7.15 Noise

This section describes the environmental setting, potential impacts, and mitigation measures for noise and vibration impacts that may result from changes in hydrology or changes in water supply. Activities that generate noise or vibration could have a potentially significant impact on noise-sensitive receptors through exceedances of established noise standards, exposure of persons to excessive levels of groundborne vibration or noise, or through substantial increases in ambient noise levels that annoy or disturb people and potentially cause an adverse psychological or physiological effect on human health.

Changes in hydrology would not result in an increased level of noise and vibration, because the associated tributary flows and reservoir levels would not generate a meaningful difference in noise or vibration levels. Changes in water supply could result in noise impacts. Specifically, actions that would generate noise could result from increased pumping associated with replacement groundwater pumping, groundwater storage and recovery, and groundwater substitution transfers. These effects are discussed and analyzed in this section.

Section 7.1, *Introduction, Project Description, and Approach to Environmental Analysis*, describes reasonably foreseeable methods of compliance and response actions, including actions that would require construction. These actions are analyzed for potential environmental effects in Section 7.21, *Habitat Restoration and Other Ecosystem Projects*, and Section 7.22, *New or Modified Facilities*.

7.15.1 Environmental Checklist

XII. Noise	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project 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?	☒	☐	☐	☐
b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐
d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐

XII. Noise	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
e. 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, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

7.15.2 Environmental Setting

This section describes the noise and vibration setting to inform the impact discussion in this section and in Section 7.21, *Habitat Restoration and Other Ecosystem Projects*; Section 7.22, *New or Modified Facilities*; and Chapter 9, *Proposed Voluntary Agreements*.

7.15.2.1 Background and Effects on People

Noise

Sound is mechanical energy (vibration) transmitted by pressure waves over a medium such as air or water. In particular, the sound pressure level or energy content (amplitude) is the most common descriptor for characterizing the loudness of an ambient (existing) sound level. Table 7.15-1 provides definitions of acoustic terminology used in this section.

Table 7.15-1. Acoustic Terminology

Term	Definition
Acoustics	The science of sound.
Ambient noise	The distinctive acoustical characteristics of a given space, consisting of all noise sources audible at that location. In many cases, the term “ambient” is used to describe an existing or preproject condition, such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-weighting	A frequency-response adjustment of a sound-level meter that conditions the output signal to approximate human response.
Community noise equivalent level	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the A-weighted sound levels occurring during the period from 7 p.m. to 10 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10 p.m. to 7 a.m.
Decibel (dB)	A fundamental unit of sound. A bel is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A decibel is one-tenth of a bel.

Term	Definition
Frequency: hertz	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second, or hertz.
Day-night noise level (L_{dn})	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10 p.m. to 7 a.m. Similar to community noise equivalent level but with no evening weighting.
Equivalent sound level	The equivalent steady-state sound level that in a stated period of time would contain the same acoustical energy.
Maximum sound level	The maximum sound level measured during the measurement period.
Minimum sound level	The minimum sound level measured during the measurement period.
Sound exposure level	A rating, in dB, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy of the event into a 1-second period.
Threshold of hearing	The lowest sound threshold that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of pain	Approximately 120 dB above the threshold of hearing.

Source: Caltrans 2013.

The decibel (dB) scale is used to measure sound levels in terms of pressure, using the hearing threshold (20 micropascals of pressure) as a point of reference, defined as 0 dB. Other sound pressures are then compared with the reference pressure, and the logarithm is used to generate dB numbers that are in a practical range. With the dB scale, a millionfold increase in pressure is expressed as 120 dB.

The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive. This process is called A-weighting, referred to as A-weighted dB (dBA). In general, human sound perception is such that a change in sound level of 1 dB cannot typically be perceived by the human ear, a change of 3 dB is barely noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving the sound level as it increases or decreases, respectively. Table 7.15-2 shows examples of noise levels for several common noise sources and environments.

Noise can be generated by numerous sources: mobile sources, such as automobiles, trucks, and airplanes, and stationary sources, such as construction activity and commercial and industrial operations. Perceived noise declines the greater the distance is from the source.

