

This section presents the fundamentals of environmental noise, discusses policies and standards applicable to the proposed Program, and provides an evaluation of the potential significance of impacts resulting from Program construction.

3.7.1 Environmental Setting

3.7.1.1 *Fundamentals of Noise*

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB), with 0 dB corresponding roughly to the threshold of hearing. Decibels and other technical terms are defined in Table 3.7-1.

Most of the sounds that we hear in the environment do not consist of a single frequency but rather a broad band of frequencies, with each frequency differing in sound level. The intensities of each frequency add together to generate a sound. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies of a sound in accordance with a weighting that reflects the facts that human hearing is less sensitive at low frequencies and extreme high frequencies than in the frequency mid-range. This is called “A” weighting, and the decibel level so measured is called the A-weighted sound level (dBA). In 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. Typical A-weighted levels measured in the environment and in industry are shown in Table 3.7-2 for different types of noise.

Although the A-weighted noise level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources that create a relatively steady background noise in which no particular source is identifiable. To describe the time-varying character of environmental noise, the statistical noise descriptors, L_{01} , L_{10} , L_{50} , and L_{90} , are commonly used. They are the A-weighted noise levels equaled or exceeded during 1 percent, 10 percent, 50 percent, and 90 percent of a stated time period. A single number descriptor called the L_{eq} is also widely used. The L_{eq} is the average A-weighted noise level during a stated period of time.

3.7.1.2 *Existing Noise Environment*

The existing noise environment along US 50 and SR 89 results primarily from vehicular traffic. Typical daytime noise levels along segments of the highway were estimated based on Caltrans traffic volume data (Caltrans 2005a) and are presented in Table 3.7-3.

**Table 3.7-1
Definitions of Acoustical Terms**

Term	Definitions
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. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sounds are below 20 Hz and ultrasonic sounds are above 20,000 Hz.
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.
Equivalent Noise Level (L_{eq})	The average A-weighted noise level during the measurement period.
L_{max} , L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01} , L_{10} , L_{50} , L_{90}	The A-weighted noise levels that are exceeded 1 percent, 10 percent, 50 percent, and 90 percent of the time during the measurement period.
Day/Night Noise Level (L_{dn} or DNL)	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 p.m. and 7:00 a.m.
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 p.m. to 10:00 p.m., and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
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.
Intrusive	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.

**Table 3.7-2
Typical Noise Levels in the Environment**

Common Outdoor Noise Source	Noise Level (dBA)	Common Indoor Noise Source
Jet flyover at 300 meters	120 dBA	Rock concert
	110 dBA	
Pile driver at 20 meters	100 dBA	Night club with live music
	90 dBA	
Large truck pass by at 15 meters	80 dBA	Noisy restaurant
	70 dBA	Garbage disposal at 1 meter
Gas lawn mower at 30 meters	70 dBA	Vacuum cleaner at 3 meters
Commercial/Urban area daytime	60 dBA	Normal speech at 1 meter
Suburban expressway at 90 meters	60 dBA	Active office environment
Suburban daytime	50 dBA	
Urban area nighttime	40 dBA	Quiet office environment
	40 dBA	
Suburban nighttime	30 dBA	Library
Quiet rural areas	30 dBA	Quiet bedroom at night
	20 dBA	
Wilderness area	20 dBA	Quiet recording studio
Most quiet remote areas	10 dBA	Threshold of human hearing
Threshold of human hearing	0 dBA	

**Table 3.7-3
Typical Daytime Noise Levels Estimated from Average Daily Traffic**

Segment	Segment Description	Typical Daytime Noise Levels at 30.5 Meters (100 Feet) from Roadway Center
US 50 Segment 1	Meyers Road to 0.1 km east of Incline Road	66 dBA L_{eq}
US 50 Segment 2	Airport Road to the US 50/SR 89 "Y" Intersection	66 to 68 dBA L_{eq}
US 50 Segment 3	Ski Run Blvd. to the Nevada State Line	67 dBA
SR 89 Segment 1	Alpine County Line to the US 50/SR 89 Intersection at Meyers	61 to 62 dBA
SR 89 Segment 2	US 50/SR 89 "Y" in South Lake Tahoe to Cascade Rd.	67 dBA
SR 89 Segment 3	Cascade Road to north of the Eagle Falls Sidehill Viaducts	61 dBA
SR 89 Segment 4	North of the Eagle Falls Sidehill Viaducts to Meeks Creek	61 dBA
SR 89 Segment 5	Meeks Creek to the Placer County Line	61 dBA

3.7.2 Regulatory Setting

3.7.2.1 Federal and State (Caltrans)

Caltrans applies noise criteria contained in the *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* (Caltrans 2006a) to projects involving federal and state sponsorship. This protocol requires noise assessment and abatement evaluation for “Type I” projects, which are defined in 23 Code of Federal Regulations (CFR) 772 and are primarily actions that add lanes to an existing highway or significantly change a highway’s alignment. None of the improvements proposed for the EIP (listed in Section 2.1) would meet this definition. Therefore, even if federal funding or other actions would apply to any future EIP projects, they do not appear to be Type I projects and would not require evaluation, based on the definition of the EIP project activities included in this EIR.

