Chapter 24
Noise and Vibration

This chapter describes the environmental setting and study area for noise and vibration; analyzes the significance of impacts that could result from construction, operation, and maintenance of the project; and provides mitigation measures to reduce the severity of noise or vibration impacts. This chapter also analyzes impacts that could result from implementation of compensatory mitigation required for the project and analyzes the impacts that could result from other mitigation measures associated with other resource chapters in this Draft Environmental Impact Report (Draft EIR).

24.0 Summary Comparison of Alternatives

Table 24-0 provides a summary comparison of important impacts on noise and vibration by alternative. The table presents the CEQA findings after all mitigation is applied. If applicable, the table also presents quantitative results after all mitigation is applied. This table provides information on the magnitude of the most pertinent and quantifiable impacts on noise and vibration that are expected to result from implementation of the project alternatives. The aspect of the project affecting the most receptors involves the construction of permanent project features, which is anticipated to occur over a duration of approximately 12 to 14 years, accounting for all features. Heavy equipment noise during construction of permanent project features from intakes, shaft sites, concrete batch plants, and a new forebay complex would affect the most receptors under Alternative 4a, with daytime criteria exceeded at 153 residences and nighttime criteria exceeded at 230 residences over the course of construction. According to modeling, construction of levee improvements, bridges, access roads, park-and-ride lots, utilities, and compensatory mitigation would exceed daytime noise criteria at nearby receptors on a short-term basis. Truck traffic on haul routes, including new access roads would exceed traffic noise criteria. Train activity on new rail spurs is not expected to exceed noise level increase criteria for rail facilities. Operation of pumping plants is not expected to be significant source of noise at the nearest receptors, as the design of these facilities would include noise-attenuating or silencing features. Groundborne vibration or noise from heavy equipment or tunnel boring machines (TBMs) is not expected to result in perceptible levels of vibration within buildings or damage to building structures. As shown in Table 24-0, Impact NOI-1: *Generate a Substantial Temporary or Permanent Increase in Ambient Noise Levels in the Vicinity of the Project in Excess of Standards Established in the Local General Plan or Noise Ordinance, or Applicable Standards of Other Agencies* would be significant and unavoidable under all project alternatives. Although mitigation measures are available to reduce Impact NOI-1 to a less-than-significant level, the voluntary participation of affected residents, which is necessary to reduce this impact, cannot be guaranteed. For this reason, Impact NOI-1 would be significant and unavoidable, even with implementation of mitigation measures.

Table ES-2 in the Executive Summary summarizes all impacts disclosed in this chapter.

Table 24-0. Comparison of Impacts on Noise and Vibration by Alternative

	Alternative								
Chapter 24 – Noise and Vibration	1	2a	2b	2c	3	4a	4b	4c	5
Impact NOI-1: Generate a Substantial Temporary or Permanent Increase in Ambient Noise Levels in the Vicinity of the Project in Excess of Standards Established in the Local General Plan or Noise Ordinance, or Applicable Standards of Other Agencies	SU [a]	SU [a]	SU [a]	SU [a]	SU [a]	SU [a]	SU [a]	SU [a]	SU [a]
Receptors exceeding daytime criteria – Buildout (exposure period up to 14 years) (residences)	14	20	7	14	19	25	12	19	35
Receptors exceeding daytime criteria – Pile driving (up to 21 months) (residences)	125	148	25	125	130	153	30	130	143
Receptors exceeding nighttime criteria – Concrete pours (up to 5 months) (residences)	177	193	42	177	214	230	79	214	230
Impact NOI-2: Generate Excessive Groundborne Vibration or Groundborne Noise Levels	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Impact NOI-3: Place Project-Related Activities in the Vicinity of a Private Airstrip or an Airport Land Use Plan, or, Where Such a Plan Has Not Been Adopted, within 2 Miles of a Public Airport or Public Use Airport, Resulting in Exposure of People Residing or Working in the Project Area to Excessive Noise Levels	NI	NI	NI	NI	NI	NI	NI	NI	NI

LTS = less than significant; NI = no impact; SU = significant and unavoidable.

[a] If all eligible property owners participate in Mitigation Measure NOI-1: *Develop and Implement a Noise Control Plan*, the impacts would be less than significant with mitigation.

24.1 Environmental Setting

This section describes the environmental setting for noise and vibration in the areas surrounding construction sites and locations of infrastructure associated with the project alternatives. The analysis area for noise (study area) is defined as all land within a 2-mile radius of aboveground construction sites and locations of new project-related infrastructure. This 2-mile buffer is used to describe the distance that potential levels of noise from project construction areas would attenuate below existing ambient levels. Figure 24-1 shows the study area. However, to the extent that there is a potential for growth inducement effects on noise from other operational changes, this topic is addressed in Chapter 31, *Growth Inducement*. The area of vibration effects from construction and operation of the project would be localized within a smaller buffer (less than 1/10 mile) inside the study area and would not be discernible outside the study area.

24.1.1 Fundamentals of Noise and Vibration

24.1.1.1 Noise

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level is the most common descriptor used to characterize the loudness of an ambient sound. The decibel (dB) scale is used to quantify sound intensity. Because sound pressure can vary enormously within the range of human hearing, the logarithmic decibel scale is used to keep sound intensity numbers at a convenient and manageable level.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels, when exposed to steady, single-frequency (pure-tone) signals in the mid-frequency (1,000 Hertz [Hz] to 8,000 Hz) range. It is widely accepted, however, that people are able to begin to detect sound-level changes of 3 dB for typical noisy environments. Further, a 10-dB increase is generally perceived as a doubling of loudness. Therefore, doubling sound energy (e.g., doubling the volume of traffic on a highway), which would result in a 3 dB increase in noise, is generally perceived as a detectable, but not substantial, increase in sound level.

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 in a process called "A-weighting." Because humans are less sensitive to low-frequency sound than to high-frequency sound, A-weighted decibel (dBA) levels deemphasize low-frequency sound energy to better represent how humans hear. Table 24-1 summarizes typical A-weighted sound levels.

Table 24-1. 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, 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: California Department of Transportation 2013:2–20.
dBA = A-weighted decibel; mph = miles per hour.

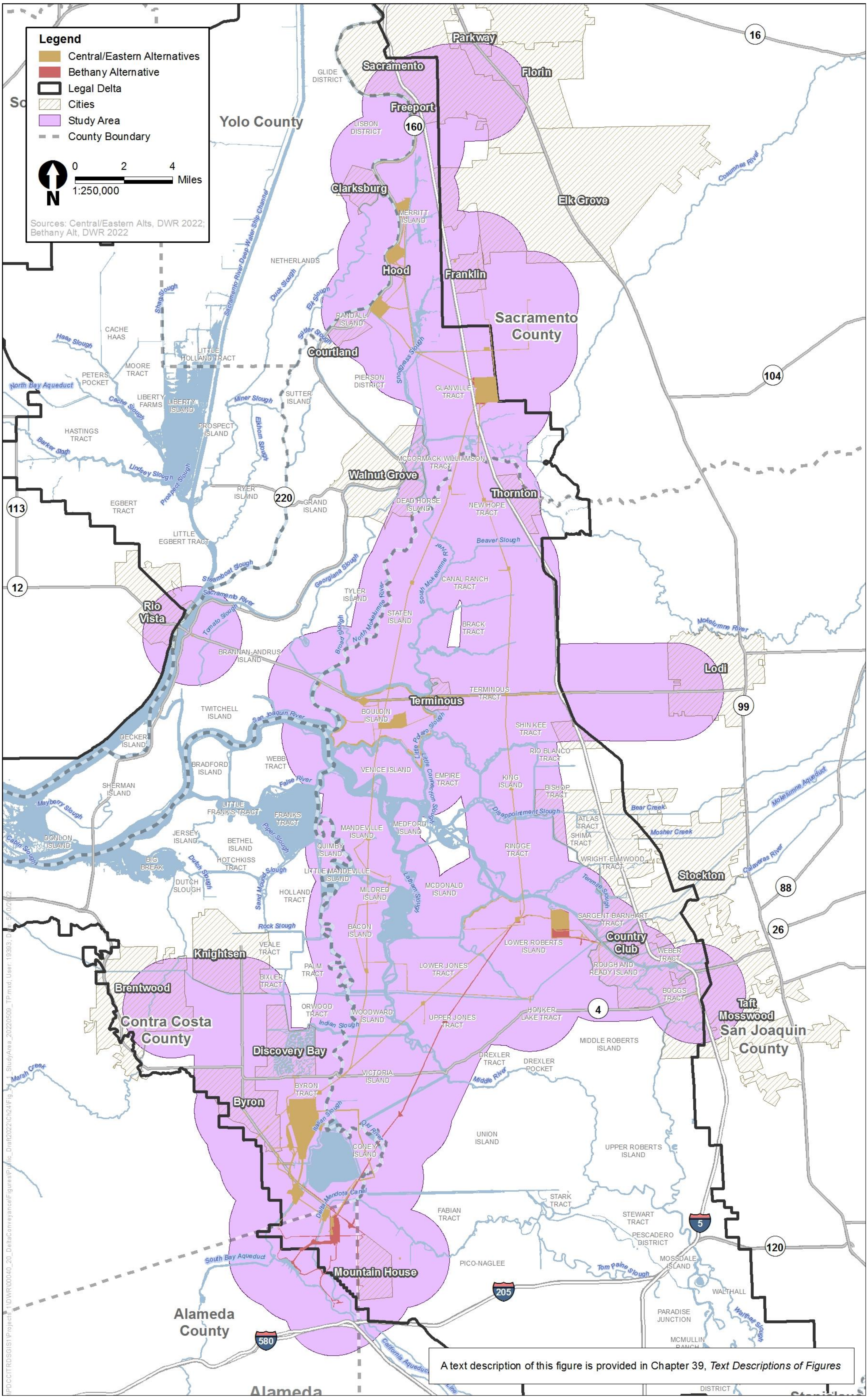

Figure 24-1. Study Area for Noise and Vibration Effects

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Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels (L_{min} and L_{max}), percentile-exceeded sound levels (L_{xx}), the day-night sound level (L_{dn}), and the community noise equivalent level (CNEL). Below are brief definitions of these measurements and other terminology used in this section.

Sound. A vibratory disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.

Noise. Sound that is loud, unpleasant, unexpected, or otherwise undesirable.

Ambient noise. The composite of noise from all sources near and far in a given environment exclusive of particular noise sources to be measured.

Decibel (dB). A unitless measure of sound. A sound-level measurement in decibels describes the logarithmic ratio of a measured sound pressure level to a reference sound pressure level of 20 micropascals.

A-Weighted Decibel (dBA). An overall frequency-weighted sound level that approximates the frequency response of the human ear.

Maximum and Minimum Sound Levels (L_{max} and L_{min}). The maximum or minimum sound level measured during a specified interval.

Equivalent Sound Level (L_{eq}). L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The duration of the measurement is commonly indicated in the metric; for example, a 1-hour L_{eq} sound level would be indicated as dBA 1-hour L_{eq}.

Percentile-exceeded sound level (L_{xx}). The sound level exceeded for an indicated percentage of time during a sound-level measurement period, where XX is the percentage of a specified time interval. For example, a 1-hour L_{90} is the sound level exceeded 90% of the time during an hour, and a 1-hour L_{10} is the sound level exceeded 10% of the time during an hour. The L_{90} is generally used to represent the ambient sound level.

Day-night sound 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 10:00 p.m. to 7:00 a.m.

Community noise equivalent level (CNEL). 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 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.

L_{dn} and CNEL values rarely differ by more than 1 dB. As a matter of practice, L_{dn} and CNEL values are considered to be equivalent. In general, human sound perception is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as doubling or halving sound level.

For a point source, such as a stationary compressor, sound attenuates based on geometry at rate of 6 dB per doubling of distance. For a line source, such as free-flowing traffic on a freeway, sound attenuates at a rate of 3 dB per doubling of distance. Atmospheric conditions including wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface such as grass attenuates at a greater rate than sound that travels over a hard surface such as pavement. The increased attenuation is typically in the range of 1 to 2 dB per doubling of distance. Barriers, such as buildings and topography that block the line of site between a source and receiver, also increase the attenuation of sound over distance.

Auditory and non-auditory effects can result from excessive or chronic exposure to elevated noise levels. Auditory effects of noise on people can include temporary or permanent hearing loss. Non-auditory effects of exposure to elevated noise levels include sleep disturbance, speech interference, and psychological effects such as annoyance. Land use compatibility standards for noise typically are based on research related to these non-auditory effects.

24.1.2 Vibration

In contrast to airborne sound, groundborne vibration is not a phenomenon that most people experience every day. Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. The background vibration velocity level in residential areas is usually much lower than the limit of human perception. Most perceptible indoor vibration is caused by sources within buildings, such as mechanical equipment while in operation, people moving, or doors slamming. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. Dynamic construction equipment, such as pile drivers, can create vibrations that radiate along the surface and downward into the earth. These surface waves can be felt as groundborne vibration. Vibration can result in effects that range from annoyance to structural damage. Variations in geology and distance result in different vibration levels with different frequencies and displacements.