Depending on the ground type located between the noise source and the receptor, noise generated from mobile or line sources attenuates at a rate of 3 dB (typical for hard surfaces, such as asphalt) to 4.5 dB (typical for soft surfaces, such as grasslands) per doubling of distance. Stationary or point noise sources (e.g., pumps, generators, construction equipment) attenuate at a rate of 6 to 7.5 dB per doubling of distance, depending on the intervening ground type between the noise source and the receptor (Caltrans 2013). Atmospheric conditions, such as temperature gradients, turbulence, wind speed, and humidity, may further alter the propagation of noise and affect noise levels at receptors. Furthermore, the presence of large objects (e.g., natural barriers such as berms or hills, walls or barriers, topographic features, intervening building façades) between the noise source and the receptor can substantially reduce noise levels.

Table 7.15-2. Typical A-Weighted Sound Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	—110—	Rock band
Jet flyover at 1,000 feet		
	—100—	
Gas lawnmower at 3 feet		
	—90—	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	—80—	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawnmower at 100 feet	—70—	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	—60—	
		Large business office
Quiet urban daytime	—50—	Dishwasher in next room
Quiet urban nighttime	—40—	Theater, large conference room (background)
Quiet suburban nighttime		
	—30—	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	—20—	
		Broadcast/recording studio
	—10—	
	—0—	

Source: Caltrans 2013.
dBA = A-weighted decibel
mph = miles per hour

Effects of Noise on People

Community noise is commonly described in terms of the *ambient noise level*, which is defined as the existing noise level associated with a given environment, including all noise sources present. A common statistical tool to measure the ambient noise level is the *equivalent sound level*, which is the average sound level over a given period (usually 1 hour).

The *day-night noise level* (L_{dn}) is based on the average noise level over 24 hours, with a +10 dB "penalty," or weighting, applied to noise generated during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based on the assumption that people react to nighttime noise (occurring during a time when many people are sleeping) exposures as though they were twice as loud as daytime exposures (which is a 10-dB increase in the logarithmic dB scale). Because L_{dn} represents a 24-hour average, it tends to smooth out or shadow short-term variations in the noise environment. The 24-hour L_{dn} is typically used for evaluating transportation sources.

To control noise from fixed sources that have developed from processes other than zoning or land use planning, many jurisdictions have adopted noise control ordinances. Noise ordinances are intended to reduce noise nuisances and to control noise from existing sources. Standards within a noise ordinance may be used as performance standards to judge the creation of a potential noise nuisance. Community noise control ordinances are generally designed to resolve noise conflicts attributable to stationary sources.

Vibration

Vibration is similar to noise in that it is a pressure wave traveling through an elastic medium, such as air; however, vibration occurs as a result of high-frequency energy input on a structure or surface, such as in buildings or the ground. Vibration sources may be continuous (e.g., operating factory machinery) or transient (e.g., explosions).

Operation of heavy construction equipment, particularly pile driving and other impact devices such as pavement breakers, creates seismic waves that radiate along the surface of the earth and downward into the earth. These surface waves can be felt as ground vibration. Vibration from operation of this equipment can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes decrease with increasing distance.

Perceptible groundborne vibration is generally limited to areas within a few hundred feet of construction activities. As seismic waves travel outward from a vibration source, they excite the particles of rock and soil through which they pass and cause the particles to oscillate. The actual distance that these particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in inches per second) at which these particles move is the commonly accepted descriptor of the vibration amplitude, referred to as the *peak particle velocity* (PPV). Table 7.15-3 summarizes typical vibration levels generated by construction equipment.

Table 7.15-3. Vibration Source Levels for Construction Equipment

Equipment	PPV at 25 Feet
Pile driver (impact)	Up to 1.518
Pile driver (sonic/vibratory)	Up to 0.734
Vibratory roller	0.210
Hoe ram	0.089
Large bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003

Source: ^FTA 2006.
Equipment not listed here generally would produce vibration levels that are less than or comparable to that of a small bulldozer.
PPV = peak particle velocity

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. The following equation can be used to quantitatively estimate the vibration level at a given distance for typical soil conditions (^FTA 2006). PPV_{ref} is the reference PPV from Table 7.15-3:

$$PPV = PPV_{ref} \times (25/\text{Distance})^{1.5}$$

Tables 7.15-4 and 7.15-5 summarize guidelines developed by the California Department of Transportation to assess potential damage and annoyance from transient and continuous vibration that usually is associated with construction activity. Equipment or activities typical of continuous vibration include excavation equipment, static compaction equipment, tracked vehicles, traffic on a highway, vibratory pile drivers, pile-extraction equipment, and vibratory compaction equipment. Equipment or activities typical of single-impact (transient) or low-rate repeated impact vibration include impact pile drivers, blasting, drop balls, “pogo stick” compactors, and crack-and-seat equipment (Caltrans 2020).

