municipal Code also regulates deliveries to commercial and industrial establishments that are adjacent to residentially zoned property to daytime hours (7:00 AM to 10:00 PM, daily).

In addition, hours of construction are regulated in the Sunnyvale Municipal Code, section 16.08.150. The section states that (1) construction activity shall be permitted between the hours of 7:00 AM and 6:00 PM daily Monday through Friday; (2) Saturday hours of operation shall be between 8:00 AM and 5:00 PM; and (3) there shall be no construction activity on Sundays or national holidays.

No loud environmentally disruptive noises, such as air compressors without mufflers, continuously running motors or generators, loud playing musical instruments, radios, etc., will be allowed where such noises may be a nuisance to adjacent residential neighborhoods.

9.2.3 State of California Building Code and Guidelines

New multi-family housing in California is subject to the environmental noise limits set forth in Title 24, Part 2, of the State Building Code. The noise limit is a maximum interior noise level of 45 L_{dn} . Where exterior noise levels exceed 60 L_{dn} , a report must be submitted with the building plans describing the noise control measures which have been incorporated into the design to meet the interior noise limit.

The State of California also provides noise guidelines for land use planning (see Table 9.3). The City of Sunnyvale has adopted these guidelines as part of the City of Sunnyvale General Plan Environmental Management Element, Noise Sub-Element (see Action Statement 3.6A.1c in section 9.2 herein).

9.3 IMPACTS AND MITIGATION MEASURES

9.3.1 Significance Criteria

The California Environmental Quality Act (CEQA) contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Based on the *CEQA Guidelines*, the proposed project would be considered in this EIR to have a *significant impact* on the noise environment if it would result in:

- (a) exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;¹
- (b) a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;²
- (c) a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;³ or
- (d) for a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people

¹CEQA Guidelines, Appendix G, item XI(a).

²CEQA Guidelines, Appendix G, item XI(c).

³CEQA Guidelines, Appendix G, item XI(d).

residing or working in the project area to excessive noise levels.¹ (The project area is not located within two miles of Moffett Federal Airfield or any other public airport or public use airport.)

A significant impact would be identified if land uses proposed by the project would be exposed to noise levels exceeding the City's established guidelines for noise and land use compatibility. A significant impact would be identified if land uses are exposed to perceptible construction-related vibration levels for an extended period of time or during sensitive evening and nighttime hours. A significant noise impact would also result if noise levels increase substantially at existing noise sensitive land uses (e.g., residences). City of Sunnyvale significance criteria are shown in Table 9.4.

Construction noise levels would be treated differently because they are temporary and intermittent. Significant noise impacts would result from construction if noise levels are sufficiently high to interfere with speech, sleep, or normal residential activities. Construction-related hourly average noise levels received at noise-sensitive land uses above 60 dBA during the daytime and 55 dBA at night, or the ambient in higher noise environments, would be considered significant. To cause a significant impact, construction activities affecting a receptor must persist for more than one construction season.

