D. NOISE

This section describes existing noise conditions in the vicinity of the Project site, describes criteria for determining the significance of noise impacts, and evaluates noise impacts associated with the proposed Project.

1. Setting

The setting section begins with an introduction to several key concepts and terms that are used in evaluating noise. It then discusses the various agencies that regulate the noise environment in the City of Oakland and summarizes key noise standards that are applied to projects in the City. This setting section concludes with a description of current noise sources that affect the Project site and the noise conditions that are experienced in the Project site vicinity.

a. Characteristics of Sound. Noise is generally defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: *pitch* and *loudness*. Pitch is the number of complete vibrations or cycles per second of a wave that results in the range of tone from high to low. Loudness is the strength of a sound that describes a noisy or quiet environment, and it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity refers to how hard the sound wave strikes an object, which in turn produces the sound's effect. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effects on adjacent sensitive land uses.

(1) Measurement of Sound. Sound intensity is measured through the A-weighted scale to correct for the relative frequency response of the human ear. An A-weighted noise level de-emphasizes low and very high frequencies of sound similar to the human ear's de-emphasis of these frequencies. Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve. Table IV.D-1 contains a list of typical acoustical terms and definitions. Table IV.D-2 shows representative outdoor and indoor A-weighted sound levels.

A decibel (dB) is a unit of measurement which indicates the relative intensity of a sound. The 0 point on the dB scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Changes of 3 dB or less are only perceptible in laboratory environments. Audible increases in noise levels generally refer to a change of 3 dB or more, as this level has been found to be barely perceptible to the human ear in outdoor environments. Sound levels in dB are calculated on a logarithmic basis. An increase of 10 dB represents a 10-fold increase in acoustic energy, while 20 dB is 100 times more intense, and 30 dB is 1,000 times more intense. Each 10 dB increase in sound level is perceived as approximately a doubling of loudness.

As noise spreads from a source, it loses energy so that the farther away the noise receiver is from the noise source, the lower the perceived noise level. Geometric spreading causes the sound

Table IV.D-1: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit that denotes the ratio between two quantities proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. 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, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels equaled or exceeded by a fluctuating sound level for 1 percent, 10 percent, 50 percent, and 90 percent of a stated time period.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of five decibels to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 decibels to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	Describing the noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence, and tonal or informational content as well as the prevailing ambient noise level.

Source: Harris, Cyril M. 1998. *Handbook of Acoustical Measurements and Noise Control*.

Table IV.D-2: Typical A-Weighted Sound Levels

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments
Near Jet Engine	140	Deafening
Civil Defense Siren	130	Threshold of pain
Hard Rock Band	120	Threshold of feeling
Accelerating Motorcycle at a Few Feet Away	110	Very loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very loud
Ambulance Siren; Food Blender	95	Very loud
Garbage Disposal	90	Very loud
Freight Cars; Living Room Music	85	Loud
Pneumatic Drill; Vacuum Cleaner	80	Loud
Busy Restaurant	75	Moderately loud
Near Freeway Auto Traffic	70	Moderately loud
Average Office	60	Moderate
Suburban Street	55	Moderate
Light Traffic; Soft Radio Music in Apartment	50	Quiet
Large Transformer	45	Quiet
Average Residence Without Stereo Playing	40	Faint
Soft Whisper	30	Faint
Rustling Leaves	20	Very faint
Human Breathing	10	Very faint

Source: Compiled by LSA Associates, Inc., 2004.

level to attenuate or be reduced, resulting in a 6 dB reduction in the noise level for each doubling of distance from a single point source of noise to the noise sensitive receptor of concern. For instance, a single point noise source, such as a lawn mower, that generates a noise level of 60 dBA when measured at 50 feet from the equipment, would result in a noise level of only 54 dBA at 100 feet, and a noise level of 48 dBA at 200 feet from the noise source.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The predominant rating scales for communities in California are the equivalent continuous sound level (L_{eq}), the community noise equivalent level (CNEL), and the day-night average level (L_{dn}) based on A-weighted decibels (dBA). L_{eq} is the total sound energy of time-varying noise over a sample period. CNEL is the time varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale, but without the adjustment for events occurring during the evening hours. CNEL and L_{dn} are within one dBA of each other and are normally interchangeable.

Other noise rating scales of importance include the maximum noise level (L_{max}), which is the highest exponential time averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis are specified in terms of maximum levels denoted by L_{max} for short-term noise impacts. L_{max} reflects peak operating conditions, and addresses the annoying aspects of intermittent noise.

Noise standards in terms of percentile exceedance levels, L_n, are often used together with the L_{max} for noise enforcement purposes. When specified, the percentile exceedance levels are not to be exceeded by an offending sound over a stated time period. For example, the L_{10} noise level represents the level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the lowest noise level experienced during a monitoring period. It is normally referred to as the background noise level. For a relatively steady noise, the measured L_{eq} and L_{50} are approximately the same.