Table 7.15-4. Guideline Vibration Damage Potential Threshold Criteria

	Maximum PPV (in/sec)	
Structure and Condition	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Caltrans 2020.
Transient sources, such as blasting or drop balls, create a single isolated vibration event. Continuous or frequent intermittent sources include excavation equipment, static compaction equipment, tracked vehicles, traffic on a highway, vibratory pile drivers, pile-extraction equipment, and vibratory compaction equipment.
in/sec = inches per second
PPV = peak particle velocity

Table 7.15-5. Guideline Vibration Annoyance Potential Criteria

	Maximum PPV (in/sec)	
Structure and Condition	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Source: Caltrans 2020.
Transient sources, such as blasting or drop balls, create a single isolated vibration event. Continuous or frequent intermittent sources include excavation equipment, static compaction equipment, tracked vehicles, traffic on a highway, vibratory pile drivers, pile-extraction equipment, and vibratory compaction equipment.
in/sec = inches per second
PPV = peak particle velocity

Vibration may inhibit general well-being and contribute to stress and annoyance and can interfere with human activities, including sleep, speech, recreation, and tasks demanding concentration or coordination. Some typical community sources of perceptible vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. At moderate and high levels, groundborne vibration may result in detectable vibrations and slight damage to nearby structures. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings). Vibration rarely results in damage to structural components.

7.15.2.2 Study Area

Noise and vibration vary by local environmental conditions, but noise typically can be generated by stationary sources and nonstationary sources. In general, stationary sources include commercial, industrial, and residential heating and cooling equipment; parks and athletic fields; and industrial uses such as corporation yards, manufacturing facilities, and natural gas compression stations. Nonstationary sources generally include transportation vehicles such as trains, aircraft, automobiles, and trucks; mobile construction equipment; and landscape equipment.

The ambient noise in a given part of the study area can vary greatly depending on the specific environment and the types of noise sources that are present. In agricultural areas, farms may use stationary equipment (e.g., generators, pumps for irrigation systems, equipment to husk corn or remove stalks from other crops) and farm vehicles (e.g., tractors) that generate noise. Although pumps and other agricultural sources of noise could affect ambient noise levels in their vicinity, these noise sources generally affect ambient noise levels only in very near areas.

Noise levels associated with existing pumps operating in agricultural areas vary based on the size and type of equipment. For example, a 5-horsepower pump with an electric motor operating at 1,800 rotations per minute could result in noise levels of about 55 dBA at a distance of 50 feet (Hoover & Keith Inc. 2000). A similar 50-horsepower pump could result in a noise level of about 65 dBA at a distance of 50 feet, and a 500-horsepower pump could result in a noise level of about 70 dBA at this distance. Since noise from a point source reduces by 6 dB per doubling of distance, noise would be greatly reduced outside of the immediate vicinity of a pump or piece of agricultural equipment. For example, at a distance of 250 feet, noise from each of these pump types would be reduced by 14 dB. It is likely that noise from agricultural equipment therefore would be noticeable only at receptors located very close to the equipment.

In natural areas such as forest or parkland adjacent to tributaries and reservoirs, while there may be some noise from equipment associated with these land uses, ambient noise levels are much lower than they would be in urban or metropolitan areas. For example, large portions of the unincorporated areas of Colusa, Butte, and Glenn Counties in the northern part of the study area are developed as agricultural uses. These uses generally generate fewer vehicle trips because fewer people travel to these areas, and noise in these areas is often much quieter than noise in urban city centers, consistent with the “rural” noise level shown in Table 7.15-6, in the range of 40 to 50 L_{dn}. On and near waterways, boats are a noise source, as is heavy equipment used for freight movement at ports.