CEQA Significance Criteria

Applicable significance criteria under CEQA for the Program include the following:

- 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.
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. A substantial temporary or periodic increase in ambient noise levels is considered a sustained increase of at least 5 dBA at one location during the seasonal construction period.

3.7.2.2 Regional

Tahoe Regional Planning Agency

The TRPA establishes noise limitations in Chapter 23 of the Code of Ordinances. These limitations are applicable to single-event noises from aircraft, marine crafts, motor vehicles, motorcycles, off-road vehicles, and snowmobiles. The limitations also apply to community noise levels in the Tahoe Region. TRPA-approved construction is specifically exempted from these provisions, provided that construction activities are limited to the hours of 8:00 a.m. to 6:30 p.m.

TRPA Thresholds

The environmental carrying capacities, or thresholds, for noise consist of numerical Community Noise Equivalent Level (CNEL) values for various land use categories and transportation corridors and single-event (L_{max}) standards for specific sources including motor vehicles, off-road vehicles, boats, snowmobiles, and aircraft. The three noise threshold indicators under TRPA are as follows:

- N-1 – Single-event noise standards for aircraft: Aircraft noise measured in decibels monitored pursuant to the monitoring element of the Lake Tahoe Airport Master Plan.
- N-2 – Single-event noise standards for other than aircraft: Any single-event noise measurement made with a Type I sound level meter using the A-weighting and “slow” response pursuant to applicable manufacturer’s instructions, except that for sounds of a duration of 2 seconds or less, the “fast” response shall be used. See Chapter 23 of the Code of Ordinances.
- N-3 – Community Noise Equivalent Levels (CNELs): CNELs calculated pursuant to the Code of Ordinances, Section 23.4. The TRPA shall review proposed activities in the Region taking into account site-specific analyses, estimated impacts on affected land uses, consistency with other provisions of the Regional Plan, and reasonable tests of significance of change in noise levels.

Table 3.7-4 lists numerical standards for background noise levels allowed for various land uses as well as standard thresholds for area transportation corridors.

**Table 3.7-4
TRPA Noise Thresholds**

Land Use Category	Average Noise Level or CNEL range (dBA)
NUMERICAL STANDARDS	
Background noise levels shall not exceed the following levels:	
High Density Residential Areas	55
Low Density Residential Areas	50
Hotel/Motel Areas	60
Commercial Areas	60
Industrial Areas	65
Urban Outdoor Recreation Areas	55
Rural Outdoor Recreation Areas	50
Wilderness and Roadless Areas	45
Critical Wildlife Habitat Areas	45
TRANSPORTATION CORRIDORS¹	
US 50	65 ²
SR 89, 207, 28, 267 and 431	55 ²
Lake Tahoe Airport	60 ³

Source: TRPA Goals and Policies, Chapter 1 – Land Use Element, Amended 05/28/97

1. Recommended CNEL levels for transportation corridors.
2. This recommended threshold overrides the land use CNEL thresholds and is limited to an area within 300 feet from the edge of the road.
3. This recommended threshold applies to those areas impacted by the approved flight paths.

El Dorado County General Plan

Maximum allowable noise levels resulting from construction are outlined in El Dorado County’s General Plan (El Dorado County 2004). Noise level standards outlined in Tables 6-3 and 6-4 of the El Dorado County Construction Noise Standards (see Figure 3.7-1) would apply to the

Program. The standards presented in Table 6-5 (see Figure 3.7-1) would not apply because construction activities would occur along existing state highways, which are not rural.

Policy 6.5.1.11 The standards outlined in Tables 6-3, 6-4, and 6-5 (Figure 3.7-1) shall apply to those activities associated with actual construction of a project as long as such construction occurs between the hours of 7 a.m. and 7 p.m., Monday through Friday, and 8 a.m. and 5 p.m. on weekends, and on federally recognized holidays. Exemptions are allowed if it can be shown that construction beyond these times is necessary to alleviate traffic congestion and safety hazards.

3.7.3 Impacts

3.7.3.1 CEQA Considerations

Construction Activities

Construction activities associated with the proposed Program are described in Section 2.1. Construction would generate noise and would temporarily increase noise levels at adjacent land uses. Construction-related noise levels are normally highest during the demolition and earthwork phases of construction because of heavy equipment and impact tools required to complete the work. These phases of construction normally generate the highest noise levels over extended periods of time.