Noise impacts can be organized into three categories. The first is audible impacts, which refer to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dBA or greater, since, as described earlier, this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 and 3 dBA. This range of noise levels has been found to be noticeable only in laboratory environments. The last category is changes in noise level of less than 1 dBA that are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

(2) Physiological Effects of Noise. Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire human system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, and thereby affecting blood pressure, functions of the ear, and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise

level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling.

b. Noise Regulatory Framework. The following section summarizes the regulatory framework related to noise, including federal, State, and City of Oakland plans, policies and standards.

(1) U.S. Environmental Protection Agency (EPA). In 1972 Congress enacted the Noise Control Act. This act authorized the United States Environmental Protection Agency (EPA) to publish descriptive data on the effects of noise and establish levels of sound "requisite to protect the public welfare with an adequate margin of safety." These levels are separated into health (hearing loss levels) and welfare (annoyance levels) categories, as shown in Table IV.D-3. The EPA cautions that these identified levels are not standards because they do not take into account the cost or feasibility of reducing noise below these levels.

For protection against hearing loss, 96 percent of the population would be protected if sound levels are less than or equal to an $L_{eq(24)}$ of 70 dB. The "(24)" signifies an L_{eq} duration of 24 hours. The EPA activity and interference guidelines are designed to ensure reliable speech communication at about 5 feet in the outdoor environment. For outdoor and indoor environments, interference with activity and annoyance should not occur if sound levels are below 55 dBA and 45 dBA, respectively.

The noise effects associated with an outdoor L_{dn} of 55 dB are summarized in Table IV.D-4. At 55 dB L_{dn}, 95 percent sentence clarity (intelligibility) may be expected at 3.5 meters, with no community reaction. However, 1 percent of the population may complain about noise at this level and 17 percent may indicate annoyance.

(2) State of California. The State of California has established regulations that help prevent adverse impacts to occupants of buildings located near noise sources. Referred to as the "State Noise Insulation Standard," it requires buildings to meet performance standards through design and/or building materials that would offset any noise source in the vicinity of the receptor. State regula-

Table IV.D-3: Summary of EPA Noise Levels

Effect	Level	Area
Hearing loss	$L_{eq(24)} \leq 70$ dB	All areas.
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	$L_{eq(24)} \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{eq} \leq 45$ dB	Indoor residential areas.
	$L_{eq(24)} \leq 45$ dB	Other indoor areas with human activities such as schools, etc.

Source: U.S. Environmental Protection Agency, 1974. "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." March.

Table IV.D-4: Summary of Human Effects in Areas Exposed to 55 dBA L_{dn}

Type of Effects	Magnitude of Effect
Speech – Indoors	100 percent sentence intelligibility (average) with a 5 dB margin of safety.
Speech – Outdoors	100 percent sentence intelligibility (average) at 0.35 meters. 99 percent sentence intelligibility (average) at 1.0 meters. 95 percent sentence intelligibility (average) at 3.5 meters.
Average Community Reaction	None evident; 7 dB below level of significant complaints and threats of legal action and at least 16 dB below "vigorous action."
Complaints	1 percent dependent on attitude and other non-level related factors.
Annoyance	17 percent dependent on attitude and other non-level related factors.
Attitude Towards Area	Noise essentially the least important of various factors.

Source: U.S. Environmental Protection Agency, 1974. "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." March.

tions include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are found in the California Code of Regulations, Title 24 (known as the Building Standards Administrative Code), Part 2 (known as the California Building Code), Appendix Chapters 12 and 12A.

The State has also established land use compatibility guidelines for determining acceptable noise levels for specified land uses. The City has adopted and modified the State's land use compatibility guidelines, as discussed below.

(3) City of Oakland. Locally, the City of Oakland addresses noise in the City's General Plan Noise Element, the Municipal Code Noise Ordinances, and in the Standard and Uniformly Applied Conditions of Approval.

City of Oakland's General Plan Noise Element. The City of Oakland adopted a revised Noise Element in June 2005. The City's maximum allowable operational noise level standards for residential and commercial land uses in terms of percentile exceedance are shown in Table IV.D-5. The City has also established an acceptable exterior noise threshold for new school land use development of 60 dBA L_{dn}.

Table IV.D-5: City of Oakland Operational Noise Standards at Receiving Property Line, dBA