Table 7.15-6. Approximate Average Day-Night Noise Levels for Various Locations

Qualitative Description of Location	Average L_{dn} in dBA
Rural	40–50
Small town or quiet suburban residential	50
Normal suburban residential	55
Urban residential	60
Noisy urban residential	65
Very noisy urban residential	70
Downtown, major metropolis	75–80
Adjoining freeway or near major airport	80–90

Source: Hoover & Keith Inc. 2000.
dBA = A-weighted decibel
L_{dn} = day-night noise level

In the core of major metropolitan or urban areas, aircraft (planes and helicopters), railroads, ports, and vehicles traveling on major freeways can generate high noise levels, resulting in higher ambient noise levels than may occur in rural areas. Residential cooling and heating equipment also can affect ambient noise levels in urban environments. In addition, metropolitan areas may have industrial districts with stationary source noise from mechanical equipment used for manufacturing or other industrial processes. For example, Sacramento, north of the Delta, would generally have ambient noise levels consistent with either “urban residential,” “noisy urban residential,” or “very noisy urban residential” (refer to Table 7.15-6), with ambient noise levels in the range of 60 to 70 L_{dn}. On the other hand, the majority of Elk Grove (where it is not adjacent to the freeway), located immediately south of Sacramento, would generally have ambient noise levels consistent with a “small town or quiet suburban residential” area or a “normal suburban residential” area, in the range of 50 to 55 L_{dn}.

Urban areas typically have higher sound levels than rural and less developed areas. Areas near highways, rail lines and switching yards, and airports experience some of the highest sound levels. Conversely, national and state parks, national forests, natural preserves, and grazing lands have some of the lowest sound levels. However, natural resource extraction and timber harvesting equipment, trucks, and off-road vehicles may generate substantial noise and vibration even in remote areas. In general, the ambient noise levels in rural areas near rivers and waterways are lower than those in metropolitan areas because rural areas typically have fewer noise sources. Refer to Table 7.15-6 for approximate average L_{dn} for various types of locations.

7.15.2.3 Existing Noise-Sensitive Receptors

Some receptors are more sensitive to noise than other receptors. Residential uses, schools, hospitals, worship places, parks, and natural preserves are among the most common noise-sensitive receptors. Many of these types of receptors are in urban and suburban areas that tend to be the noisiest environments, but noise-sensitive receptors can be located anywhere. The noise levels that noise-sensitive receptors are allowed to be exposed to vary by jurisdiction, because each city and county has its own noise standards (generally from the local noise ordinance and general plan).

7.15.3 Impact Analysis

Noise is commonly defined as unwanted sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Activities that generate noise or vibration could have a potentially significant impact on noise-sensitive receptors through exceedances of established noise standards, exposure of persons to excessive levels of groundborne vibration or noise, or substantial increases in ambient noise levels relative to changes in hydrology or changes in water supply under the proposed Plan amendments.

Changes in hydrology that would result in altered timing of flows and changes in reservoir levels would not result in the generation of noise or vibration in excess of established thresholds, result in a substantial permanent or temporary increase in ambient noise levels, or expose residents or workers to excessive aircraft noise because the movement of more or less water in these waterbodies would not generate a meaningful difference in noise or vibration levels. There would be no impact, and conditions associated with changes in hydrology are not evaluated further in this section.

Changes in water supply include reduced Sacramento/Delta water supply to agricultural and municipal users, which could result in agricultural land fallowing, groundwater pumping, and use of other water management actions (groundwater storage and recovery, water transfers, water recycling, and water conservation). Reduced agricultural activity due to agricultural land fallowing could result in lowered noise levels in the immediate area relative to existing ambient noise because of the reduced use of farm equipment. There would be no impact.

Increased groundwater pumping associated with replacement groundwater pumping, groundwater storage and recovery, or groundwater substitution transfers could generate noise, possibly exposing persons in the vicinity of groundwater wells to noise levels in excess of established standards or to excessive groundborne vibration or noise or resulting in a substantial permanent or temporary increase in ambient noise levels above existing levels. These conditions are evaluated in this section.

Other water management actions involving water recycling and water conservation would utilize existing infrastructure and would not be expected to generate additional noise or vibration. There would be no impact, and these activities are not evaluated further in this section.

Actions associated with changes in water supply would continue the use of existing infrastructure and would not result in new or increased exposure of people residing or working near public or private airports or airstrips to excessive aircraft noise. There would be no impact, and Impact NOI-e and Impact NOI-f are not further evaluated in this section.

Section 7.21, *Habitat Restoration and Other Ecosystem Projects*, and Section 7.22, *New or Modified Facilities,* describe and analyze potential noise impacts from various actions that involve construction.

Impact NOI-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

Impact NOI-c: A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project

Impact NOI-d: A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project

The analysis of activities that could expose persons to noise or generate substantial permanent, temporary, or periodic increases in ambient noise levels are closely related and therefore are combined and addressed together under Impacts NOI-a, NOI-c, and NOI-d.