Figure 3.7-1 El Dorado County Construction Noise Standards

TABLE 6-3 MAXIMUM ALLOWABLE NOISE EXPOSURE FOR NONTRANSPORTATION NOISE SOURCES IN COMMUNITY REGIONS AND ADOPTED PLAN AREAS—CONSTRUCTION NOISE			
Land Use Designation ¹	Time Period	Noise Level (dB)	
		L _{eq}	L _{max}
Higher-Density Residential (MFR, HDR, MDR)	7 am–7 pm	55	75
	7 pm–10 pm	50	65
	10 pm–7 am	45	60
Commercial and Public Facilities (C, R&D, PF)	7 am–7 pm	70	90
	7 pm–7 am	65	75
Industrial (I)	Any Time	80	90
Note: ¹ Adopted Plan areas should refer to those land use designations that most closely correspond to the similar General Plan land use designations for similar development.			

TABLE 6-4 MAXIMUM ALLOWABLE NOISE EXPOSURE FOR NONTRANSPORTATION NOISE SOURCES IN RURAL CENTERS—CONSTRUCTION NOISE			
Land Use Designation	Time Period	Noise Level (dB)	
		L _{eq}	L _{max}
All Residential (MFR, HDR, MDR)	7 am–7 pm	55	75
	7 pm–10 pm	50	65
	10 pm–7 am	40	55
Commercial, Recreation, and Public Facilities (C, TR, PF)	7 am–7 pm	65	75
	7 pm–7 am	60	70
Industrial (I)	Any Time	70	80
Open Space (OS)	7 am–7 pm	55	75
	7 pm–7 am	50	65

TABLE 6-5 MAXIMUM ALLOWABLE NOISE EXPOSURE FOR NONTRANSPORTATION NOISE SOURCES IN RURAL REGIONS—CONSTRUCTION NOISE			
Land Use Designation	Time Period	Noise Level (dB)	
		L _{eq}	L _{max}
All Residential (LDR)	7 am–7 pm	50	60
	7 pm–10 pm	45	55
	10 pm–7 am	40	50
Commercial, Recreation, and Public Facilities (C, TR, PF)	7 am–7 pm	65	75
	7 pm–7 am	60	70
Rural Land, Natural Resources, Open Space, and Agricultural Lands (RR, NR, OS, AL)	7 am–7 pm	65	75
	7 pm–7 am	60	70

Typical hourly average noise levels resulting from the construction of roadways, sewers, and trenches are about 79 dBA to 88 dBA L_{eq} measured at a distance of 15.2 meters (50 feet) from the center of the site during busy construction periods. Construction noise levels would vary on a day-to-day basis depending on the actual activities occurring at the site. Table 3.7-5 summarizes the typical range of average noise levels that could be expected during construction phases.

**Table 3.7-5
Typical Ranges of Energy Equivalent Noise Levels at 15.2
Meters (50 Feet), L_{eq} in dBA, at Construction Sites**

Phase	Public Works Roads and Highways, Sewers, and Trenches	
	With all pertinent equipment present at site	With minimum required equipment present at site
Ground Clearing	84	84
Excavation	88	78
Foundations	88	88
Erection	79	78
Finishing	84	84

Source: USEPA 1973, 2-104.

Maximum noise levels resulting from individual pieces of equipment would range from about 74 dBA to 89 dBA measured at a distance of 15.2 meters (50 feet) from the construction equipment. Table 3.7-6 summarizes the typical range of maximum noise levels that could be expected with construction equipment.

Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can substantially reduce construction noise levels at distant receptors.

**Table 3.7-6
Maximum Noise Levels from Construction Equipment at
15.2 Meters (50 Feet)**

Equipment	Maximum Noise Levels (dBA)
Dozer	88
Excavator	85
Elevating Scraper	89
Backhoe	84
Front-End Loader	87
Water Truck	87
Tractor Trailer – 20 cubic yards	80
Crane	86
Compactor	82
Paver	85
Welding Machine	74
Generator	84
Drill Rig	88

Source: National Cooperative Highway Research Program 1999; USEPA 1971.

Noise Levels in Excess of Applicable Standards

Maximum and average noise levels generated by construction activities would exceed the construction noise level standards established by El Dorado County. El Dorado County's maximum allowable noise exposure levels for construction noise during the daytime (an hourly average limit of 55 dBA L_{eq}) would generally be 6 to 13 dB below ambient hourly average traffic noise levels at the closest receptors to the highway alignment (approximately 30.5 meters [100 feet] from the roadway center). Similarly, the maximum noise level standard of 75 dBA would typically be below ambient maximum noise levels resulting from vehicular traffic along the highways (e.g., motorcycles, trucks, etc.). The noise level standards presented in the General Plan (El Dorado County 2004) do not account for the duration of Program construction. A reasonable construction period (1 year) should be allowed so that projects of limited duration can be mitigated by the implementation of a series of BMPs.