As vibration waves travel outward from a source, they excite the particles of rock and soil through which they pass and cause them 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 definition of vibration amplitude, referred to as peak particle velocity (PPV).

Vibration is measured in units of inches per second PPV (in/sec PPV), defined as the maximum instantaneous peak of the vibration signal in inches per second. Steady-state vibration becomes slightly perceptible to humans at a level of 0.012 in/sec PPV (California Department of Transportation 2020:21).

24.1.3 Study Area

This section describes existing noise and vibration conditions in the study area, which includes western portions of Sacramento and San Joaquin Counties, and eastern portions of Yolo, Contra Costa, Solano and Alameda Counties. A figure depicting the study area in the context of California geography is shown in Figure 24-1. Much of the study area consists of open space, which is typical of a quiet, rural setting. Many of these open areas are used for agriculture, and tractors, farm equipment and crop-dusting aircraft are intermittent sources of noise in many of these areas. Vehicle traffic noise is a source of noise from highways and arterial roads that traverse the study area, such as Interstate (I-) 5, I-205, Byron Highway, State Route (SR) 4, and SR 12. Freight trains are an intermittent source of noise and vibration in the immediate areas surrounding Union Pacific Railroad (UPRR) rail lines that cross the study area. Noise from aircraft overflights also contributes to ambient noise levels. On interconnected waterways in the study area, motorized boats are an intermittent source of noise.

Vibration in the study area may occur on an occasional basis in areas directly adjacent to construction sites where heavy equipment is used. In areas with average soil conditions, vibration from freight trains is generally not noticeable more than 200 feet from the track (Federal Transit Administration 2018:135).

24.1.3.1 Sacramento County

Existing Sources of Noise

Noise sources in western Sacramento County in the vicinity of the study area include traffic noise, which occurs along the main transportation corridor of I-5 and on the arterials of River Road/SR 160, Hood-Franklin Road, Lambert Road, Franklin Boulevard, and Twin Cities Road. Aircraft activity contributes to the noise environment, with flights to and from several airports in the area, including Sacramento International Airport, Sacramento Executive Airport, Sharpe AAF, Stockton Municipal Airport, Kingdon Airpark, Lodi Airpark, Franklin Field, Clarksburg Airport, Walnut Grove Airport, Lost Isle Seaplane Base, and several private airstrips. Motorized boating is a common source of noise along the Sacramento River and adjacent waterways, and there are several marinas serving boaters in the portion of the county that is in the study area, including on Brannon Island and in the population centers of Walnut Grove, Courtland and Isleton. Nontransportation noise sources include agricultural equipment, crop-dusting aircraft and commercial activities in the population centers of Hood, Courtland, and Walnut Grove.

Existing Noise-Sensitive Land Uses

Residences, schools, and recreational uses, including marinas are primary noise-sensitive land uses within the county. Residential, commercial, and industrial uses are concentrated in the population centers of Hood, Courtland, and Walnut Grove. Low-density single-family residences are mixed with agricultural use and open space areas along the intakes and conveyance alignments. Schools located within the noise and vibration study area are Courtland Elementary School and Walnut Grove Elementary School. A large portion of the study area in Sacramento County consists of the Stone Lakes National Wildlife Refuge. A discussion of noise effects on species present in the refuge is found in Chapter 13, *Terrestrial Biological Resources*. Effects of noise on recreational use are discussed in Chapter 16, *Recreation*.

Existing Ambient Sound Levels in Sacramento County

Sound-level monitoring was conducted at two locations using SoftdB Piccolo Type II sound-level meters (SLMs). The locations are shown in Figure 24-2. The purpose of the measurements was to characterize the traffic noise pattern throughout a typical day/night cycle near the intake construction areas and along the northern section of the tunnel alignment. Sound-level data was collected continuously over a period of at least 24 hours at each site, beginning Tuesday, October 20 and ending Thursday, October 22, 2020. The two measurements were conducted in the town of Hood, one about 200 feet from SR 160/River Road, and the other about 200 feet from Hood-Franklin Road. The daytime average hourly sound level values were higher than nighttime average values, indicating a day-night pattern typical of populated areas, as traffic volumes decrease during nighttime hours. Daytime average hourly levels were measured in a range of 51.0 to 52.6 dBA 1-hour L_{eq}, and nighttime average hourly levels were measured in a range of 46.7 to 50.2 dBA 1-hour L_{eq}. Given the proximity of these sites to roads, reduced vehicle use during coronavirus disease 19 (COVID-19) pandemic conditions may have resulted in lower overall sound levels compared to pre-COVID-19 conditions. A summary of the noise survey results is shown in Table 24-2. Detailed hourly sound-level monitoring values are included in Appendix 24C, *Ambient Sound Level Charts from Field Measurement*, and field observations are included in Appendix 24D*, Sound Level Measurement Field Data Sheets*.

Table 24-2. Sound-Level Measurement Sites, Sacramento County

Site Number	Site Description	Date and Time	Daytime Average 1-hour L_{eq} (dBA)	Nighttime Average 1-hour L_{eq} (dBA)	L_{dn} (dBA)
M01A	Near River Road	October 20, 1:00 p.m. to October 22, 11:00 a.m., 2020	52.6	46.7	54.7
M01B	Near Hood-Franklin Road	October 20, 10:00 a.m. to October 22, 6:00 p.m., 2020	51.0	50.2	56.8

Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibel; 1-hour L_{eq} = equivalent sound level over 1 hour.

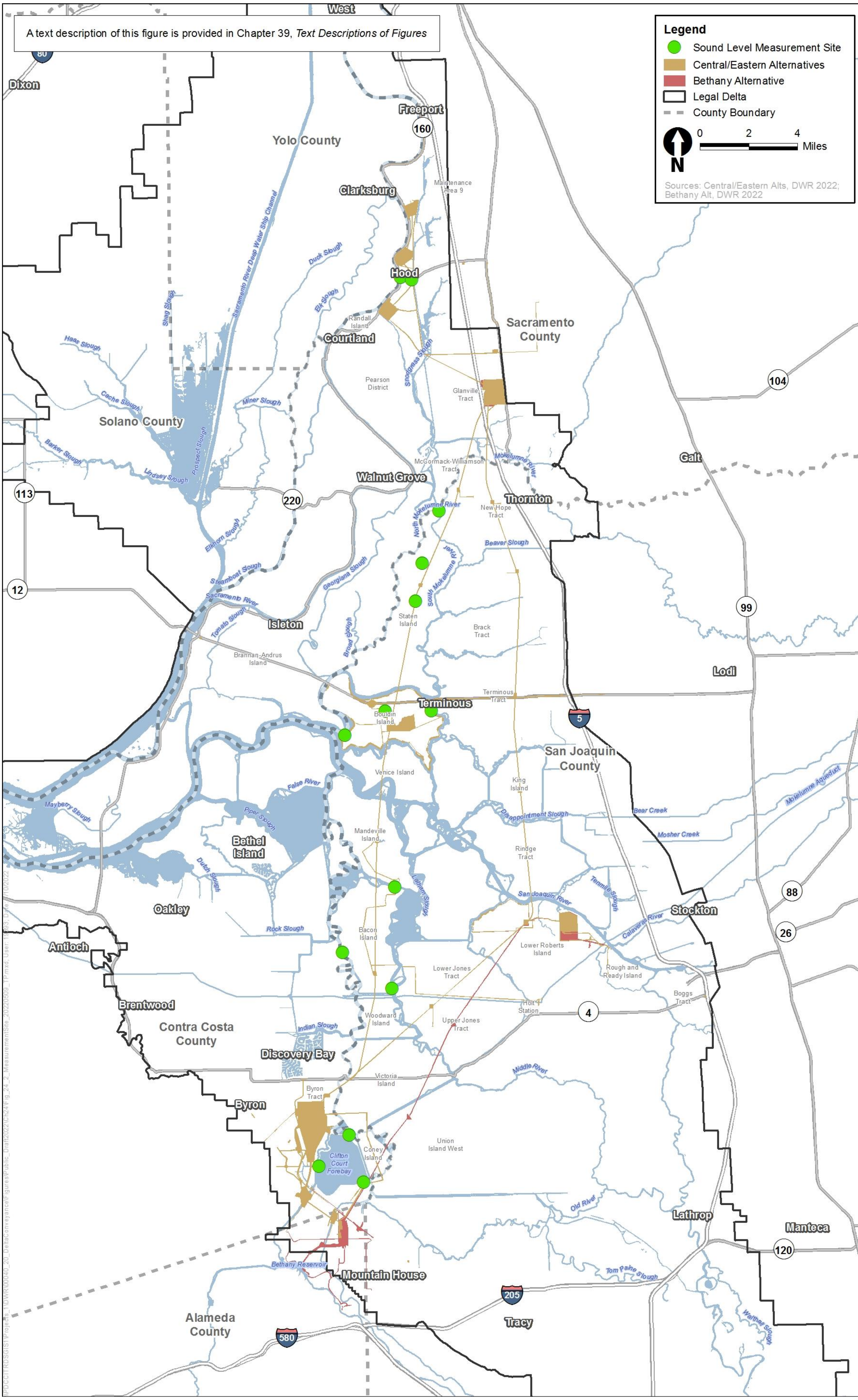

Figure 24-2. Sound-Level Measurement Sites

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24.1.3.2 Yolo County

Existing Sources of Noise

Noise sources in eastern Yolo County in the vicinity of the study area include traffic noise, which occurs primarily along the river frontage road of Riverview Drive/SR 160. Aircraft activity contributes to the noise environment, with flights to and from Sacramento International Airport, Sacramento Executive Airport, and Borges-Clarksburg Airport. Motorized boating is a common source of noise in the Delta, and there are several marinas serving boaters in the study area, including in the population centers of Clarksburg, Walnut Grove, Isleton, and Brannon Island. Nontransportation noise sources include commercial activities in the population center of Clarksburg and use of agricultural equipment in the surrounding area.

Existing Noise-Sensitive Land Uses

Residences, schools, and recreational uses, including marinas, are primary noise-sensitive land uses in the portion of the study area that is in Yolo County. Residential, commercial, and industrial uses are concentrated in the population center of Clarksburg. Low-density, single-family residences are mixed with agricultural use and open space areas located along SR 160 near the river shoreline areas. Schools in the study area include Delta Elementary Charter School, Clarksburg Middle School, and Delta High School. Effects of noise on recreational use are discussed in Chapter 16, *Recreation*.

Existing Ambient Sound Levels in Yolo County

No sound-level measurements were conducted in Yolo County, as no property access permissions were available within the areas that would potentially be affected by noise during construction. The nearest measurements were conducted nearby across the Sacramento River in Sacramento County near the community of Hood, which would be representative of noise levels within 200 feet of a local road. See Section 24.1.3.1, *Sacramento County*, for this discussion.

24.1.3.3 San Joaquin County

Existing Sources of Noise

Noise sources in western San Joaquin County in the vicinity of the study area include traffic noise, which occurs along the main transportation corridors of I-5, SR 4, SR 12, and on the arterials of Walnut Grove Road, and Byron Road. Aircraft activity contributes to the noise environment from flights to and from Sacramento International Airport, Sacramento Executive Airport, Stockton Metropolitan Airport, Kingdon Airpark, Sharpe Army Air Field, and Lodi Airpark. Rail corridors traverse the San Joaquin County portion of the study area from Stockton and Tracy into Contra Costa County. Motorized boating is a common source of noise along the many Delta waterways in this part of the county, and several marina and waterfront resorts are distributed throughout the area, including the community of Terminous. Nontransportation noise sources include commercial and industrial activities in Stockton, including Port of Stockton shipping activities, and the population centers of Thornton and Mountain House.

Existing Noise-Sensitive Land Uses

Residences and recreational uses, including marinas, are primary noise-sensitive land uses in the portion of the study area that is in San Joaquin County. Residential, commercial, and industrial uses are concentrated in Stockton and the population centers of Thornton and Mountain House. Several marina and resort areas are distributed throughout the San Joaquin Delta that include liveaboards in the greater Stockton area and the community of Terminous. Low-density, single-family residences are mixed with agricultural use and open space areas throughout the Delta area.