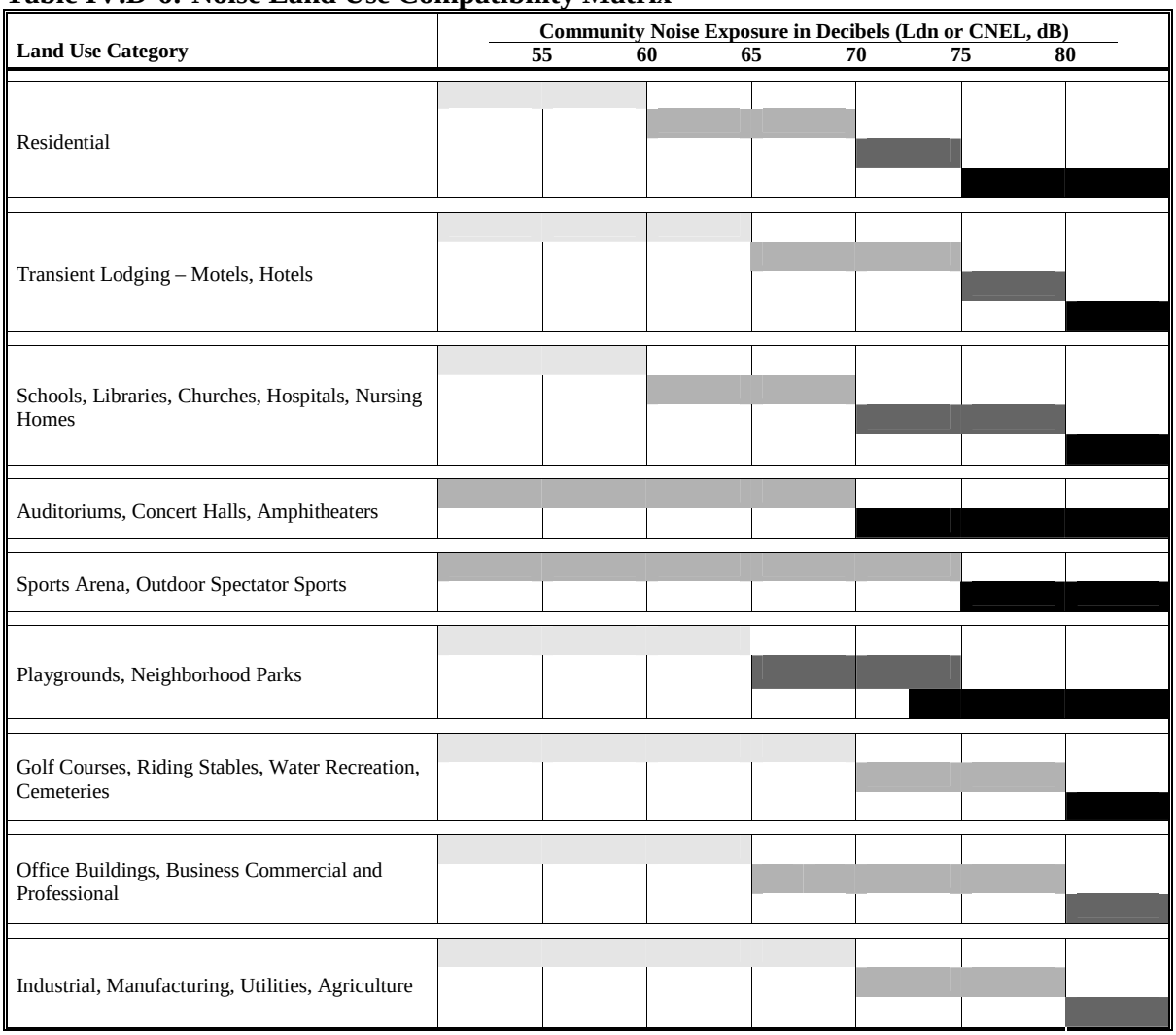
Cumulative Number of Minutes in Either the Daytime or Nighttime 1-Hour Time Period	Residential & Civic Daytime 7:00 a.m. to 10:00 p.m.	Residential & Civic Nighttime 10:00 p.m. to 7:00 a.m.	Commercial Use, Anytime
20	60	45	65
10	65	50	70
5	70	55	75
1	75	60	80
0	80	65	85

Source: City of Oakland Municipal Code Section 17.120.050 Noise.

Following are the noise policies and actions of the Noise Element and other elements of the General Plan that are applicable to the proposed Project:

- Policy 1: Ensure the compatibility of existing and, especially, of proposed development projects not only with neighboring land uses but also with their surrounding noise environment.
    - Action 1.1: Use the noise-land use compatibility matrix (Figure 6 of the Noise Element [Table IV.D-6 of this EIR]) in conjunction with the noise contour maps (especially for roadway traffic) to evaluate the acceptability of residential and other proposed land uses and also the need for any mitigation or abatement measures to achieve the desired degree of acceptability.
    - Action 1.2: Continue using the City's zoning regulations and permit processes to limit the hours of operation of noise-producing activities which create conflicts with residential uses and to attach noise-abatement requirements to such activities.
    - Policy 2: Protect the noise environment by controlling the generation of noise by both stationary and mobile noise sources.
- Policy 3: Reduce the community's exposure to noise by minimizing the noise levels that are *received* by Oakland residents and others in the City. (This policy addresses the *reception* of noise whereas Policy 2 addresses the *generation* of noise.)
    - Action 3.1: Continue to use the building-permit application process to enforce the California Noise Insulation Standards regulating the maximum allowable interior noise level in new multi-unit buildings.

Table IV.D-6: Noise Land Use Compatibility Matrix



NORMALLY ACCEPTABLE
Development may occur without an analysis of potential noise impacts *to the proposed development* (though it might still be necessary to analyze noise impacts that the project might have *on its surroundings*).

CONDITIONALLY ACCEPTABLE
Development should be undertaken only after an analysis of noise-reduction requirements is conducted, and if necessary noise-mitigating features are included in the design. Conventional construction will usually suffice as long as it incorporates air conditioning or forced-air-supply systems, though it will likely require that project occupants maintain their windows closed.