Typical hourly average noise levels resulting from the construction of roadways, sewers, and trenches are about 73 dBA to 82 dBA, measured at a distance of 30.5 meters (100 feet). Maximum noise levels resulting from individual pieces of equipment range from about 68 dBA to 83 dBA, measured at a distance of 30.5 meters (100 feet). Hourly average noise levels could exceed 55 dBA L_{eq} within about 152.4 to 670.6 meters (500 to 2,200 feet) of the construction site during various activities, assuming no excess attenuation resulting from shielding or ground absorption. Maximum noise levels would exceed 75 dBA within approximately 76.2 meters (250 feet) of the loudest pieces of construction equipment.

Maximum and hourly average noise levels would exceed the County's construction noise standards. Program construction activities would affect a particular receptor or group of receptors for a temporary period of time, due to the transitional nature of the work as it proceeds

along each highway within each segment. The impact would be less than significant provided that standard Caltrans construction noise control measures are implemented at all construction sites and where noise levels that exceed the County's standards can be limited to one construction season or less.

Temporary Noise Increases During Construction

Construction activities would result in temporary noise level increases at receptors along the project alignment. This is a less-than-significant impact given the anticipated construction schedule and the amount of time that particular noise-sensitive receptors would be affected by the Program.

Road construction activities could take up to three to four construction seasons to complete on roadway segments due to the relatively small construction period available each year. Noise generated by roadway construction does not typically last over extended periods of time, because activities move along the right-of-way as construction proceeds.

Construction equipment would likely include air compressors, paving machines, forklift trucks, loaders, pavement grinders, dump trucks, trenching machines, compactors, and backhoes. Noise levels generated by construction activities could be as high as 82 dBA L_{eq} at receptors 30.5 meters (100 feet) from the construction site would be expected to exceed 60 dBA L_{eq} and would increase the ambient noise environment by at least 5 decibels during the busiest hours at receptors up to 396.2 meters (1,300 feet) from the construction site. However, construction activities are anticipated to affect a particular receptor or group of receptors for a period of time considerably less than one construction season. Noise impacts resulting from construction would be less than significant because of the short exposure period.

Construction noise impacts could result when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours); the construction occurs in areas immediately adjoining noise-sensitive land uses; or construction durations last over extended periods of time.

Post-Construction Noise

Noise levels along each of the project segments would be the same after construction is completed as they were prior to the commencement of construction. The Program will not change highway capacity or traffic flow to any measurable extent that would have any effect on long-term noise levels. There would be no impacts or change to the existing noise environment.

3.7.3.2 TRPA Considerations

The Program would not alter or otherwise affect aircraft volume or flight patterns, and therefore it would have no impact on the TRPA Threshold N-1 pertaining to aircraft noise. Similarly, noise levels generated by single events relating to boats, motor vehicles, motorcycles, off-road vehicles, and snowmobiles would not be affected by the Program.

Although the Program would not alter future noise levels for communities, temporary noise levels would increase during construction activities. Mitigation measures would be employed to minimize adverse effects associated with construction noise, particularly if construction takes place outside of the 8:00 a.m. to 6:30 p.m. timeframe when construction noise is exempted from

the TRPA Code of Ordinances considerations. Mitigation measures are described in Section 3.7.4.

3.7.3.3 *No Project Alternative*

The No Project Alternative would consist of not implementing the EIP projects for which Caltrans is the lead agency. Therefore, there would be no noise impacts.

3.7.4 Avoidance, Minimization, and Mitigation

Although the potential for construction noise impacts is considered less than significant, standard construction noise control measures should be implemented to reduce the effects of construction noise on adjacent land uses. Caltrans requires construction contractors to comply with Standard Specifications and Special Provisions. These include that the contractor shall comply with all local sound control and noise level rules, regulations, and ordinances that apply to any work performed for the construction contract. Typical measures that may be considered and/or implemented at noise sensitive locations include the following:

- Noise-generating activities at the construction site or in areas adjacent to the construction site associated with the Program would be restricted to a specified daytime period that would be included in the construction contract.
- Equip internal combustion engine–driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Prohibit unnecessary idling of internal combustion engines.
- Avoid staging of construction equipment within 61 meters (200 feet) of residences and locate all stationary noise-generating construction equipment, such as air compressors and portable power generators, away from existing noise-sensitive receptors.
- In unusual circumstances where daytime construction noise would be ongoing and located immediately adjacent to noise-sensitive land uses, temporary barriers could be considered to screen stationary noise-generating equipment.
- Use “quiet” air compressors and other stationary noise sources if such technology is available.
- The project Resident Engineer would be responsible for responding to any local complaints about construction noise.

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