Existing Ambient Sound Levels in San Joaquin County

Sound-level monitoring was conducted at nine locations using SoftdB Piccolo Type II SLMs. The locations are shown in Figure 24-2. The purpose of the measurements was to characterize the traffic noise pattern throughout a typical day/night cycle at different locations in the study area. Sound-level data was collected continuously over a period of at least 24 hours at each site, between Tuesday, October 20 and Thursday, December 17, 2020. These measurements were conducted on Staten Island, Bouldin Island, and Bacon Island, along the central tunnel alignment. The daytime average sound-level values were higher than nighttime average values at five of the sites, while nighttime average levels were higher at four of the sites. Field staff noted that harvesting equipment and trucks were in use near several of the sites, and birds were also very audible at these locations. Daytime average hourly levels were measured in the range of 46.4 to 57.6 dBA 1-hour L_{eq}, and nighttime average hourly levels were measured in the range of 39.2 to 53.7 dBA 1-hour L_{eq}. None of the monitoring locations in the county were near major roads, and as such reduced vehicle use during COVID-19 conditions was unlikely to influence sound levels during the monitoring period. A summary of the noise survey results is shown in Table 24-3. Detailed hourly sound-level monitoring values are included in Appendix 24C, and field observations are included in Appendix 24D.

Table 24-3. Sound-Level Measurement Sites, San Joaquin County

Site Number	Site Description	Date and Time	Daytime Average 1-hour L_{eq} (dBA)	Nighttime Average 1-hour L_{eq} (dBA)	L_{dn} (dBA)
M03	Center of Staten Island	December 15, 3:00 p.m. to December 16, 4:00 a.m., 2020	57.6	53.7	61.5
M04	West side of Bouldin Island	October 20, 10:00 a.m. to October 22, 6:00 p.m., 2020	44.3	45.6	50.8
M05	Middle of Bouldin Island	October 20, 10:00 a.m. to October 22, 6:00 p.m., 2020	53.7	51.2	57.1
M06	East side of Bouldin Island	October 20, 10:00 a.m. to October 22, 6:00 p.m., 2020	50.2	50.6	57.5
C16A	North end of Staten Island	December 15, 2:00 p.m. to December 17, 11:00 a.m., 2020	52.4	53.7	60.1
C18	Middle of Staten Island	December 15, 2:00 p.m. to December 17, 11:00 a.m., 2020	57.1	53.5	60.7
C20	North end of Bacon Island	December 1, 12:00 p.m. to December 2, 3:00 a.m., 2020	52.2	52.7	59.0
C22	Southeast corner of Bacon Island	December 1, 11:00 a.m. to December 2, 10:00 p.m., 2020	47.4	46.4	52.0
C23	Southwest corner of Bacon Island	December 1, 1:00 p.m. to December 2, 9:00 p.m., 2020	46.4	39.2	47.3

Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibel; 1-hour L_{eq} = equivalent sound level over 1 hour.

24.1.3.4 Contra Costa County

Existing Sources of Noise

Noise sources in eastern Contra Costa County in the vicinity of the study area include traffic noise, which occurs primarily along SR 4 and Byron Road. Aircraft activity contributes to the noise environment from Byron Airport. Two freight rail corridors owned by UPRR extend west from the San Joaquin County line. Motorized boating is a common source of noise along the Delta areas near the cities of Brentwood and Byron, and in the community of Discovery Bay. Nontransportation noise sources include agricultural operations and commercial activities in the population centers of Byron and Brentwood.

Existing Noise-Sensitive Land Uses

Residences and recreational uses, including marinas, are primary noise-sensitive land uses in the portion of the study area that is in Contra Costa County. Residential, commercial, and industrial uses are concentrated in the population centers of Byron, Brentwood, and Discovery Bay. Several marina and resort areas, as well as low-density, single-family residences, are mixed with agricultural use and open space areas throughout the Delta area.

Existing Ambient Sound Levels in Contra Costa County

Sound-level monitoring was conducted at three locations using SoftdB Piccolo Type II SLMs. The locations are shown in Figure 24-2. The purpose of the measurements was to characterize the traffic noise pattern throughout a typical day/night cycle at different locations along the conveyance alignments and in the area of the Southern Complex. Sound-level data was collected continuously over a period of at least 24 hours at each site, between Tuesday, December 15 and Thursday, December 17, 2020. These measurements were conducted in the area of Clifton Court Forebay. The daytime average hourly sound-level values were higher than nighttime average values, indicating a day-night pattern typical of populated areas, as traffic volumes decrease during nighttime hours. Daytime average hourly levels were measured in the range of 43.5 to 48.6 dBA 1-hour L_{eq}, and nighttime average hourly levels were measured in the range of 38.4 to 41.7 dBA 1-hour L_{eq}. A summary of the noise survey results is shown in Table 24-4. Detailed hourly sound-level monitoring values are included in Appendix 24C, and field observations are included in Appendix 24D.

Table 24-4. Sound-Level Measurement Sites, Contra Costa County

Site Number	Site Description	Date and Time	Daytime Average 1-hour L_{eq} (dBA)	Nighttime Average 1-hour L_{eq} (dBA)	L_{dn} (dBA)
S37	Clifton Court Forebay Access Road, Near Kings Island	December 15, 11:00 a.m. to December 17, 11:00 a.m., 2020	48.6	38.4	48.5
S37A	End of Clifton Court Road	December 15, 12:00 p.m. to December 17, 11:00 a.m., 2020	47.0	41.7	49.9
S38A	Southeast of Clifton Court Forebay	December 15, 10:00 a.m. to December 17, 9:00 a.m., 2020	43.5	40.8	45.7

Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
dBA = A-weighted decibel; 1-hour L_{eq} = equivalent sound level over 1 hour.

24.1.3.5 Alameda County

Existing Sources of Noise

Noise sources in the northeastern corner of Alameda County in the vicinity of the study area include traffic noise on Byron Road and a rail corridor that runs parallel to Byron Road. Motorized boating is a source of noise along marina areas in Delta waterways. Agricultural equipment is also a source of noise in this part of the study area.

Existing Noise-Sensitive Land Uses

Residences and recreational uses, including marinas, are the primary noise-sensitive land uses in the portion of the study area that is in Alameda County. Mountain House Elementary School is in the study area. Low-density, single-family residences are mixed with agricultural use and open space areas throughout the portion of the county within the study area.

Existing Ambient Sound Levels in Alameda County

No sound-level measurements were conducted in Alameda County, as no property access permissions were available within the areas that would potentially be affected by noise during construction. The nearest measurements were conducted nearby in Contra Costa County at Clifton Court Forebay, as discussed in the previous section. Ambient noise levels would vary depending on proximity to Byron Highway or arterial roads. For a conservative analysis, the nearest measurements at Clifton Court Forebay are used to describe the lower ambient noise levels in parts of the study area within Alameda County.

24.1.3.6 Solano County

Existing Sources of Noise

Noise sources in the southeastern corner of Solano County in the vicinity of the study area include traffic noise on SR 12 and SR 84. Motorized boating is a source of noise along marina areas in Delta waterways. Agricultural equipment is also a source of noise in this part of the study area.

Existing Noise-Sensitive Land Uses

Residences and waterfront recreational uses are the primary noise-sensitive land uses in the portion of the study area in Solano County, which consists only of areas near the river in the City of Rio Vista that are within 1 mile of the Rio Vista park-and-ride site.

Existing Ambient Sound Levels in Solano County

No sound-level measurements were conducted in Solano County. Noise measurements conducted near Hood in Sacramento County may be considered similar to ambient noise levels in a population center such as the residential neighborhood in the Rio Vista portion of the study area. As discussed in Section 24.1.3.1, *Sacramento County*, daytime average hourly levels were measured in a range of 51.0 to 52.6 dBA 1-hour L_{eq}, and nighttime average hourly levels were measured in a range of 46.7 to 50.2 dBA 1-hour L_{eq}. This is consistent with typical ambient sound levels for a suburban area (Cowan 1994: 40).

24.2 Applicable Laws, Regulations, and Programs

The applicable laws, regulations, and programs considered in the assessment of project impacts on noise and vibration are indicated in Section 24.3.1, *Methods for Analysis*, or the impact analysis, as appropriate. Applicable laws, regulations and programs associated with state and federal agencies that have a review or potential approval responsibility have also been considered in the development of CEQA impact thresholds or are otherwise considered in the assessment of environmental impacts. A listing of some of the agencies and their respective potential review and approval responsibilities, in addition to those under CEQA, is provided in Chapter 1, *Introduction*, Table 1-1. A listing of some of the federal agencies and their respective potential review, approval, and other responsibilities, in addition to those under NEPA, is provided in Chapter 1, Table 1-2.

24.3 Environmental Impacts

This section describes the direct and cumulative environmental impacts to land use in the study area associated with noise and vibration that would result from project construction, operation, and maintenance of the project. This section describes the methods used to determine the impacts of the project and lists the thresholds used to conclude whether an impact would be significant. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant impacts are provided. The analysis contained in this section describes effects to human receptors and associated land uses. For a discussion of noise and vibration effects specific to aquatic biological resources, see Chapter 12, *Fish and Aquatic Resources*. For a discussion of noise and vibration effects specific to terrestrial biological resources, see Chapter 13, *Terrestrial Biological Resources.* For a discussion of noise and vibration effects to specific to recreational resources, see Chapter 16, *Recreation*. Indirect impacts are discussed in Chapter 31, *Growth Inducement*.

24.3.1 Methods for Analysis

24.3.1.1 Process and Methods of Review for Noise

Noise

Noise levels from construction of intakes, shaft sites and facilities, and long-term operation of pumping plants were modeled using the SoundPLAN 8.2 acoustical modeling software, implementing ISO Standard 9613-2: Acoustics—Attenuation of Sound during Propagation Outdoors—Part 2 General Method of Calculation for Propagation Modeling. The standard is designed to calculate sound pressure levels under "average" meteorological conditions that are favorable to propagation. The standard applies downwind and temperature inversion conditions to predict reasonable worst-case sound levels. Sound propagation values in the model used mixed hard/soft ground over land areas and hard ground over water areas.

Project engineering and equipment use data was based on information provided in the engineering project report for the central and eastern alignment alternatives Delta Conveyance Design and Construction Authority 2022a:158–265) and the engineering project report for the Bethany Reservoir alternative (Delta Conveyance Design and Construction Authority 2022b:96–124). Each project feature was modeled and sound levels calculated at sensitive receptor locations identified by a geographic information system (GIS) within 2 miles of project features such as intake sites, shaft sites, levee improvement areas, and concrete batch plants. The model generated a geographic grid map of sound levels around project features to draw sound-level contours for intake features, shaft sites, levee improvement areas, and south Delta areas for visualization of sound levels from construction in the surrounding area from each given project feature. The model calculated noise levels at receptor locations identified from GIS analysis.

Noise levels from construction of linear features, such as roads, SCADA lines and utility corridors, were calculated using standard acoustical methods to develop a combined source level from the three loudest pieces of equipment being used in one location. Noise levels as a function of distance were calculated using point-source attenuation from the combined source, accounting for the ground type (hard or soft) at the construction site. Noise from heavy equipment during construction of linear features would affect different locations at different times, as equipment progresses from the beginning to the end of each construction corridor. As such, a receptor at a given location along a construction corridor would be exposed to increased noise levels from heavy equipment for a short period of time. For linear features, noise levels are reported as a function of distance from the equipment source.

Traffic noise emissions from data tables developed from the Federal Highway Administration FHWA Traffic Noise Model Version 2.5 (TNM) (Federal Highway Administration 1998:7–21, 2004:13–14) were used to develop model predictions of noise levels from traffic.

Vibration

The noise analysis calculated levels of vibration from heavy equipment using typical equipment source levels published by Federal Transit Administration (FTA), and standard acoustical methods. Vibration levels as a function of distance were calculated using point-source attenuation from each type of equipment, assuming average soil conditions.

24.3.1.2 Evaluation of Construction Activities

Each of the major equipment types associated with construction are analyzed using the methods discussed below.

Noise from Pile Driving

Noise levels from pile driving using either impact or vibratory methods are typically higher than noise levels from heavy construction equipment. Pile driving would be used for several project components including intake cofferdams, control structures, and bridges. For each component, pile driving would be done only during daytime hours between 7:00 a.m. and 7:00 p.m. and would occur intermittently on a temporary basis, ceasing once the corresponding phase of construction is complete.

The most extensive pile driving would be done at new north Delta intakes to install casings for intake foundation piers and temporary cofferdams around the intake structure work areas. Prior to cofferdam construction, field investigations would be conducted at an intake site involving temporary installation and testing of piles. Construction assumptions for pile driving, including numbers of pile installations per day are included in the Conceptual Intake Cofferdam Construction (Final Draft) Technical Memorandum, provided in Attachment A of the *Volume 1: Delta Conveyance Final Draft Engineering Project Report—Central and Eastern Options* (C-E EPR) (Delta Conveyance Design and Construction Authority 2022c:1–9).

Timing of in-water pile driving is dependent on migration patterns for special-status fish species. For in-water work, impact pile driving would be done as regulated by National Marine Fisheries Service and U.S. Fish and Wildlife Service, as described under Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources*, in Appendix 3B, *Environmental Commitments and Best Management Practices*. Vibratory driving of pier casings for the intake structure foundations would be done inside the cofferdam and would not be subject to schedule limitations for in-water work.