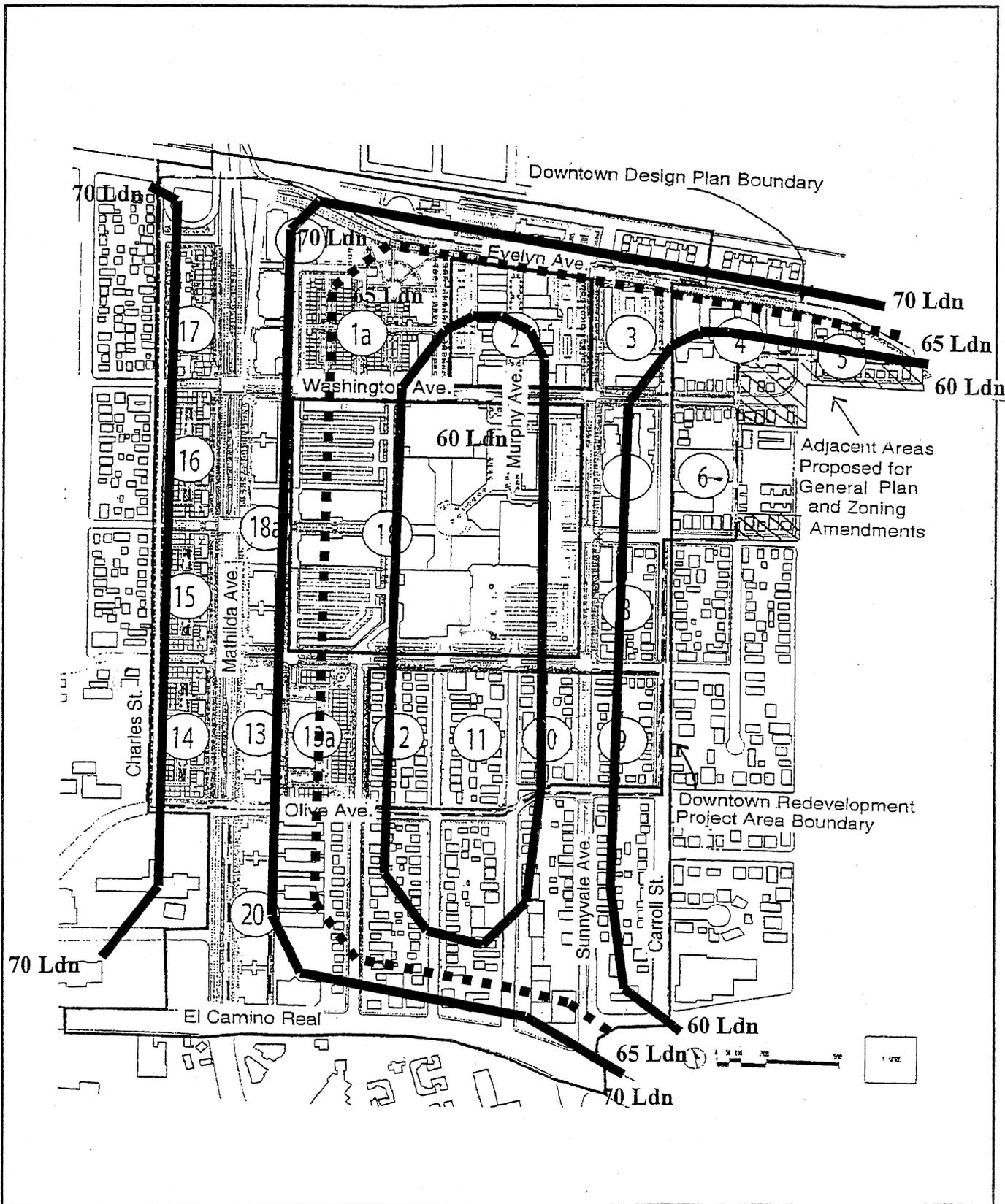
9.3.2 Impacts and Mitigation Measures

Impact 9-1: Potential Exposure of New, Project-Facilitated Office, Retail, Public Facility, Residential, and Open Space Development to Excessive Environmental Noise. Project-facilitated office, retail, public facility, residential, and open space development could be exposed to noise levels exceeding State- and City-adopted noise/land use compatibility standards. These levels of possible noise exposure represent a **potentially significant impact** (see criterion (a) in subsection 9.2.1, "Significance Criteria," above).

The 2002 *Downtown Design Plan* proposes a combination of office, retail, public facility, and residential intensification within the project area, including associated open space areas such as Evelyn Plaza and open space areas within multi-family residential complexes. The compatibility of these permitted land uses with the existing and projected project area noise environment has been evaluated based on the guidelines identified in Table 9.3.

Figure 9.1 shows the *Downtown Design Plan* diagram with projected future (2010) L_{dn} noise contours, from the *Noise Sub-Element* of the Sunnyvale General Plan, refined based on the project-area-specific noise measurement data described in the "Setting" section above. Office and retail development is normally compatible with noise levels up to 70 L_{dn} . With the exception of street frontages along El Camino Real and Mathilda Avenue, noise exposure

¹CEQA Guidelines, Appendix G, item XI(e).



SOURCE: Sunnyvale General Plan Noise Sub-Element and Illingworth & Rodkin, Inc.