NORMALLY UNACCEPTABLE
Development should generally de discouraged; it may be undertaken only if a detailed analysis of the noise-reduction requirements is conducted, and if highly effective noise insulation, mitigation or abatement features are included in the design.

CLEARLY UNACCEPTABLE
Development should not be undertaken.

Source: Oakland, City of, 2005. *City of Oakland General Plan, Noise Element, Figure 6.* June.

- Action 3.2: Review the City's noise performance standards and revise them as appropriate to be consistent with City Council policy.

- Action 3.3: Demand that Caltrans implement sound barriers, building retrofit programs and other measures to mitigate to the maximum extent feasible noise impacts on residential and other sensitive land uses from any new, widened or upgraded roadways; any new sound barrier must conform with City policies and standards regarding visual and aesthetic resources and quality.

City of Oakland Municipal Code Noise Ordinances. The noise performance standard of ordinance 17.120.050 of the City's Municipal Code[1] establishes a maximum allowable receiving noise level standard for residential and civic land uses. The standard sets a maximum allowable receiving noise level of 60 dBA for a cumulative 20 minute period during any daytime (7:00 a.m. to 10:00 p.m.) 1-hour time period. However, the ordinance further states that in the event that the measured ambient noise level exceeds the applicable noise level standard, the stated applicable noise level shall be adjusted so as to equal the ambient noise level. The Municipal Code also regulates the maximum allowable daytime average receiving noise level for construction activity. As the proposed Project would not include demolition or construction activities, these standards would not be applicable to the Project.

City of Oakland's Standard Conditions of Approval. The City of Oakland has established Standard Conditions of Approval that apply to all proposed projects within the City. The City's Standard Conditions of Approval relevant to this impact topic are listed below for reference. These conditions of approval will be adopted as requirements of the proposed Project (if the Project is approved by the City) to help ensure that no significant impacts (for the applicable topic) occur. As a result, they are not listed as mitigation measures.

> **COA 32: Operational Noise-General.** *Ongoing.* Noise levels from the activity, property, or any mechanical equipment on site shall comply with the performance standards of Section 17.120 of the Oakland Planning Code and Section 8.18 of the Oakland Municipal Code. If noise levels exceed these standards, the activity causing the noise shall be abated until appropriate noise reduction measures have been installed and compliance verified by the Planning and Zoning Division and Building Services.

c. Existing Ambient Noise Conditions. The Project site is located in an urban area and is, therefore, influenced by several surrounding noise sources. Primary noise sources that affect the background noise level of the area include vehicular traffic on Hiller Drive, Tunnel Road, and Caldecott Lane.

An LSA noise technician conducted short-term ambient noise monitoring on the Project site on Tuesday, December 11, 2007, between the hours of 12:00 p.m. and 1:30 p.m. (when on-site school-related noise levels are expected to be at or near their peak). The measurements were taken with the sound level meter along the school's eastern property line between the playground area and the nearest off-site residential property (16 feet west of the property line and 28 feet south of the Upper Art Room building). The purpose of this noise monitoring was to document the existing noise environment and capture the noise levels associated with school operations and activities. Table IV.D-7 lists the noise levels measured during the short-term 20-minute noise measurements.

[1] Section 17.120 and Section 8.18.

Maximum and minimum noise levels were recorded as well as the equivalent continuous noise level L_{eq}. The meteorological conditions at the time of the short-term noise measurements are shown in Table IV.D-8.