Prior to construction of main intake structures, interlocking sheet piles would be driven primarily by vibratory methods to install a river-facing cofferdam at each of the intake locations. The sheet piles would be installed and reinforced with horizontal wide flange steel beams and braced to a cutoff wall at the back of the cofferdam. Installation of piles using vibratory methods produces noticeably lower noise levels than when an impact hammer is used.

According to geotechnical analysis of soils around intakes and facility locations in the study area, impact methods to drive sheet piles would rarely be needed to place piles at the required tip depth. Vibratory methods would be used to drive sheet piles and intake foundation pier casings at all locations. Impact driving may be required in some situations where hard or gravelly soil is encountered such that vibratory methods cannot penetrate the soil layer. Based on geotechnical data, impact driving methods are unlikely to be required except for brief periods of time. It is estimated that an impact hammer may be used for up to 2 minutes per pile (Delta Conveyance Design and Construction Authority 2022c:1–9), if required. The durations of pile driving are discussed in more detail in Section 24.3, *Environmental Impacts*.

At intakes, sheet piles would also be driven by vibratory methods for a small retaining wall at one of the electrical buildings. These would be located on the land side of SR 160 at a central location within the intake structure footprint and would be farther away from sensitive noise receptors.

Installation of sheet piles would be required for other project features in the south Delta area using pre-drilling and vibratory methods. Although vibratory methods would primarily be used, impact hammers may be required in some limited cases where hard soils are encountered. The features requiring pile driving vary by project alternative, including the California Aqueduct Control Structure at the Harvey O. Banks Pumping Plant inlet channel, an emergency spillway and the outlet structure at the Southern Forebay, the Delta-Mendota Control Structure, and the Bethany Reservoir Discharge Structure. These are each evaluated according to applicable project alternatives in Section 24.3.

Additional pile driving would be required on a temporary basis for construction of new bridges for project access roads and reconstruction of existing bridges. Some impact driving may be required for installing permanent bridge supports, though vibratory and cast-in-drilled-hole techniques would be used wherever possible. The locations vary by alignment and are evaluated in Section 24.3.

Source levels for pile drivers are based on airborne sound-level measurements of impact and vibratory driving in water, conducted by Washington State Department of Transportation (2018:7.13). The analysis assumed source level measurements for a pile size of 30 inches based on the anticipated use of AZ 48-700 sheet piles, which have a width of 28 inches. The model assumes sheet piles would be driven in pairs. Source levels for individual piles are shown in Table 24-5. As shown in the table, impact methods produce a higher sound level than vibratory methods. Modeled propagation of sound from the equipment source accounted for the attenuation rates of different ground types (water or soil).

Table 24-5. Source Sound Levels for Pile Driving

Pile Size	Location	Driving Method	Date	L_{max} at 50 Feet (dBA)
30-inch steel	Vashon Ferry Terminal, WA	Impact Hammer	12/7/2015	110
30-inch steel	Vashon Ferry Terminal, WA	Vibratory Hammer	11/1/2009	96

Source: Washington State Department of Transportation 2018:7.13.
dBA = A-weighted decibel; L_{max} = maximum sound level; WA = Washington.

Noise from Heavy Construction Equipment

The assessment of potential construction noise levels was based on a methodology developed by the FTA (2018). Construction assumptions for project facilities are described in Section 24.3.3, *Impacts and Mitigation Approaches*. Potential effects associated with construction activities would be temporary; however, the duration relative to noise-sensitive receptors surrounding the construction sites would vary based on the location of the project feature. Noise levels produced by commonly used heavy non-impact construction equipment are summarized in Table 24-6. Individual types of construction equipment are expected to generate maximum noise levels ranging from 76 to 88 dBA at a distance of 50 feet. The construction noise level received at a given noise-sensitive location depends on the type of construction activity, the distance from the source and the ground type between the activity and noise-sensitive receivers.

Table 24-6. Noise Emission Levels Commonly Generated by Heavy Construction Equipment

Equipment	Typical Noise Level (dBA) at 50 Feet from Source
Grader	85
Bulldozers	85
Heavy truck	84
Water truck	84
Loader	80
Roller	85
Paver	85
Air compressor	80
Backhoe	80
Pneumatic tool	85
Excavator	85 [a]
Auger drill rig (for hydrofraise and DMM walls)	85 [a]
Crane, mobile	83
Compactor (ground)	82
Concrete mixer	85
Generator	82
Pump	77

Equipment	Typical Noise Level (dBA) at 50 Feet from Source
Ventilation fan	79 [b]
Concrete batch plant	84 [c]
Asphalt concrete and rock processing plant	84 [c]
Recycling plant	84 [c]

Sources: Federal Transit Administration 2018:176 except as noted.
dBA = A-weighted decibel; DMM = deep mixing method.
[a] Thalheimer 2000:160.
[b] Federal Highway Administration 2006:92.
[c] Brown-Buntin Associates 2003:6.

An inventory of equipment expected to be in service by phase of project construction is discussed in the Section 24.3.3. Utilization factors for construction noise are used in the analysis to develop L_{eq} noise exposure values, based on average minutes of use per hour. The L_{eq} value accounts for the energy average of noise over a specified interval (usually 1 hour), so a utilization factor represents the amount of time a type of equipment may potentially be used during the time interval. The noise modeling conservatively assumes up to 100% utilization for heavy equipment would occur at times throughout the construction period. In practice, over a multi-year construction schedule, equipment utilization factors for a given hour of a workday would vary substantially.

Traffic Noise

Traffic noise levels along highways, local roads, and new haul roads were calculated using haul truck data and haul route information provided in Attachment F, Site Development, Site Access & Logistics, in the Traffic Impact Analysis Technical Memorandum and Facilities Siting Study—Bethany Reservoir Alternative Technical Memorandum (Delta Conveyance Design and Construction Authority 2022d:1–46, 2022e:1–54).

Traffic noise emissions from data tables developed from the Federal Highway Administration TNM (Federal Highway Administration 1998, 2004) were used to develop model predictions of noise levels from traffic.

Traffic noise levels on new haul roads, access roads, and existing roads were modeled using calculated TNM noise emissions methods to estimate distance to the 60, 65, and 70 dBA L_{dn} traffic noise level contours. The C-E EPR and *Volume 1: Delta Conveyance Final Draft Engineering Project Report—Bethany Reservoir Alternative* technical memoranda expressed truck volumes in terms of a volume histogram of projected truck volumes by month, for each project feature. Monthly truck volumes were converted to average daily traffic of trucks using a factor of 10% of monthly volumes, conservatively assuming that truck traffic would vary on a daily basis, up to double the volume of an average day (assuming a month equals 20 work days, 5% of trucks a day would be evenly distributed across the month).

The traffic noise level calculations produced an estimate of traffic-generated noise levels due to heavy truck and increased commuter trips associated with construction of project alternatives. The traffic impacts study provided projections of haul truck monthly volumes by project access road. The maximum truck volume from monthly histograms was used in the noise level calculation for each haul route. These truck volumes were converted to average daily traffic and compared to existing levels based on ambient measurements or existing traffic volumes provided by the California Department of Transportation (Caltrans) and Sacramento, San Joaquin, Alameda, and

Contra Costa Counties, as applicable (California Department of Transportation 2019; County of Sacramento 2021; County of San Joaquin 2021; County of Contra Costa 2014).

Segments of SR 160/River Road would be temporarily realigned inland from fish screen construction areas at each of the new intakes. Haul trucks are not anticipated to use SR 160 as a haul route; however, the realigned road would locate traffic on SR 160 farther landward from receptors on the opposite side of the river. The effects of traffic noise from the temporary alignment of SR 160 are analyzed in terms of distance from the segments of realigned road to the nearest receptors.

Rail

FTA has published and implemented impact assessment procedures and criteria pertaining to noise. Noise and vibration impacts associated with the proposed project are based on guidance in the FTA Manual. The FTA Manual is used for rail projects where conventional train speeds are below 90 miles per hour (Federal Railroad Administration 2012:1-1). As such, the Federal Railroad Administration generally uses noise and vibration guidance from the FTA Manual.

The FTA Manual describes noise impact criteria that have been adopted to assess noise contributions and potential impacts on the existing environment from rail sources. The noise impact criteria defined in the FTA Manual are based on an objective that calls for maintaining a noise environment that is considered acceptable for noise-sensitive land uses.

For assessing noise from transit operations, FTA defines three land use categories.

- Category 1: Tracts of land where quiet is an essential element of their intended purpose, such as outdoor amphitheaters, concert pavilions, and national historic landmarks with significant outdoor use
- Category 2: Residences and buildings where people normally sleep, including homes, hospitals, and hotels
- Category 3: Institutional land uses (e.g., schools, places of worship, libraries) that are typically available during daytime and evening hours. Other uses in this category can include medical offices, conference rooms, recording studios, concert halls, cemeteries, monuments, museums, historical sites, parks, and recreational facilities.

Noise exposure values are reported as the L_{dn} average sound level for residential land uses (Category 2) or 1-hour L_{eq}, the equivalent sound level over a 1-hour time period, for other land uses (Categories 1 and 3). Commercial and industrial uses are not included in the vast majority of cases because they are generally compatible with higher noise levels. Exceptions include commercial land uses with a feature that receives significant outdoor use, such as a playground, or uses that require quiet as an important part of their function, such as recording studios.

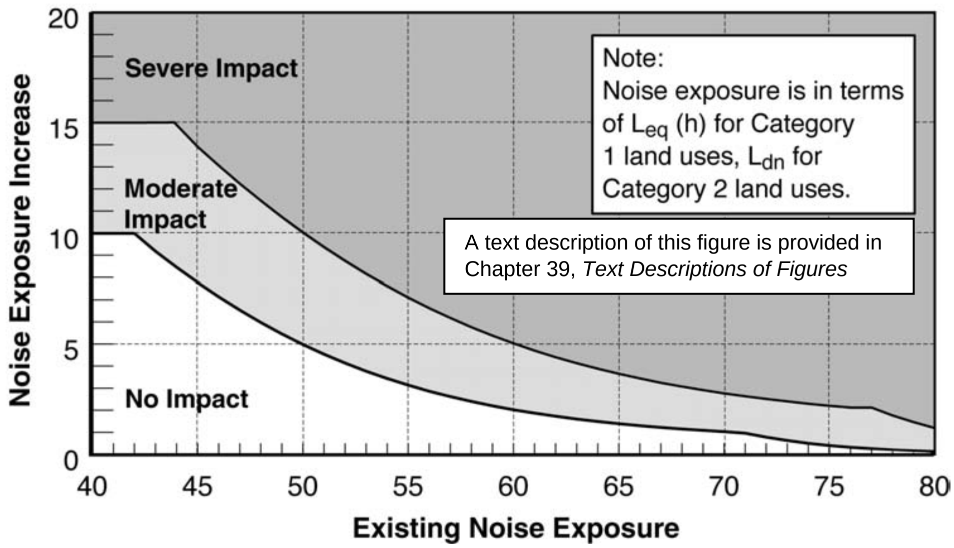
In the FTA Manual, the noise impact criteria for operation of rail facilities consider a project's contribution to existing noise levels using a sliding scale according to the land uses affected. The criteria correspond to heightened community annoyance due to the introduction of a new transit facility relative to existing ambient noise conditions.

Noise impacts are assessed by comparing existing outdoor exposures with future project-related outdoor noise levels, as illustrated on Figure 24-3 (Federal Transit Administration 2018:25). The criterion for each degree of impact is based on a sliding scale that is dependent on the existing noise exposure and the increase in noise exposure due to a project.

The noise impact categories are as follows:

- No Impact: A project, on average, will result in an insignificant increase in the number of instances where people are "highly annoyed" by new noise.
- Moderate Impact: The change in cumulative noise is noticeable to most people but may not be enough to cause strong, adverse community reactions.
- Severe Impact: A significant percentage of people would be highly annoyed by the noise, perhaps resulting in vigorous community reaction.

Impact curves based on community increases in cumulative noise exposure relative to existing conditions are shown in Figure 24-3. The justification for the sliding scale for allowable cumulative noise increase recognizes that people who are already exposed to high levels of noise in the ambient environment are expected to tolerate different levels of increase in noise in their community according to the level of their existing noise exposure.



Source: Federal Transit Administration 2018:25.

Note: noise exposure increase impact curves are adjusted by +5 dB for Category 3 land uses.

Figure 24-3. Increase in Cumulative Noise Levels Allowed by Criteria

Tugboats and Barges

Tugboats would be used to haul barges along waterways for delivery of certain construction materials. Barges would be used for the final stages of the intake construction period to deliver riprap for placement at intakes, haul away material excavated from the river bottom, and place piles and log booms. No barge landings or unloading sites would be constructed. The analysis assumes barges would be transported by up to three 1,500-horsepower tugboats to maneuver around turns in the river, traveling up the Sacramento River from Isleton or south from Sacramento. Evaluation of tugboat noise was conducted using source levels for tugboats to be used and standard acoustical methods. A 1,500-horsepower tugboat has a source level of 89 dBA at 50 feet (Epsilon Associates 2006:8, 29; Hoover and Keith 2000:7-13). Tugboats pulling barges can travel at a speed of about 5 to 6 knots.