Figure 9.1

SUNNYVALE DOWNTOWN AREA 2010 NOISE CONTOURS

within the project area would be less than $70 L_{dn}$, as shown on Figure 9.1. New office, retail, and public facility development adjacent to these two roadways would be exposed to noise levels exceeding $70 L_{dn}$, a level representing a *potentially significant impact*. Additional residential development is proposed in subdistricts 1a, 4, 5, 6, 8, 9, 10, 11, 12, 13a, 14, 15, and 16; public facility development (e.g., child care, personal care, etc.) is proposed at the northwest corner of El Camino Real and Mathilda Avenue. Projected noise levels exceed $60 L_{dn}$ throughout most of these development areas. Exposure of the proposed residential and public facility development to such noise levels would represent a *potentially significant impact*. Of particular concern is residential development proposed along Mathilda Avenue in subdistricts 14, 15, and 16, and public facility development at El Camino Real/Mathilda Avenue, where projected noise exposure along the street frontages exceeds $70 L_{dn}$.

Mitigation 9-1: To mitigate potential traffic noise impacts on project-facilitated office and retail development adjacent to El Camino Real and Mathilda Avenue, noise attenuation features shall be incorporated into the design of new office and retail space along these streets. Normally, standard construction with adequate mechanical ventilation or air conditioning would provide a suitable interior environment. Certain noise-sensitive office spaces, such as conference rooms, may require sound-rated windows.

To adequately mitigate potential traffic noise impacts on future new residential, public facility, and open space development, noise attenuation features shall be incorporated into the new construction to reduce interior noise to $45 L_{dn}$ or less and exterior noise to $60 L_{dn}$ or less. Multi-family residential development proposed where the L_{dn} exceeds $60 L_{dn}$ would be regulated by the California Administrative Code (Title 24, Part 2). The design for such projects must incorporate the necessary noise control treatments to reduce interior noise to $45 L_{dn}$ or less in interior habitable spaces. Where the L_{dn} is $65 L_{dn}$ or less, standard construction is normally sufficient. Where the noise level is $65 L_{dn}$ to $75 L_{dn}$, additional controls, such as sound rated windows, doors, and wall constructions, may be necessary. A report shall be submitted with the building plans for all residential projects proposed for project area frontage locations along El Camino Real or Mathilda Avenue describing to City satisfaction the noise control measures that have been incorporated into the design to meet the $45 L_{dn}$ interior noise limit.

For Evelyn Plaza and open space areas within new multi-family residential complexes, the placement/location of structures, natural berms, and "quiet areas," as indicated on plans to City satisfaction, would minimize exterior noise.

Implementation of these measures would reduce this impact to a ***less-than-significant level***.

Project-Facilitated Traffic Noise Impacts. Added traffic generated by the anticipated, project-facilitated, total growth increment in the project area would increase traffic volumes on the local roadway network, resulting in slight increases in noise levels. Based on a review of the traffic data provided by CCS Planning & Engineering (the EIR traffic engineers), noise levels on roadways in the vicinity of the project area, including any increases resulting from sound waves deflected by structures, are projected to increase by less than one dBA as a result of the project-facilitated additional development. This increase would represent is a ***less-than-significant impact***.

Mitigation. No project-facilitated significant noise impact has been identified; no mitigation is required.

Impact 9-2: Project-Facilitated Construction Noise. Additional downtown construction activities facilitated by the project could include site grading and preparation, building demolition, building modification and rehabilitation, construction of new buildings, and installation of utilities. The noise effects of these future construction activities would depend upon the amount of activity, the type of construction equipment used, the noise control measures utilized, and the proximity to noise-sensitive activities. Residential and other noise-sensitive uses located adjacent to project-facilitated construction activities could be exposed to noise levels that would interfere with normal activities. This would constitute a ***potentially significant impact*** (see criterion (c) in subsection 9.3.1, "Significance Criteria," above).

Construction activities generate considerable amounts of noise, especially during the demolition phase and the construction of project infrastructure when heavy equipment is used. The effects of noise resulting from construction depend on the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive receptors. Construction noise would occur in phases, including demolition of existing structures, grading and excavation, construction of foundations (including pile driving), erection of the new structures, and finishing. Tables 9.5 and 9.6 show typical noise levels generated by construction equipment at a distance of 50 feet from the source and at a distance of 50 feet from the construction activity center, respectively. As shown in Table 9.5, the highest maximum noise levels generated by construction would typically range from about 90 to 105 dBA at a distance of 50 feet from the noise source. These noise levels primarily result from pile drivers, jack hammers, and other impulsive pieces of equipment. As shown in Table 9.6, typical hourly average construction generated noise levels are about 81 dBA to 89 dBA measured at a distance of 50 feet from the center of the site during busy construction periods. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of distance between the source and receptor. Shielding by buildings or terrain result in much lower construction noise levels at distant receptors.