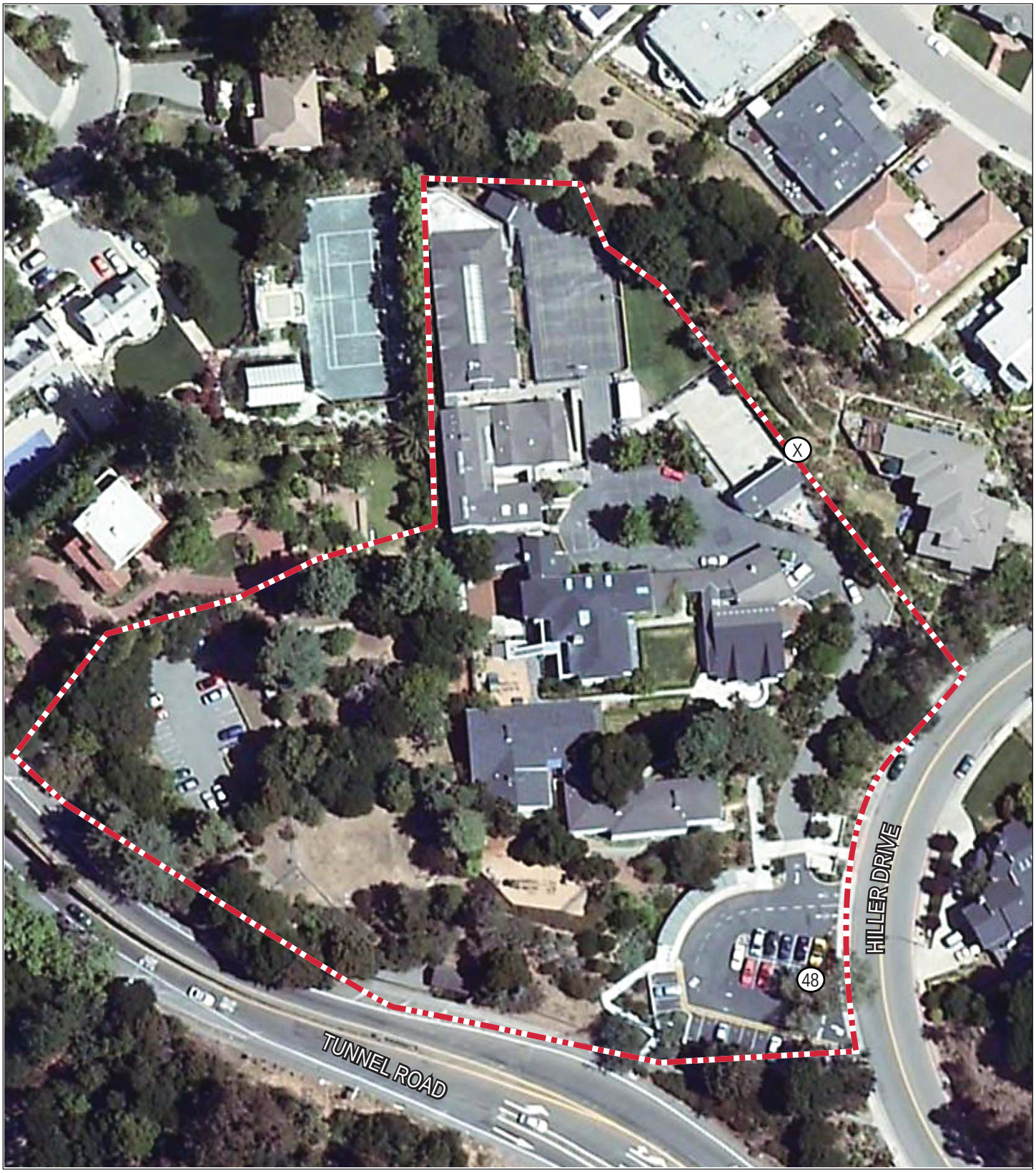
Long-term noise monitoring was also conducted from Tuesday, December 11th through Thursday, December 13th, 2007. The measurements were taken with the sound level meter equipment positioned 6 feet above the ground on a tree located in the center of the school's circular driveway, approximately 12 feet from the edge of Hiller Drive. Noise monitoring locations are shown in Figure IV.D-1. Table IV.D-9 lists the long-term noise monitoring results; these include the calculated 24-hour L_{eq} and L_{dn} values. The L_{dn} is the time-varying noise over a 24-hour period, with a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). The ambient noise level for the measured time period was 64 dBA L_{dn}. The long-term ambient noise measurement captured all audible traffic noise in the Project site vicinity, including drop-off and pick-up peak hour traffic activities at the school. As shown in the Project-related noise impacts discussion, there would be no perceptible difference between these measured existing ambient noise levels (with an enrollment of 352 students) and the ambient noise levels under Project conditions (with a permitted enrollment of up to 360 students).

2. Impacts

This section evaluates potential noise impacts associated with the proposed Project.

a. Criteria of Significance. The proposed Project would result in a significant noise or vibration impact if it would:

- Expose persons to or generate noise levels in excess of standards established in the Oakland General Plan or applicable standards of other agencies (e.g., Occupational Safety and Health Administration (OSHA)).
- Violate the City of Oakland Noise Ordinance (Oakland Planning Code Section 17.120.050) regarding operational noise *(Table IV.D-4)*.
- Violate the City of Oakland Noise Ordinance (Oakland Planning Code Section 17.120.050) regarding construction noise, except if an acoustical analysis is performed. During the hours of 7:00 p.m. to 7:00 a.m. on weekdays and 8:00 p.m. to 9:00 a.m. on weekends and federal holidays, noise levels received by any land use from construction or demolition shall not exceed the applicable nighttime operational noise level standard *(Table IV.D-5)*.
- Violate the City of Oakland Noise Ordinance (Oakland Municipal Code Section 8.18.020) regarding nuisance of persistent construction-related noise.
- Create a vibration not associated with motor vehicles, trains, or temporary construction or demolition work which is perceptible without instruments by the average person at or beyond any lot line containing the vibration-causing activity, except vibration-causing activities located in the M-40 zone or in the M-30 zone more than 400 feet from any legally occupied residential property (Oakland Planning Code Section 17.120.060).



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FEET

PROJECT SITE

X SHORT-TERM NOISE MONITORING LOCATION

48 48-HOUR NOISE MONITORING LOCATION

FIGURE IV.D-1

Bentley School Major Conditional Use Permit EIR
Noise Monitoring Locations

SOURCE: GOOGLE MAPS; LSA ASSOCIATES, INC., 2007.

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Table IV.D-7: Short-Term Ambient Noise Monitoring Results, dBA

Start Time	L_{eq} [a]	L_{max} [b]	L_{min} [c]	Primary Noise Sources
12:20	61.3	70.4	53.9	Students playing/yelling during lunch recess; birds; vehicular activity on driveway and roads; wind.
12:45	67.2	85.1	51.3	

[a] L_{eq} represents the average of the sound energy occurring over the 20-minute time period.
[b] L_{max} is the highest instantaneous sound level measured during the 20-minute time period.
[c] L_{min} is the lowest instantaneous sound level measured during the 20-minute time period.
Source: LSA Associates, Inc., December 2007.