Groundborne Vibration from Pile Driving and Heavy Equipment

Groundborne vibration from pile driving and various types of heavy equipment is assessed using methods developed by FTA (2018:182). Attenuation with distance was calculated using standard acoustical methods.

Table 24-7 summarizes typical groundborne vibration levels generated by construction equipment as a function of distance from the source, assuming average soil conditions. The groundborne vibration levels associated with potential building damage generated by construction activities are shown in Table 24-8.

Table 24-7. Groundborne Vibration Levels Commonly Generated by Construction Equipment

	PPV in Inches per Second at Radial Distance from Equipment					
Equipment	25 Feet	40 Feet	50 Feet	100 Feet	160 Feet	280 Feet
Impact pile driver (upper range)	1.518	0.750	0.540	0.190	0.094	0.040
Vibratory pile driver (upper range)	0.644	0.318	0.228	0.081	0.040	0.017
Vibratory roller	0.210	0.104	0.074	0.026	0.013	0.006
Auger drill (for hydrofraise and DMM walls)	0.089	0.032	0.017	0.011	0.005	0.002
Hoe ram	0.089	0.032	0.017	0.011	0.005	0.002
Large bulldozer	0.089	0.032	0.017	0.011	0.005	0.002
Loaded trucks	0.076	0.027	0.015	0.010	0.005	0.002
Jackhammer	0.035	0.012	0.007	0.004	0.002	0.001

Source: Federal Transit Administration 2018:184.
DMM = deep mixing method; PPV = peak particle velocity.

Table 24-8. Maximum Groundborne Vibration Levels for Preventing Damage to Buildings

Building Category	Peak Particle Velocity (PPV, inches/second)
Reinforced concrete, steel, or timber (no plaster)	0.5
Engineered concrete and masonry (no plaster)	0.3
Non-engineered timber and masonry buildings	0.2
Buildings that are extremely susceptible to vibration damage	0.12

Source: Federal Transit Administration 2018:186.

Groundborne Vibration from Tunnel Construction

Vibration sources from construction of the project would include the use of TBMs and associated vehicles and conveyors of material from the TBM to tunnel shaft sites. Vibration from TBM operations occurs at low frequencies, whereas groundborne noise typically is caused by higher frequency vibrations that manifest as audible noise inside of buildings. TBMs and conveyors operating underground during tunnel construction would be the only potential source of perceptible groundborne noise and vibration above ground.

The source levels for groundborne vibration from TBMs are based on published vibration attenuation data described in the Tunneling Effects Assessment (Final Draft) (Delta Conveyance Design and Construction Authority 2022f:21–23).

Aqueduct sections under Alternative 5 would use a roadheader tunneling machine to construct short sections of tunnel. Vibration source data from this type of equipment is assumed to be similar to auger drilling, as shown in Table 24-7.

Noise and Vibration from Removal of Infrastructure and Staging Areas

The removal of equipment and cleanup of staging areas would require the use of trucks and heavy equipment for a short period of time to decommission equipment. This would be assessed using the methods of analysis of non-impact heavy equipment as described above.

Noise Exposure to Workers at Construction Sites

Construction workers would be exposed to noise from heavy equipment used at construction sites. Workers are subject to Occupational Safety and Health Administration (OSHA) standards. The OSHA standard for noise exposure is defined as an 8-hour time-weighted average of 85 dBA. Occupational exposure to noise levels above 85 dBA requires monitoring and mitigation to protect workers from hearing loss. These are referred to as OSHA action levels for noise mitigation, as described in 29 CFR Section 1910.95. It is the contractor's responsibility to provide hearing protection equipment to workers exposed to high noise levels from heavy construction equipment, in compliance with OSHA. Given that on-site workers would be protected under OSHA requirements, no project-related noise impacts on workers would occur during project construction.

24.3.1.3 Evaluation of Operations

Potential loudest-case pump noise levels during operation of the pumping plants and associated facilities were evaluated by calculating sound power levels of the pumps, generators, and facility equipment based on available acoustical specifications, or estimated from horsepower rating (Hoover and Keith 2000:7-13). The operations analysis considered a scenario where continuous operation of equipment would be required during times where high flow rates are needed. The scenario includes continuous operation of pumps, air compressors for air handling, and use of ventilation fans for tunnel shafts and at pumping plants. Backup generators would be installed at each of the intakes, shaft sites, and control structures to maintain continuous power for operations in the event of a power outage. Generators would also be used during dewatering and inspection of tunnels, which is expected to be done every 10 years.

Evaluation of operations would also include an assessment of potential noise levels from routine maintenance of the intake facilities, pumping plants, and forebay. This would include trucks, maintenance vehicles, dredging equipment, and other equipment requirements. However, this is anticipated to be only an occasional and intermittent source of noise on a permanent basis. Equipment used during operation and maintenance would involve occasional use of non-impact heavy equipment and rubber-tired vehicles, which are not significant sources of vibration.

Noise Exposure to Workers during Operation and Maintenance

Requirements to protect workers from hearing loss are the same as those for construction. Occupational exposure to noise levels above 85 dBA requires monitoring and mitigation to protect workers from hearing loss. It is the responsibility of California Department of Water Resources (DWR) to provide hearing protection equipment to workers exposed to high noise levels from heavy equipment, in compliance with OSHA. Given that on-site workers would be protected under OSHA requirements, no project-related noise impacts on workers would occur during operation and maintenance.

24.3.2 Thresholds of Significance

The proposed project would be considered to have a significant impact if it would result in any of the conditions listed below.

- Generation of substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
  - **Noise during Construction (Heavy Equipment, Pile Driving, Tugboats)**

    Between the hours of 7:00 a.m. and 10:00 p.m., noise levels during project construction would be considered to exceed daytime noise criteria where overall equipment noise levels are predicted to exceed 60 dBA on an hourly L_{eq} basis, AND overall equipment noise levels are predicted to increase by 5 dB or more relative to existing daytime ambient noise levels at sensitive receptor locations, as determined through a sound-level monitoring program.

    Between the hours of 10:00 p.m. and 7:00 a.m., noise levels during project construction would be considered to exceed nighttime noise criteria where overall equipment noise levels are predicted to exceed 50 dBA on an hourly L_{eq} basis, AND overall equipment noise levels are predicted to increase by 5 dB or more relative to existing nighttime ambient noise levels at sensitive receptor locations, as determined through a sound-level monitoring program.

    These criteria used are based on DWR Standard Specification 05-16 (California Department of Water Resources 2005:01570-12). If these criteria are exceeded, the impact analysis evaluates the temporal frequency, duration, and intensity of construction noise to determine whether a significant noise impact requiring mitigation would occur.
  - **Noise from New Rail Infrastructure**

    Impacts from train activity on new rail spurs, grade crossings, and associated rail infrastructure would be considered significant if noise levels from new train activity would result in a “severe impact” as defined by FTA. The noise exposure curves defining the category of “severe impact” are shown in Figure 24-3. The criteria used are from FTA guidance (Federal Transit Administration 2018:25).
  - **Noise from Increased Traffic on Haul Roads**

    An impact from increased traffic on haul roads would be considered significant if it results in a distinctly noticeable change relative to existing conditions based on the average increase in traffic noise over existing ambient levels. An increase of 5 dB over existing levels is a discernible change (Federal Highway Administration 2011:10). The existing ambient sound-level values are based on sound-level monitoring or existing traffic volume data from counts conducted on state roads by Caltrans or on county roads by the respective counties.

If this criterion is exceeded, the impact analysis evaluates the temporal frequency, duration, and intensity of increased traffic to determine whether a significant noise impact requiring mitigation would occur.

- **Permanent Noise from Operation of the Project**

  Significance of noise impacts from operation of project features, such as intakes, pumps, and maintenance vehicles is evaluated based on the noise standard from the applicable local jurisdiction of the project feature.

- Generation of excessive groundborne vibration or groundborne noise levels.

  - **Vibration during Construction**

    Groundborne vibration from heavy equipment such as pile drivers or TBMs would be considered to result in a significant impact if vibration levels are predicted to exceed FTA construction vibration damage criteria of 0.20 PPV for "non-engineered timber and masonry buildings" or 0.12 PPV for "buildings extremely susceptible to vibration damage." The criteria used are from FTA guidance (Federal Transit Administration 2018:186).

    In addition to building damage, the potential for annoyance of building occupants due to vibration was evaluated from criteria developed by Caltrans. Vibration from intermittent sources may be perceptible at a level of 0.04 in/sec PPV (California Department of Transportation 2020:38)

    Groundborne noise from TBMs would be a significant impact if groundborne noise levels inside of buildings exceeds the FTA criteria of 35 dBA for low-frequency vibration (approximately 30 Hz) (Federal Transit Administration 2018:123).

- Placement of project-related activities in the vicinity of a private airstrip or an airport land use plan, or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, resulting in exposure of people residing or working in the project area to excessive noise levels.

24.3.2.1 Evaluation of Mitigation Impacts

CEQA also requires an evaluation of potential impacts caused by the implementation of mitigation measures. Following the CEQA conclusion for each impact, the chapter analyzes potential impacts associated with implementing both the Compensatory Mitigation Plan and the other mitigation measures required to address potential impacts caused by the project. Mitigation impacts are considered in combination with project impacts in determining the overall significance of the project. Additional information regarding the analysis of mitigation measure impacts is provided in Chapter 4, *Framework for the Environmental Analysis*.

24.3.3 Impacts and Mitigation Approaches

This analysis describes noise and vibration effects under the No Project Alternative and construction and operation under each of the project alternatives. An analysis of impacts related to the No Project Alternative and the project alternatives in 2040 is provided in Appendix 24E, *Noise and Vibration 2040 Analysis*.

24.3.3.1 No Project Alternative

As described in Chapter 3, *Description of the Proposed Project and Alternatives,* CEQA Guidelines Section 15126.6 directs that an EIR evaluate a specific alternative of "no project" along with its impact. The No Project Alternative in this analysis represents the circumstances under which the project (or project alternative) does not proceed and considers predictable actions, such as projects, plans, and programs, that would be predicted to occur in the foreseeable future if the Delta Conveyance Project is not constructed and operated. This description of the environmental conditions under the No Project Alternative first considers how noise and vibration could change over time and then discusses how other predictable actions could affect noise and vibration.

Future Noise and Vibration Conditions

Under future conditions, sea level rise and changing hydrologic conditions may increase the probability of levee failures. A levee failure would require the use of a considerable amount of heavy equipment for emergency flood-fighting and cleanup actions, commensurate with the size of the flood. The presence of heavy equipment and associated transportation would be expected to generate a considerable amount of noise in the areas they are protecting, but these types of actions would only occur on an emergency basis. On a more routine basis, maintenance and repair of levees would continue to periodically require use of heavy equipment for levee improvement projects.

In addition to the above, ambient traffic noise levels in the vicinity of roads would likely increase relative to existing conditions. The level of increase relative to any receptor would depend on site-specific development, population growth, and socioeconomic factors. An average annual vehicle traffic volume increase of 2% to 3% from 2020 to 2040 would result in a noise level increase in the range of 2 to 3 dB. An increase of this magnitude would generally not be noticeable over this time horizon.

Predictable Actions by Others

A list and description of actions included as part of the No Project Alternative are provided in Appendix 3C, *Defining Existing Conditions, No Project Alternative, and Cumulative Impact Conditions*. As described in Chapter 4, *Framework for the Environmental Analysis,* the No Project Alternative analyses focus on identifying the additional water-supply-related actions public water agencies may opt to follow if the Delta Conveyance Project does not occur.

Public water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Project Alternative (Appendix 3C).

Desalination plants, water recycling facilities, groundwater management facilities and water efficiency projects would be constructed to supply water to the coastal and inland regions that would have received water under the Delta Conveyance Project. In general, more projects would be required in the south Delta, where the additional supply would be needed to meet regional demand for water. Multiple facilities would be built and would require use of heavy equipment for construction of elements such as water conveyance infrastructure, structures, access roads and other needed infrastructure. The construction of each facility would result in a temporary increase in ambient noise at construction sites and along equipment and materials transportation routes. Although these construction-related increases in noise would be temporary, they may result in noise levels exceeding daytime criteria. Concrete pours requiring continuous work would likely exceed nighttime noise criteria at the nearest receptors. Road and utility work may also be required during nighttime hours in some cases. Water supply actions requiring the largest facilities, such as desalination plants and major water recycling/treatment facilities, are expected to generate the most noise because of their size and time needed for their construction. Other actions with smaller footprints, such as water conservation measures or groundwater storage, are expected to generate less noise when compared to other actions.