Table 9.5
TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVEL RANGES

	A-weighted Noise Level (dB) At 50 Feet					
	60	70	80	90	100	110
Earth Moving:						
Compacters (Rollers)			70	85		
Front Loaders		70	90	105		
Backhoes		70	90	100		
Bulldozers		75	90	100		
Scrapers, Graders		75	90	100		
Pavers			80	90		
Trucks		70	90	100		
Materials Handling:						
Concrete Mixers		70	85	95		
Concrete Pumps		75	85			
Cranes (Movable)		75	90	100		
Cranes (Derricks)				85		
Stationary:						
Pumps		70	80			
Generators		70	85			
Compressors		70	85	95		
Impact Equipment:						
Pneumatic Wrenches			80	85		
Jackhammers and Rock Drills		75	90	100		
Pile Drivers (Peak)				90	105	
Other:						
Vibrator		70	80			
Saws		70	90	100		

Source: Handbook of Noise Control, Cyril M. Harris, 1979.

Table 9.6
 TYPICAL RANGES OF ENERGY-EQUIVALENT NOISE LEVELS AT 50 FEET, L_{eq} IN dBA, AT
 CONSTRUCTION SITES

	<u>Domestic Housing</u>		<u>Office Building, Hotel, Hospital, School, Public Works</u>		<u>Industrial, Parking Garage, Religious, Amusement and Recreation, Store, Service Station</u>		<u>Public Works, Roads and Highways, Sewers and Trenches</u>	
	<u>I</u>	<u>II</u>	<u>I</u>	<u>II</u>	<u>I</u>	<u>II</u>	<u>I</u>	<u>II</u>
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

SOURCE: U.S. EPA, Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

I - All pertinent equipment present at site.

II - Minimum required equipment present at site.

Construction noise impacts primarily result when construction occurs during noise-sensitive times of the day (early morning, evening, or nighttime hours), or in areas immediately adjoining noise-sensitive land uses, or when construction lasts for extended periods of time. Limiting construction to daytime hours is often a simple method to reduce the potential for noise impacts. In areas immediately adjacent to construction, controls such as constructing temporary noise barriers and utilizing "quiet" construction equipment can also reduce the potential for noise impacts. Typically, noise generated by construction is temporary and intermittent (generally less than one construction season in duration).

Mitigation 9-2: To reduce the noise impacts from project-related construction activities, the following measures shall be implemented at all construction sites within the project area:

- (1) *Construction Scheduling.* Limit noise-generating construction activity to between the hours of 7:00 AM to 6:00 PM, Monday through Friday, and 8:00 AM to 5:00 PM on Saturdays. No construction activities shall occur on Sundays or national holidays (Sunnyvale Municipal Code Section 16.08.150).
- (2) *Construction Equipment Mufflers and Maintenance.* Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- (3) *Equipment Locations.* Locate stationary noise-generating equipment as far as possible from sensitive receptors when sensitive receptors adjoin or are near a construction project area.
- (4) *Construction Traffic.* Route all construction traffic to and from the site via designated truck routes where possible. Prohibit construction-related heavy truck traffic in residential areas where feasible.
- (5) *Quiet Equipment Selection.* Use quiet construction equipment, particularly air compressors, wherever possible
- (6) *Pile Drivers.* Where pile drivers are to be used, use multiple-pile drivers to expedite this phase of project construction.

(continued)

Mitigation 9-2 (continued):

- (7) *Noise Disturbance Coordinator.* For larger construction projects, the City may choose to require project designation of a "Noise Disturbance Coordinator" who would be responsible for responding to any local complaints about construction noise. The Disturbance Coordinator would determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and institute reasonable measures to correct the problem. Conspicuously post a telephone number for the Disturbance Coordinator at the construction site and include it in the notice sent to neighbors regarding the construction schedule. (The City should be responsible for designating a Noise Disturbance Coordinator and the individual project sponsor should be responsible for posting the phone number and providing construction schedule notices.)

Implementation of these measures would reduce this impact to a ***less-than-significant level.***