Table IV.D-8: Meteorological Conditions During Short-Term Monitoring

Maximum Wind Speed (mph)	Average Wind Speed (mph)	Temperature (F)	Relative Humidity (%)
5.7	1.4	57.7	24

Source: LSA Associates, Inc., December 2007.

Table IV.D-9: Long-Term Ambient Noise Monitoring Results (December 11–13, 2007)

Measurement	Description	dBA	Time Period the Event Occurred
L_{dn}	Weighted 24 hour average	64.0	NA
L_{eq}	24 hour average	59.0	NA
L_{max}	Highest recorded L_{max} for 24 hour period	89.6	11:00 a.m. – 12:00 p.m., December 12
L_{min}	Lowest recorded L_{min} for 24 hour period	38.0	3:00 a.m. – 4:00 a.m., December 12

Source: LSA Associates, Inc., December 2007.

- Expose persons to or generate rail-related groundborne vibration in excess of standards established by the Federal Transit Administration (FTA).
- Generate interior L_{dn} or CNEL greater than 45 dBA for multi-family dwellings, hotels, motels, dormitories and long-term care facilities (and may be extended by local legislative action to include single family dwellings) per California Noise Insulation Standards (CCR Part 2, Title 24).
- Result in a 5 dBA permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project.
- Conflict with land use compatibility guidelines for all specified land uses for determination of acceptability of noise (Source: State of California, Governor's Office of Planning and Research, *General Plan Guidelines, 2003*).
- Be located within an airport land use plan and would expose people residing or working in the Project area to excessive noise levels.
- Be located within the vicinity of a private airstrip, and would expose people residing or working in the Project area to excessive noise levels.

b. Less-Than-Significant Noise Impacts. Less-than-significant impacts of the proposed Project are discussed below.

(1) Construction Related Noise and Vibration. Implementation of the proposed Project would not include the construction of any new structures. Therefore, the proposed Project would not result in any construction-related noise or vibration impacts.

(2) Groundborne Noise and Vibration. The proposed Project, which includes enrollment and operational changes at Bentley School, would not generate any groundborne noise or vibration. In addition, the Project site does not contain any equipment or facilities that generate substantial levels of groundborne vibration or noise. The Project site is not located in the vicinity of railroad tracks and would not be exposed to railroad-related vibration.

(3) Aircraft Related Noise. The proposed Project is located approximately 20 miles northeast of the San Francisco International Airport and approximately 10 miles northeast of the Oakland International Airport. The Project site is located beyond the 65 CNEL noise contours for either airport. There are no private airstrips in the Project site vicinity. Therefore, aircraft related noise impacts on the proposed Project would be considered less than significant.

(4) Stationary and Operational Noise Sources. Stationary noise sources that would be associated with the Project include outdoor school activities such as recess and physical education classes, parking lot activities such as slamming car doors and talking, mechanical ventilation systems, and occasional delivery truck idling and unloading noise.

These conclusions pertain to effects on the noise environment associated with all Project-related operations, including existing Project-related hours of operation during the school day, and occasional evening, weekend, and summer events.

The proposed Project, which would legalize existing school enrollment and allow for an enrollment of up to 360 students, and associated operations, does not include the addition of any new mechanical systems. Existing buildings and systems have met the City's building permitting requirements in regard to noise standards. The proposed Project would not be expected to substantially increase the number of deliveries to the school. Existing noise sources would continue to contribute to future cumulative ambient noise levels on the site, and would result in a less-than-significant impact on sensitive receptors in the Project vicinity.

The operational noise levels of Bentley School, including those associated with the existing enrollment and operational characteristics that would be legalized as part of the Project, were documented by LSA Associates through short-term and long-term noise monitoring. The results are presented under the existing noise conditions discussion above. The short-term measurements were taken during a time period when on-site school-related noise levels were expected to be at or near their peak at a location near the property line of the closest off-site sensitive receptor to the school campus (the residential property located along the school's eastern property boundary). The long-term measurements were taken to document the existing ambient noise levels in the Project site vicinity. With the attenuation of noise due to the additional 16 feet from the monitoring location to the nearest receiving property line, the highest measured 20-minute short-term noise levels would attenuate to approximately 63 dBA L_{eq}. Based on the 48-hour long-term noise monitoring data, the calculated ambient noise level in the Project vicinity is 64 dBA L_{dn}. According to the Municipal Code performance standard 17.120.50, in the event the measured ambient noise level exceeds the applicable noise level standard, the stated applicable noise level shall be adjusted so as to equal the ambient noise level. As the measured short-term operational noise levels at the nearest receiving property line are below the existing ambient noise levels in the Project vicinity, they do not exceed the City's noise performance standards. The slight increase from the existing enrollment of 352

students to the enrollment permitted with the Project (360 students) would not result in a perceptible increase in operational noise levels above existing operational noise levels. In addition, the City of Oakland's Standard Conditions of Approval regarding noise control of ongoing operational noise impacts of a project would be implemented as part of the Project. Therefore, stationary and operational noises associated with implementation of the proposed Project are considered less than significant and no mitigation is required.