Operation of the project would involve ongoing use of pumps and air handlers, and intermittent use of maintenance equipment. As with construction, the amount of noise generated would be dependent on the type and location of the facility being operated. Projects with exposed infrastructure, such as groundwater injection and extraction pumps, may produce more noise than those water supply projects housed in closed structures. Noise-attenuating features could be incorporated into facility structures to minimize noise from operations. An analysis of impacts related to the No Project Alternative in 2040 is provided in Appendix 24E.

24.3.3.2 Impacts of the Project Alternatives Related to Noise and Vibration

Impact NOI-1: Generate a Substantial Temporary or Permanent Increase in Ambient Noise Levels in the Vicinity of the Project in Excess of Standards Established in the Local General Plan or Noise Ordinance, or Applicable Standards of Other Agencies

Alternatives 1, 2c

Project Construction

Intakes B and C (4,500 and 6,000 cfs Capacity)

Construction equipment types at intakes were modeled under different scenarios to describe sound levels at different locations of pile driving when combined with heavy equipment. By modeling different construction equipment configurations and combinations, the model calculated a range of sound levels that individual receptors would potentially be exposed to over the construction period, which is estimated to be 12 years. However, the magnitude of noise levels reported in this analysis would occur on a nonconsecutive basis over this timeframe.

At each intake, temporary in-river cofferdams and permanent training walls would be constructed with interlocking sheet piles. Pile driving would only occur at one intake structure at a given time; however, two vibratory pile drivers may be used simultaneously during building of cofferdams. Impact drivers would only be used where a hard soil layer cannot be penetrated using a vibratory method. Impact pile driving would be done during the in-water work period regulated by National Marine Fisheries Service and U.S. Fish and Wildlife Service, as described under Environmental Commitment EC-14: *Construction Best Management Practices for Biological Resources* in Appendix 3B, *Environmental Commitments and Best Management Practices*. Pile driving would be restricted to the daytime hours between 7:00 a.m. and 7:00 p.m. and would not occur at night. The analysis assumes that nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required.

The construction process for intakes is described in the C-E EPR. The conceptual intake cofferdam construction analysis determined that piles would be driven primarily using vibratory methods. According to pile drivability studies, for complete construction of an intake cofferdam, vibratory hammers are anticipated to be used for a total of up to 255 hours, for each intake location (Delta Conveyance Design and Construction Authority 2022c:1–9). On a given day, the amount of pile driving would vary but may occur at any time within the allowable work hours of 7:00 a.m. to 7:00 p.m. until all cofferdam piles are installed. Impact hammers would be used only if hard soils are encountered. Based on geotechnical analysis, it is expected that, for each pile, impact driving would be required for a period of 2 minutes, and vibratory driving would be used for the remainder of the time. Accounting for all piles that would be driven for each intake's cofferdam and training walls, an impact hammer would be used for a total of up to 18 hours. While the times of pile driving would vary based on timing requirements of in-water work, impact pile driving at the intake would cease once the cofferdam and training wall construction is complete. The balance of the 12-year construction schedule would involve the use of some vibratory pier casing driving and standard heavy equipment to build the rest of the intake components.

In addition to construction-phase pile driving, a pilot study would be done prior to construction to test sheet pile installation methods at one of the intake sites. This is discussed below under *Field Investigations*.

Contour maps depicting modeled sound levels from new facilities are shown in Appendix 24A, *Sound Level Contours.* Tables of predicted sound levels under each of the modeling scenarios are shown in Appendix 24B, *Construction Sound Level Model Predictions*. The vibratory hammer, in combination with other equipment at intakes may produce a level of up to 97 dBA 1-hour L_{eq} as sheet piles are installed. If impact drivers are used, the combined noise level from an impact hammer pile driver operating simultaneously with noise levels from other equipment in Table 24-6 would produce a combined maximum level of 110 dBA L_{max} at 50 feet. Assuming an impact driving time of 2 minutes per pile every 15 minutes, the loudest level under this condition would be 101 dBA 1-hour L_{eq} at a distance of 50 feet. This value accounts for the fact that the pile hammer would be idle between periods of impact and vibratory driving, as equipment would need to be set up, staged, and realigned during the pile installation process.

Pile driving would also be done to install sheet piles for an electrical service building at a central location on the sedimentation basins within the intake site. This location would be farther away from surrounding receptors, and it is estimated that piles would take a total of about 2 hours of vibratory driving time to install. Noise levels from this feature would be lower overall relative to surrounding receptors than cofferdam construction or general use of heavy equipment on the site.

Foundation piers for the intake structure would be installed using drilled piers constructed of concrete placed inside starter casings and deeper augered pier excavations. The starter casings would be placed using vibratory driving methods, with permanent piers drilled inside and below the casings. Foundation piers would be installed over a period of 18 months.

Standard heavy equipment would be used to construct the rest of the intake components. Including the initial building of supporting infrastructure such as haul roads and power to the intake locations, use of heavy equipment for construction of intakes would occur over an estimated 12 years. The heavy equipment types assumed used in the model for the intake site are a bulldozer, truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization. Over time, the riverfront and jurisdictional levees that would be constructed around the intake structure would provide some terrain shielding from heavy equipment and operation activities within the intake work area. As a result, noise levels from heavy equipment would be expected to be reduced over time. However, for this conservative analysis, factors related to facility attenuation during construction are not included in the model.

The existing hourly ambient sound levels are based on the nearest location of noise monitoring conducted for this analysis, at the south end of the town of Hood. Result tables in Appendix 24B show predicted sound levels at receptors from pile drivers and heavy equipment.

The existing measured ambient daytime sound level is 51 dBA 1-hour L_{eq}, based on the nearest monitoring location. To meet daytime criteria for project-related noise that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime noise limit for intakes and the Twin Cities Complex facilities.

The existing measured ambient nighttime sound level is 47 dBA 1-hour L_{eq}, based on the nearest monitoring location. To meet nighttime criteria for project-related noise that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 52 dBA 1-hour L_{eq} is used as the nighttime noise limit for intakes and the Twin Cities Complex facilities.

The results of the modeling analysis, as shown in Table 24-9, indicate that during periods of vibratory or impact pile driving, up to 117 residences within 2 miles of the intake locations would be exposed to construction noise exceeding the 60 dBA 1-hour L_{eq} daytime noise limit. During intake construction activities other than cofferdam construction, heavy equipment may intermittently exceed the daytime noise limit of 60 dBA 1-hour L_{eq} at a total of 9 residences, with the highest receptor noise level approaching 67 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, during nightwork, use of heavy equipment would exceed the 52 dBA 1-hour L_{eq} nighttime limit at up to 147 residences.

Table 24-9. Land Use Affected by Noise during Construction of Intakes B and C

Construction Activity	Total Duration of Construction Activity	Utilization (% of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
Vibratory pile driving (cofferdam, training walls, foundation piers) and heavy equipment (intake components)	21 months for each intake [c]	25% for pile drivers, up to 100% for heavy equipment	117 residences	N/A [f]
Impact pile driving (cofferdam and training walls) and heavy equipment (intake components)	18 hours total driving time [d] or 2 minutes per pile [e]	12% for pile drivers, up to 100% for heavy equipment	117 residences	N/A [f]
Nighttime concrete pours	Total of up to 1 month for each intake [g]	100%	N/A [h]	147 residences
No impact pile driving, heavy equipment only	12 years	Up to 100%	9 residences	None

N/A = not applicable.
[a] Average % of time per hour equipment is at full power.

[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
[c] The duration would be reduced to 14 months for Alternative 2c because the intake would be designed for a flow rate of 1,500 cfs instead of 3,000 cfs under Alternative 1.
[d] Total driving time for Alternative 2c would be reduced to 10 hours.
[e] Accounting for active pile installation drive times only. The cofferdam and training wall pile installation would occur over a longer period during regulatory in-water work periods.
[f] Pile driving is restricted to the hours of 7:00 a.m. to 7:00 p.m.
[g] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.
[h] During the day, concrete pours would occur at the same time as other earthmoving and heavy equipment activity.

Twin Cities Complex Double Launch Shaft and Concrete Batch Plant along Lambert Road

Heavy equipment at the Twin Cities Complex launch shaft and the concrete batch plant along Lambert Road were modeled at the perimeter of the site and at interior locations to model a range of sound levels that each individual receptor would potentially be exposed to over the construction period. The types of heavy equipment used in the model are the three loudest types of equipment that may be used near one another at a given time. The heavy equipment types used in the model for the Twin Cities site are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization. Each batch plant at the Lambert site would have a sound level of 84 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization over the term of construction.

The modeling for these features used the same criteria as Intakes B and C. Predicted sound levels at receptors from heavy equipment are shown in Appendix 24B, Table 24B-4. The results of the modeling analysis, as shown in Table 24-10, indicate heavy equipment may intermittently exceed the daytime noise limit of 60 dBA 1-hour L_{eq} at five residences, with the highest noise level approaching 71 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours where continuous working of concrete is required. Concrete production at the batch plant would be required periodically during nighttime hours for tunnel shaft pours and intake concrete pours. According to modeling, when night work is required, use of heavy equipment at the same levels of service would exceed the 52 dBA 1-hour L_{eq} nighttime limit at up to 12 residences.

Table 24-10. Land Use Affected by Noise during Construction of the Twin Cities Complex and Operation of the Lambert Concrete Batch Plant

Construction Location/ Activity	Total Duration of Construction Activity	Utilization (% of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
Twin Cities Complex				
Buildout, RTM stockpiling, Shaft operations	12 years	Up to 100%	3 residences	None
Nighttime concrete pours	Up to 1 month [c]	100%	N/A [d]	10 residences
Lambert Concrete Batch Plant				
Concrete production	12 years	Up to 100%	2 residences	2 residences (for up to 5 months total duration [e])

RTM = reusable tunnel material; N/A = not applicable.

[a] Average % of time per hour equipment is at full power.
[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
[c] During the day, concrete pours would occur at the same time as other earthmoving and heavy equipment activity during buildout, RTM stockpiling and shaft operations.
[d] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.
[e] Shaft sites using concrete from the batch plant would have night pours for up to 2 months total accounting for all shaft sites, and each intake would have night pours for a total of 1 month.

Tunnel Shafts and Levee Improvements along the Central Alignment

Heavy equipment at the tunnel shafts along the central alignment were modeled at the perimeter of each site and at interior locations to model a range of sound levels that each individual receptor would potentially be exposed to over the construction period. Heavy equipment for levee improvements were modeled at each levee improvement location, at nearest locations to surrounding receptors. The types of heavy equipment used in the model are the three loudest types of equipment that may be used near one another at a given time. The heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization would occur over the term of construction.

The existing hourly ambient sound levels are based on monitoring conducted at Bouldin Island, which had the lowest average measured levels among these locations. Predicted sound levels from heavy equipment at individual receptors are shown in Appendix 24B. The existing measured ambient daytime sound level is 44 dBA 1-hour L_{eq}, based on the nearest monitoring location. To meet daytime criteria for project-related noise that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime limit for tunnel shafts and levee improvements along the central alignment.

The existing measured ambient nighttime sound level was 46 dBA 1-hour L_{eq}, based on the nearest monitoring location. Since this value is higher than the daytime measured value, the lower value of 44 dBA 1-hour L_{eq} is used to be conservative, because typically daytime levels are lower than nighttime levels. To meet the nighttime criteria for project-related noise that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 50 dBA 1-hour L_{eq} is used as the nighttime limit for tunnel shafts and levee improvements along the central alignment.

The results of the modeling analysis shown in Table 24-11 indicate heavy equipment may intermittently exceed the daytime noise limit of 60 dBA 1-hour L_{eq} at 247 residences, with the highest noise level approaching 64 dBA 1-hour L_{eq}. This would occur during levee improvements on Bouldin Island. Work during nighttime hours would consist only of certain concrete pours that would need to be done continuously. All night work would be done at shaft sites. According to modeling, when night work is required, use of heavy equipment would exceed nighttime criteria at up to five residences.

Table 24-11. Land Use Affected by Noise during Construction of Tunnel Shafts and Levee Improvement Areas, Central Alignment

Construction Location /Activity	Total Duration of Construction Activity	Utilization (% of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
New Hope Maintenance Shaft				
Buildout, shaft operations	12 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	N/A	4 residences
Staten Island Maintenance Shaft				
Buildout, shaft operations	12 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	N/A	1 residence
Bouldin Island Launch and Reception Shaft				
Buildout, RTM stockpiling, shaft operations	12 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	N/A	None
Bouldin Island Levee Improvements				
Earthwork	up to 1 month in a given location	Up to 100%	247 residences	None
Mandeville Island Maintenance Shaft				
Buildout, shaft operations	12 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	N/A	None
Bacon Island Reception Shaft				
Buildout, concrete production, shaft operations	12 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	N/A	None

RTM = reusable tunnel material; N/A = not applicable.
[a] Average % of time per hour equipment is at full power.
[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
[c] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.

Southern Complex and South Delta Conveyance Facilities

Heavy equipment used during construction of the Southern Complex, pumping plants, reusable tunnel material (RTM) stockpile and South Delta Conveyance Facilities was modeled both at the perimeter of each feature and at interior locations to describe the range of sound levels that each individual receptor would potentially be exposed to over the entire period of construction.