Increased groundwater pumping for replacement water supply, groundwater storage and recovery, or groundwater substitution transfers could expose noise-sensitive receptors to higher noise levels.

Noise levels associated with pumps vary based on the size and type of equipment. For example, a 5-horsepower pump with an electric motor operating at 1,800 rotations per minute could result in noise levels of about 55 dBA at a distance of 50 feet (Hoover & Keith Inc. 2000). A similar 50-horsepower pump could result in a noise level of about 65 dBA at a distance of 50 feet, and a 500-horsepower pump could result in a noise level of about 70 dBA at this distance. Groundwater pumps often are not located near noise-sensitive (e.g., residential) land uses; therefore, although the specific noise level of future pumps cannot be known with certainty, the likelihood for noise from these pumps to exceed applicable local thresholds is low. Because the specific equipment types and locations of potential future pump installations are not known at this time, it is not known if the increases in noise from future groundwater pumps would result in excessive noise levels at noise-sensitive land uses.

Increased groundwater pumping may result in a permanent, temporary, or periodic increase in ambient noise that could be considered substantial, depending on the existing ambient noise, the noise generated by the pump, noise levels of future activities, and the proximity to noise-sensitive land uses. However, noise from these pumps is expected to be minor and intermittent. Furthermore, groundwater pumps often are not close to noise-sensitive (e.g., residential) land uses. Because it is not known where increased pumping will occur, noise impacts associated with noise levels in excess of established local general plan or noise ordinance standards, a substantial permanent increase in ambient noise levels in the project vicinity above existing levels, and a substantial temporary or periodic increase in ambient noise levels in the project vicinity above existing levels could occur, and the impacts would be potentially significant.

Entities or agencies that increase groundwater pumping should implement Mitigation Measure MM-NOI-a,c,d to reduce potential operations noise impacts on noise-sensitive land uses. Implementation of this mitigation measure could reduce noise impacts through compliance with applicable regulations and incorporation of noise-reduction measures such that operational noise does not exceed applicable local noise standards or limits. Unless and until Mitigation Measure MM-NOI-a,c,d is implemented, the identified noise impacts remain potentially significant.

Impact NOI-b: Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels

Increased groundwater pumping could generate additional intermittent and localized vibration effects when the well is pumping; however, this additional level of vibration would likely be imperceptible at distances beyond 25 feet. Further, groundwater pumps often are not located near noise-sensitive (e.g., residential) land uses. Municipal groundwater wells often are enclosed in some type of small low-profile structure or fence that reduces the operating noise of the well. Therefore, the likelihood for vibration from the increased operation of groundwater pumps being perceptible is low. The impact would be less than significant.

7.15.4 Mitigation Measures

MM-NOI-a,c,d: Mitigate exposure of persons to or generation of noise levels in excess of established standards and to substantial permanent or temporary increases in ambient noise levels in the project vicinity

1. **Applicable Policies and Regulations:** Entities that implement actions requiring increased operation of existing stationary source equipment (e.g., groundwater pumps) will comply with all applicable local policies and regulations regarding noise.

2. **Noise-Reduction Consideration in Operations:** Entities that implement actions requiring increased operation of existing stationary source equipment (e.g., groundwater pumps) in the vicinity of noise-sensitive receptors will prepare an acoustical study and include noise-reduction measures such that operational noise from stationary equipment does not exceed applicable local noise standards or limits specified in the applicable county or city ordinances and general plan noise elements. Such noise-reduction measures may include the following.

    i. Maximize the distance between noise-generating equipment and nearby noise-sensitive receptors.

    ii. Utilize quiet technology.

    iii. Enclose pumps and other noise-generating machinery in buildings that reduce the operating noise.

    iv. Provide local barriers between equipment and noise-sensitive receptors to provide acoustical shielding.

    v. Utilize noise-reduction devices, such as mufflers or silencers, on mechanical equipment where applicable and when feasible.

    vi. Incorporate dense landscaping to reduce operational noise sources.

    vii. Restrict noise-producing operational activities conducted near noise-sensitive land uses to daytime hours.

7.15.5 References Cited

7.15.5.1 Common References

^Federal Transit Administration (FTA). 2006. *Transit Noise and Vibration Impact Assessment*. May. Washington, DC. Available: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf. Accessed: May 4, 2017.

7.15.5.2 Printed References

California Department of Transportation (Caltrans). 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol*. September.

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Hoover & Keith Inc. 2000. *Noise Control for Buildings and Manufacturing Plants*. Houston, TX.