(5) Vehicle Related Noise. The dominant noise source in the Project site vicinity consists of vehicular noise on surrounding roadways. The Project's potential effects on future traffic noise levels were calculated using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (RD-77-108). Both the existing plus Project and the cumulative conditions for year 2030 with the Project were evaluated. Existing plus Project conditions represent a maximum student enrollment of 360 students.

The resulting noise levels were weighted and summed over a 24-hour period in order to determine the L_{dn} values. The L_{dn} contours are derived through a series of computerized iterations to isolate the 60, 65, and 70 dBA L_{dn} contours for traffic noise levels in the Project area. Table IV.D-10 lists the traffic noise levels for the existing plus Project conditions. Table IV.D-11 lists the traffic noise levels for the cumulative with the Project conditions for year 2030.

Table IV.D-10: Existing Traffic Noise Levels with the Project (360 Students)

Roadway Segment	Average Daily Trips	Centerline to 70 dBA L_{dn} (feet)	Centerline to 65 dBA L_{dn} (feet)	Centerline to 60 dBA L_{dn} (feet)	L_{dn} (dBA) 50 Feet From Outermost Lane
Hiller Drive - Tunnel Road to School Exit	8,200	< 50 [a]	< 50	52	59.2
Hiller Drive - School Exit to School Entrance	6,100	< 50	< 50	< 50	57.9
Hiller Drive - School Entrance to Hill Court	4,200	< 50	< 50	< 50	56.3
Hiller Drive - west of Hill Court	1,600	< 50	< 50	< 50	52.1
Tunnel Road - Caldecott Lane to Vicente Road	22,900	< 50	80	172	67.0
Tunnel Road - Vicente Road to Roble Road	22,900	< 50	80	172	67.0

[a] Traffic noise within 50 feet of the roadway centerline requires site-specific analysis.
Source: LSA Associates Inc., January 2008.

Table IV.D-11: Cumulative (2030) Traffic Noise Levels with the Project (360 Students)

Roadway Segment	Average Daily Trips	Centerline to 70 dBA L_{dn} (feet)	Centerline to 65 dBA L_{dn} (feet)	Centerline to 60 dBA L_{dn} (feet)	L_{dn} (dBA) 50 Feet From Outermost Lane
Hiller Drive - Tunnel Road to School Exit	8,400	< 50	< 50	53	59.3
Hiller Drive - School Exit to School Entrance	6,300	< 50	< 50	< 50	58.0
Hiller Drive - School Entrance to Hill Court	4,400	< 50	< 50	< 50	56.5
Hiller Drive - west of Hill Court	1,700	< 50	< 50	< 50	52.3
Tunnel Road - Caldecott Lane to Vicente Road	32,500	< 50	101	217	68.6
Tunnel Road - Vicente Road to Roble Road	32,500	< 50	101	217	68.6

Source: LSA Associates Inc., January 2008.

While the proposed Project does not include new construction, it does include approval of expanded use of the existing land use, and as such must be consistent with the City's land use compatibility standards. According to the City's land use compatibility standards for proposed development, environments with noise levels less than 60 dBA L_{dn} are considered normally acceptable for new school development. Traffic noise levels along Hiller Drive range up to 59.3 dBA L_{dn} at a distance of 50 feet from the centerline of the outermost travel lane. Due to distance attenuation, these noise levels would be reduced to approximately 52 dBA L_{dn} at the nearest sensitive receptor area on the school campus. Traffic noise levels along Tunnel Road range up to 68.6 dBA L_{dn} at a distance of 50 feet from the centerline of the outermost travel lane. Due to distance attenuation, these noise levels would be reduced to approximately 59.7 dBA L_{dn} at the nearest outdoor activity area on the school campus. These noise levels are therefore within the City's normally acceptable range for new school development. Consequently, traffic noise sources would be considered less than significant and no mitigation would be required.

(6) Project-Related Noise Increases. Since the student enrollment under existing conditions (352 students) exceeds the legally permitted baseline enrollment of 200 students, baseline noise level measurements could not be captured. However, the Project's operational noise impact on ambient noise levels in the Project vicinity can still be determined through qualitative analysis.

The stationary or operational activities that have increased with implementation of the proposed Project over baseline conditions include outdoor school activities such as recess and physical education classes, and activities associated with the extended hours of operation, as well as increased parking lot activities such as slamming car doors and talking. As mentioned previously, the proposed Project does not include the addition of any new mechanical systems, nor has the proposed Project substantially increased the number of deliveries to the school.

A comparison of operational noise levels of baseline conditions (a student enrollment of 200 students) to existing conditions with the Project (an enrollment of up to 360 students) shows the Project has resulted in an increased number of students using outdoor activity areas. In acoustics, every doubling of an equal sound energy results in a 3 dBA increase in combined noise level (as noted in the setting section, 3 dBA represents the lowest noise increase that is audible by humans outside of a laboratory environment). The Project enrollment level does not represent a doubling of the student body compared to the baseline condition. Therefore, even assuming the worst case of all 360 students playing on the outdoor activity areas at the same time, their combined noise level would not result in even a 3 dBA permanent increase in ambient noise levels compared to the noise generated by the baseline condition of 200 students playing in the outdoor activity areas at the same time. This noise increase does not exceed the City's established significance criterion of a 5 dBA permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project. Therefore, increased noise levels due to increased student enrollment would be considered a less-than-significant impact.