Construction of the emergency spillway and outlet structure of the Southern Forebay and the California Aqueduct Control Structure would require temporary installation of sheet piles, which would be removed after in-water work is complete. Pile driving would be done using vibratory methods. Noise levels during periods of pile driving are described in Section 24.3.1.2, *Evaluation of Construction Activities*. The vibratory installation method in combination with other heavy equipment at the Southern Complex and South Delta Conveyance Facilities may produce a level of up to 97 dBA 1-hour L_{eq} as sheet piles are installed.

For general construction exclusive of pile driving, the heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization. Multiple batch plants would supply concrete for continuous pours over the course of construction. Each batch plant at the Southern Complex would have a sound level of 84 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization. Predicted sound levels from heavy equipment at receptor locations are shown in Appendix 24B.

The existing hourly ambient sound levels are based on monitoring conducted around Clifton Court Forebay.

The existing measured ambient daytime sound level is 44 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet daytime criteria for project-related noise that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime noise limit for the Southern Complex and South Delta Conveyance Facilities.

The existing measured ambient nighttime sound level is 38 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet nighttime criteria for project-related noise that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 50 dBA 1-hour L_{eq} is used as the nighttime noise limit for the Southern Complex and South Delta Conveyance Facilities.

The results of the modeling analysis shown in Table 24-12 indicate heavy equipment may intermittently exceed the daytime noise limit of 60 dBA 1-hour L_{eq} at three residences, with the highest noise level approaching 73 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, when night work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime limit at six residences during operation of the concrete batch plants and pours at the pumping plant and Byron Tract working shaft and four residences during pours at the south forebay outlet structure double launch shaft and the California Aqueduct double reception shaft.

Table 24-12. Land Use Affected by Noise during Construction of the Southern Complex and South Delta Conveyance Facilities

Construction Location/Activity	Total Duration of Construction Activity [1]	Utilization (% of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
Southern Forebay Pumping Plant, Embankments, Inlet Structure Launch Shaft, Byron Tract Working Shaft				
Buildout, Shaft operations, Concrete Production	12 years	Up to 100%	None	3 residences (for up to 3 months)
Nighttime concrete pour at pumping plant	1 month [c]	100%	N/A	3 residences

Construction Location/Activity	Total Duration of Construction Activity [1]	Utilization (% of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
Southern Forebay Emergency Spillway				
Vibratory pile driving	23 hours total driving time, installed over 44 days	25%	1 residence	N/A [d]
South Forebay Outlet Structure and Double Launch Shafts				
Vibratory pile driving	30 hours total driving time, installed over 56 days	25%	1 residence	N/A [d]
Nighttime concrete pours	1 month [c]	100%	N/A [e]	1 residence
California Aqueduct Control Structure and South Delta Outlet and Control Structure Double Reception Shaft				
Buildout	12 years	Up to 100%	None	None
Vibratory pile driving	61 hours total driving time, installed over 116 days	25%	1 residence	N/A [d]
Nighttime concrete pours	1 month [c]	100%	N/A [e]	3 residences

N/A = not applicable.
[a] Average % of time per hour equipment is at full power.
[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
[c] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.
[d] Pile driving is restricted to the hours of 7:00 a.m. to 7:00 p.m.
[e] During the day, concrete pours would occur at the same time as other earthmoving and heavy equipment activity.

Construction of Bridges, New Access Roads, Road Improvements, and Park-and-Ride Lots

Potential heavy equipment noise levels from construction of roads and park-and-ride lots are shown in Table 24-13. The analysis assumes that the three loudest equipment types may be used within the same area at the same time.

Road construction would require building of new bridges and reconstruction of some existing bridges for project facility access roads to central conveyance alignment facilities. Piles and piers would be installed for bridge supports and trestles. Noise levels during periods of pile driving are described in Section 24.3.1.2. Specifications of pile driving for new bridges and bridge widenings to accommodate new access roads are provided in Appendix 24F, *Pile Driving Specifications for New Bridges on Haul Routes*. The model assumes an average percentage of time pile driving would be active (up to 17% of the time during pile installation), accounting for equipment set up time when the pile hammer would be idle. The total number of days required for pile installation at bridges would vary between 4 and 45 days. Pile driving would only be done during daytime hours of 7:00 a.m. to 7:00 p.m., and vibratory driving would be used where possible, although it is anticipated impact pile driving would be required for bridge support piles. Accounting for all bridges, the daytime noise level criteria would be exceeded at up to 450 residences for a period of up to 45 days.

Noise level contours for bridges, road improvements, new access roads, and park-and-ride lots are shown in Appendix 24A.

For road construction, the model conservatively assumes simultaneous use of a grader, a roller, and a paver. Assuming up to 100% equipment utilization for a given hour of day, the combined noise level of these pieces of equipment within work areas is 90 dBA 1-hour L_{eq} at 50 feet.

The results shown in Table 24-13 indicate that noise-sensitive land uses within 700 feet of an active road construction area could be exposed to heavy equipment noise in excess of the daytime (7:00 a.m. to 10:00 p.m.) noise limit of 60 dBA 1-hour L_{eq}. The nighttime limit of 50 dBA 1-hour L_{eq} would be exceeded at a distance of 1,600 feet. However, construction of roads would affect different locations at different times, as equipment progresses over time from the beginning to the end of the road alignment. As such, noise levels at a given location are expected to exceed the indicated limits for only a short-term period of time. Park-and-ride lots would be constructed over a larger area and would likely result in readily noticeable noise levels for a temporary but longer period of time at the nearest receptors, compared to roads.

Table 24-13. Heavy Equipment Noise Levels from Construction of Roads and Park-and-Ride Lots

Distance between Source and Receiver (feet)	Calculated 1-hour L_{eq}
50	90
100	82
150	77
300	69
400	66
500	64
700	60
1,000	56
1,600	50
2,000	48

Notes: Calculations are based on Federal Transit Administration 2018:172–187. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
1-hour L_{eq} = equivalent sound level over 1 hour.

Construction of Utilities and SCADA Lines

Potential reasonable worst-case equipment noise levels from construction of power transmission and SCADA lines were evaluated by combining the noise levels of the three loudest pieces of equipment that would likely operate at the same time (a crane, a truck, and a drill rig for overhead work; two trucks, and an excavator for installation of underground cables). Overhead and underground equipment profiles for this activity would produce similar noise levels, and as such the overground equipment profile is used in this analysis. Assuming up to 100% utilization, the combined noise level is 89 dBA 1-hour L_{eq} at 50 feet, as shown in Table 24-14. The results shown in Table 24-14 indicate that noise-sensitive land uses within 650 feet of an active utility construction area could be exposed to heavy equipment noise in excess of the daytime (7:00 a.m. to 10:00 p.m.) noise limit of 60 dBA 1-hour L_{eq}. Construction of utilities and SCADA lines would affect different locations at different times, as equipment progresses over time from the beginning to the end of the utility or SCADA line corridor. As such, noise levels at a given location are expected to exceed the indicated limits for less than a week's time. Noise level contours for SCADA line construction are shown in Appendix 24A.

Helicopters would be used to install 36 transmission towers to serve the Southern Complex. Helicopters would be required to hover for up to 25 days at 10 hours per day during construction of transmission towers around Clifton Court Forebay. Light- and medium-duty helicopters have a source level of up to 84 dBA L_{max} at a reference distance of 500 feet (Nelson 1987:19/3-19/37). There are no residences within 1,000 feet of the utility corridor where helicopters would be used. Given that noise exposure to helicopters at receptors nearest to the utility corridor would be isolated to a single brief event during daytime hours, helicopters are not considered to contribute significantly to ambient noise levels during construction.

Table 24-14. Predicted Noise Levels from Construction of Utilities and SCADA lines

Distance between Source and Receiver (feet)	Calculated 1-hour L_{eq}
50	89
100	82
150	77
300	69
400	66
500	63
650	60
1,000	55
1,600	50
2,000	48

Notes: Calculations are based on Federal Transit Administration 2018:172–187. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
1-hour L_{eq} = equivalent sound level over 1 hour.

<u>Truck Traffic on Haul Roads</u>

Haul trucks and worker commutes would result in increased traffic noise levels along haul routes, which include existing roads connecting to new roads that would be constructed to access project intakes, tunnel shaft sites, and new facilities.

Haul Route to New Intake Access Roads, Twin Cities Complex, and Lambert Concrete Batch Plant

The haul route to intakes would include I-5, Lambert Road, and a new haul road that would connect to Lambert Road. Lambert Road would be widened between Franklin Boulevard and the new intake haul road to accommodate intake truck traffic. Approximately 1 mile of Franklin Boulevard north of Twin Cities Road would be shifted slightly to the west for railroad service to the Twin Cities Complex. Traffic noise modeling results are shown in Table 24-15. The results include temporary use of concrete mixer trucks during nighttime concrete pours. According to modeling, during nighttime concrete pours, the increase in traffic noise would exceed 5 dB along Lambert Road and new intake haul roads. This would exceed the traffic noise increase criterion at one residence on Lambert Road and two residences on Corky Lane during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 month for each intake.

Table 24-15. Traffic Noise Levels on Haul Roads to Intakes, Twin Cities Complex and Lambert Road Concrete Batch Plant

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to Nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing Plus Project L_{dn}, dBA	Increase, dBA
I-5	57,700	490	100	74	74	0
Lambert Road	557	490	100	55	60 [b]	+5 [b]
Franklin Blvd	557	490	700	50	50	0
Intake B haul road	N/A	150	100	55	60 [b]	+5 [b]
Intake C haul road	N/A	340	100	55	61 [b]	+6 [b]
Twin Cities Road	5,558	240	75	60	62	+2

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level; N/A = not applicable.
[a] Based on noise measurement data or most recently counted traffic volumes, whichever value is greater.
[b] Value shown is for highest truck volumes during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 month for each intake. During concrete pours and other hauling activity occurring only during daytime hours, the value would be reduced by 2 dB.

Haul Route to New Hope Tract Maintenance Shaft

This haul route would construct a new haul road to the shaft site and would include I-5, Walnut Grove Road, Vail Road and Lauffer Road. Traffic noise modeling results are shown in Table 24-16. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 week. According to modeling results, the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-16. Traffic Noise Levels on New Hope Tract Access Roads

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to Nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing Plus Project L_{dn}, dBA	Increase, dBA
I-5	57,700	70	100	74	74	0
Walnut Grove Road	3,638	70	75	58	58	0
Vail Road	238	70	75	50	53 [b]	+3
Lauffer Road	27	70	500	50	50	0

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level.
[a] Based on noise measurement data, or traffic volumes, whichever value is greater.
[b] Value shown is for highest truck volumes during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 week. During concrete pours and other hauling activity occurring only during daytime hours, the Ldn value would be reduced by 1 dB.

Haul Route to Staten Island Maintenance Shaft

This haul route would construct a new driveway to the shaft site and would include I-5, Walnut Grove Road and Staten Island Road. Traffic noise modeling results are shown in Table 24-17. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. According to modeling results, the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-17. Traffic Noise Levels on Staten Island Access Roads

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to Nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing Plus Project L_{dn}, dBA	Increase, dBA
I-5	57,700	70	100	74	74	0
Walnut Grove Road	3,638	70	75	58	58	0
Staten Island Road	176	70	50	50	54 [b]	+4

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level.

[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

[b] Value shown is for highest truck volumes during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 week. During concrete pours and other hauling activity occurring only during daytime hours, the Ldn value would be reduced by 2 dB.

Haul Route to Bouldin Island

This route would involve construction of new access roads from SR 12 to Bouldin Island Road. SR 12 would also be widened for additional haul traffic. Traffic noise modeling results are shown in Table 24-18. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. According to modeling results, the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-18. Traffic Noise Levels on Bouldin Island Access Roads

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to Nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing Plus Project L_{dn}, dBA	Increase, dBA
SR 12	18,200	150	100	69	69	0
Bouldin Island Road	N/A	150	100	51	55 [b]	+4

ADT = average daily traffic; dBA = A-weighted decibel; L_{dn} = day-night level; SR = State Route; N/A = not applicable.

[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

[b] Value shown is for highest truck volumes during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 week. During concrete pours and other hauling activity occurring only during daytime hours, the Ldn value would be reduced by 2 dB.

Haul Routes to Mandeville Island Maintenance Shaft and Bacon Island Reception Shaft

This haul route would include SR 4, Lower Jones Road, and Bacon Island Road to serve the Bacon Island shaft site. The route would extend from there to a new access road at Mandeville Island shaft site. Traffic noise modeling results are shown in Table 24-19. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. For the Mandeville Island Maintenance Shaft, mixer trucks would travel from the concrete batch plant at the Bacon Island Reception Shaft. According to modeling results, the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-19. Traffic Noise Levels on Mandeville and Bacon Island Access Roads

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to Nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing Plus Project L_{dn}, dBA	Increase, dBA
SR 4	15,400	150 [b]	100	68	68	0
West Lower Jones Road	257	150 [b]	175	52	55 [c]	+3
Bacon Island Road	178	150 [b]	100	52	56 [c]	+4
Mandeville Access Road	N/A	65	100	52	55 [c]	+3

ADT = average daily traffic; dBA = A-weighted decibel; L_{dn} = day-night level; SR = State Route; N/A = not applicable.