Similarly, although Project implementation has resulted in increased use of the parking areas and driveways by staff and parents, these activities have not doubled compared to baseline conditions and have therefore resulted in a less-than-perceptible increase (less than 3 dBA) in ambient noise levels in the Project vicinity. This is less than the City's significance criterion of a 5 dBA or greater increase and would therefore be considered a less-than-significant impact.

Project implementation has also resulted in an increase in vehicular trips to the school site. However, the Project-related average daily trips would represent a less than 50 percent increase compared to baseline conditions. Even more importantly, these average daily trips have not doubled the vehicular volume on roadway segments in the Project vicinity. Therefore, the noise increase on roadways around the Project site associated with increased vehicle trips to the school is less-than-perceptible (less than 3 dBA) and would be considered a less-than-significant impact.

c. Significant Noise Impacts. Implementation of the proposed Project would not result any significant noise- or vibration-related impacts on sensitive receptors in the Project vicinity.

d. Cumulative Noise Impacts. The geographic area considered for the cumulative noise analysis includes the area in close proximity to the Project site, generally the area shown in Figure III-1. The cumulative analysis considers longer-term operational and traffic-related noise and shorter-term construction-related noise of other proposed projects in the Project vicinity.

Longer-term noise from cumulative development (including past, existing, approved, pending, and reasonably foreseeable future development) in the area would primarily occur from motor vehicle traffic. Cumulative traffic noise levels in the Project area for the year 2030 were estimated using traffic data provided by Dowling Associates, Inc., and are presented in Table IV.D-11. As shown in the table and as discussed under the vehicle noise impacts discussion above, cumulative traffic noise levels in the Project vicinity for the year 2030 would attenuate with distance from the source so that traffic noise levels at the nearest outdoor sensitive receptor areas on the school campus would be within the City's normally acceptable range for new school development.

The cumulative noise analysis must also consider other projects in the vicinity that could generate significant noise levels around sensitive receptors. Proposed construction projects in the Project vicinity include the planned construction of the fourth bore of the Caldecott Tunnel. However, due to terrain features and distance attenuation, construction noise related to this planned project would not result in a significant cumulative noise impact on the proposed Project. It is also likely that a small number of single-family construction projects and expansions would occur in the Project vicinity in the next several years.

Two types of temporary noise impacts would occur during the demolition and construction phases for construction projects in the Project vicinity, including the planned construction of the fourth bore of the Caldecott Tunnel, and any single-family residential construction projects. The first is the increase in traffic flow on local streets associated with the transport of workers, equipment, and materials to and from the project sites. Although these future projects may result in increases in traffic volumes on roadway segments in the Project vicinity (such as along Tunnel Road), these increases would be expected to be minimal and would result in a less-than-significant impact on sensitive receptors in the vicinity (including receptors at Bentley School). According to the Final Environmental Assessment and Environmental Impact Report prepared for the Caldecott project, access to the project construction zone would primarily be via SR 24, Fish Ranch Road, and Old Tunnel Road, and thus construction vehicles would not expose Bentley School to high noise levels.[2]

[2] U.S. Department of Transportation, Federal Highway Administration, and California Department of Transportation, 2007. *Final Environmental Assessment/Environmental Impact Report*. August.

For construction projects in the Project vicinity, including the planned construction of the fourth bore of the Caldecott Tunnel, and any single-family residential construction projects, the second type of temporary noise impact is related to the noise generated by heavy construction equipment. Demolition and site preparation phases are typically the loudest phases of construction due to the types of equipment used. The worst case combined noise level during this phase of construction would be approximately 91 dBA L_{max} at a distance of 50 feet from an active construction area. However, the impacts from construction noise at such sites would be reduced to less-than-significant levels with implementation of the City's Standard and Uniformly Applied Conditions of Approval for construction noise. Compliance with the conditions of approval applicable to construction hours of operation, noise control, noise complaint procedures, and pile driving and other extreme noise generators, would ensure that planned projects in the Project vicinity comply with the City's Noise Ordinance. As the City's Standard and Uniformly Applied Conditions of Approval would be included as part of this and other planned projects, the associated cumulative impact would be considered less-than-significant. According to the Final Environmental Assessment and Environmental Impact Report prepared for the Caldecott project, noise levels immediately surrounding the staging area (which would be located over ¼-mile from Bentley School) would be 3 dBA L_{eq} or less, and would not be perceptible at Bentley School.[3]

Finally, while aircraft operations at nearby airports are expected to increase over time, due to the distance of the Project site from the nearest airports, no cumulative aircraft-related noise impacts would occur at noise sensitive receptors at Bentley School.

[3] U.S. Department of Transportation, Federal Highway Administration, and California Department of Transportation, 2007. *Final Environmental Assessment/Environmental Impact Report*. August.