[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

[b] Combined haul volumes for both Bacon Island and Mandeville Island.

[c] Value shown is for highest truck volumes during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 week. During concrete pours and other hauling activity occurring only during daytime hours, the Ldn value would be reduced by 2 dB.

Haul Routes to Southern Complex

This route would connect new facility access roads on Byron Tract to Byron Highway. Traffic noise modeling results are shown in Table 24-20. According to modeling results, the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-20. Traffic Noise Levels on Southern Complex Access Roads

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to Nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing Plus Project L_{dn}, dBA	Increase, dBA
I-205	83,000	600 [b]	100	75	75	0
Byron Highway	11,504	600 [b]	100	67	67	0
SR 4	15,400	600 [b]	100	68	68	0
Site Access Roads	N/A	600 [b]	500	50	51	+1

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level; SR = State Route; N/A = not applicable.

[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

[b] Assuming a maximum daily haul volume of approximately 1,200 trucks in a day, distributed among north and south routes.

Temporary Realignment of State Route 160

Segments of SR 160/River Road would be temporarily realigned inland at fish screen construction areas at Intakes B and C. Haul trucks are not anticipated to use SR 160 as a haul route. The realigned road would locate traffic on SR 160 further from the nearest residences across the Sacramento River. After construction of the levee is complete, the segment of SR 160 crossing the intake would be relocated within about 100 feet of the same horizontal alignment as the existing SR 160. Because the road would be moved farther from the nearest receptors on a temporary basis and returned to nearly the same alignment once construction is complete, the change in traffic noise from SR 160 would not be noticeable.

Park-and-Ride Lots

New park-and-ride facilities would be used for parking of commuter vehicles and transportation by bus to work sites. Vehicle activity in the park-and-ride lot would include parking of commuter vehicles and operation of buses transporting workers to and from work sites. Modeling results for the five park-and-ride lots proposed for the project are shown in Table 24-21. According to modeling results, the increase in noise related to use of park-and-ride lots is not expected to exceed the criterion of 5 dB above existing levels at the receptors nearest to the park-and-ride lots, and the increase resulting from operation of park-and-ride lots would result in no impact, as defined by FTA (CEQA conclusions are shown at the end of the discussion of this alternative). Park-and-ride lots would have some nighttime use by construction workers during continuous concrete pours, which may be done for up to 1 month at each of these locations. The nighttime use of park-and-rides would be temporary and would cease once concrete pours are complete.

Table 24-21. Predicted Noise Levels from Operation of Park-and-Ride Lots

Park-and-Ride	Distance to nearest Receptor (feet)	Commuter Vehicle Round Trips per Day	Bus Round Trips per Day	Existing L_{dn}, dBA [a]	Existing Plus Project L_{dn}, dBA	Increase, dBA
Rio Vista	>1,000	200	20	64	64	0
Hood-Franklin	>1,000	200	20	61	61	0
Charter Way	50	200	20	60	60	0
Byron	100	200	20	56	58	+2
Bethany	50	200	20	56	58	+2

dBA = A-weighted decibel; L_{dn} = day-night level.

[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

Commuter Traffic

Construction employee commuter routes would be distributed among the main arterials including SR 12 and Byron Highway. Worst-case peak hour traffic noise modeling results are shown in Table 24-22. According to modeling results, the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along commuter routes, on a peak hour basis.

Table 24-22. Traffic Noise Levels on Commuter Routes

Road	Existing Intersection Volume	Project Increase	Centerline Distance to Nearest Receptor (feet)	Existing 1-hour L_{eq}, dBA [a]	Existing Plus Project 1-hour L_{eq}, dBA	Increase, dBA
Byron Highway	850	170	100	62	63	+1
SR 12	875	205	100	62	63	+1

dBA = A-weighted decibel; 1-hour L_{eq} = hourly-equivalent noise level; SR = State Route.
[a] Based on modeled traffic volumes.

<u>*New Rail Infrastructure*</u>

New rail spurs extending from UPRR track would be added to move RTM, tunnel segments, and other building materials. This analysis assumes that up to 3 trains may use each of the new spurs on a given day, with each train consisting of an average of 2 locomotives and 50 rail cars.

Twin Cities Launch Shaft

At the Twin Cities launch shaft, Franklin Road would be realigned to the west, by a distance of approximately 100 feet. A railroad siding would be added parallel to the UPRR mainline along the northbound side of the realigned section of Franklin Road. Track would also be added parallel to the perimeter of the launch shaft facility to provide loading and staging area for rail cars. The new track would be categorized as a rail yard as defined by FTA. The FTA *Noise and Vibration Impact Assessment Manual* indicates that receptors located within 1,000 feet of a rail yard would trigger the need for a quantitative noise analysis (Federal Transit Administration 2018:35). There are two residences to the south of the facility, approximately 150 feet away. Noise measurements obtained at Staten Island are representative of this location, considering similar proximity to arterial roads, and as such a value of 60 dBA Ldn is used to describe ambient levels at this location. There are projected to be four train movements per 24-hour day on the Twin Cities rail spurs, which run parallel to the southern perimeter of the facility, and as such, train use at the facility may result in a noise level increase of about 1 dBA compared to existing levels. An increase of this magnitude would not be noticeable above ambient conditions and would be categorized as “no impact” under FTA criteria. The new rail yard would also be located approximately 1,050 feet away from a residence east of Franklin Road, which would be farther than the screening distance indicated by FTA.

There is existing rail activity on the UPRR rail line parallel to Franklin Road with grade crossings requiring sounding of horns at the intersection of Lambert Road and Franklin Road, and across Mokelumne School Road. New at-grade crossings would be added to the realigned segment of Franklin Road along the eastern perimeter of the facility. Locomotives are required to sound horns within 0.25 mile of at-grade crossings. The grade crossings would both be approximately 1,750 feet from the nearest residence, which is greater than the screening distance of 1,600 feet for quantitative analysis of horn noise. As such, noise from new grade crossings was not considered further.

Southern Complex

At the Southern Complex, a rail spur would extend from UPRR track near the Contra Costa–San Joaquin County line toward the new Southern Forebay. The track would pass within 500 feet of a residence and marina on Clifton Court Road. A sound-level measurement of 50 dBA L_{dn} is representative of this area on noise measurements obtained around the perimeter of Clifton Court Forebay. The project may result in a noise level increase of up to 5 dBA at this location. For a location with an existing level of 50 dBA L_{dn}, an increase of this magnitude would be categorized as "no impact" under FTA criteria. The remainder of the spur would travel through agricultural or vacant land, with the nearest receptors more than 1,000 feet away.

Tugboats and Barges

During construction of permanent project components, barges would only be used to deliver and place riprap and haul away soil material excavated from the river bottom, all during the last stages of intake construction. For each intake, barges would be required for delivery of riprap and removal of soil near the end of the construction period. For Intake B, there would be 47 round trips under both Alternatives 1 and 2c. For Intake C, there would be 34 round trips under Alternative 1, and 27 round trips under Alternative 2c. Barges would travel from north or south along the Sacramento River, two roundtrips per day (excluding weekends) are expected, and each barge may be pulled by up to three tugs to maneuver bends in the river. Assuming a travel speed of 5 knots, noise from three tugs would be noticeable at a shoreline location for approximately 10 minutes for each pass by. As shown in Table 24-23, noise levels may exceed the daytime standard of 60 dBA 1-hour L_{eq} at a distance of up to 500 feet from the source.

Table 24-23. Noise Levels from Tugboats

Distance between Source and Receiver (feet)	Calculated 1-hour L_{eq}
50	81
100	75
150	71
200	69
300	65
400	63
450	62
500	61
600	59

Notes: Calculations are based on Federal Transit Administration 2018:172–187. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further. Noise propagation over water (hard ground) is assumed.

1-hour L_{eq} = equivalent sound level over 1 hour.

Given the infrequent occurrence of tugboat use for the project, the potential exceedance of the daytime standard of 60 dBA 1-hour L_{eq} is not considered to be substantial.

Post-Construction Reclamation

After construction of permanent project features at the intakes, tunnel launch shaft sites, and Southern Complex, portions of the temporary construction areas would be restored to be suitable for habitat or agricultural use. Details regarding duration and equipment requirements for reclamation at each of these sites is described in Attachment H of the C-E EPR (Delta Conveyance Design and Construction Authority 2022g:1–77). In general, similar types of equipment would be used during reclamation as for construction of permanent features, such as scrapers, graders, dozers, and trucks. As such, model results for feature would apply to reclamation activities. These results are discussed above and sound levels by receptor location are shown in Appendix 24A.

Operations and Maintenance

Long-term operation of the project would involve the periodic and sometimes continuous use of pumps within the South Delta Pumping Plant. To accommodate the capacity of flow that may be required, five pumps would operate at 9,000 horsepower, and two pumps would operate at 6,000 horsepower. Without any attenuating features, pumps at this rating could produce steady-state sound levels of 98 to 100 dBA at 50 feet, and a combined sound level of up to 108 dBA with all pumps running at full power. The facility would be designed so that pumps would operate inside of attenuating enclosures within buildings. Furthermore, the nearest receptors to the Southern Complex are more than 1 mile away, and at this distance the operation of the pumps in combination with attenuating features would not be noticeable above ambient sound levels.

Large ventilation fans would be used for equipment air handling, building heating, ventilation, and air conditioning equipment (HVAC), pumping plants, and shaft sites. Operation of this equipment may result in audible noise outside of facilities where the equipment is housed. To reduce fan noise from pumping plants, noise-attenuating enclosures would be installed, and fans would be located inside facility ductwork, rather than at an exterior location. At shaft sites, fans with exhaust silencers may also be used on an occasional basis. Noise-attenuating measures would be specified so that facilities are in compliance with local noise level performance standards.

Maintenance activities would involve periodic use of trucks, heavy equipment, and pumps to remove sediment and conduct other required activities among the tunnel shafts, intakes, and complex sites. These activities would generally occur during daytime hours and would only involve a small number of pieces of equipment. The maintenance activities would occur only occasionally and would not be a noticeable source of noise on a long-term permanent basis.

Alternative 2a

Project Construction

The effects under Alternative 2a would be the same as Alternative 1, except for the addition of Intake A, the additional tunnel from Intake A to Intake B, an extension of the intake haul road to Intake A (including a new bridge over a drainage channel), the Jones Control Structure, the Jones Outlet Structure, the Jones tunnel, and the Delta-Mendota Control Structure. Under this alternative, three intakes would be constructed instead of two, to accommodate the design capacity of 7,500 cubic feet per second (cfs) under this alternative. Construction of Alternative 2a would require approximately 13 years to complete.

Intakes A, B, and C (7,500 cfs Capacity)

Intakes A, B, and C under Alternative 2a were modeled using the same scenarios and criteria described for Alternative 1, applied to three intakes instead of two. The results of the modeling analysis shown in Table 24-24 indicate that during periods of vibratory pile driving, up to 139 residences would be exposed to construction noise exceeding the 60 dBA 1-hour L_{eq} daytime criterion. During intake construction activities, apart from building cofferdams and training walls and installing foundation piers, heavy equipment may intermittently exceed the daytime noise criterion of 60 dBA 1-hour L_{eq} at 15 residences, with the highest noise level approaching 67 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, when night work is required, use of heavy equipment would exceed the 52 dBA 1-hour L_{eq} nighttime criterion at up to 162 residences.

Noise contour maps depicting noise level from new facilities are shown in Appendix 24A. Tables of predicted sound levels under each of the modeling scenarios are shown in Appendix 24B.

Table 24-24. Land Use Affected by Noise during Construction of Intakes A, B, and C

Construction Activity	Total duration of Construction Activity	Utilization (Average % of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
Vibratory pile driving (cofferdam, training walls, foundation piers) and heavy equipment (intake components)	21 months for each intake [c]	25% for pile drivers, up to 100% for heavy equipment	139 residences	N/A [d]
Impact pile driving (cofferdam and training walls) and heavy equipment (intake components)	18 hours (2 minutes per pile) [c]	12% for pile drivers, up to 100% for heavy equipment	139 residences	N/A [d]
Nighttime concrete pours	up to 1 month for each intake [e]	100%	N/A [f]	162 residences
No pile driving, heavy equipment only	13 years	Up to 100%	15 residences	None

N/A = not applicable.
[a] Average % of time per hour equipment is at full power.
[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
[c] Accounting for active pile installation drive times only. The cofferdam pile installation would occur over a longer period of 4-5 months during regulatory in-water work periods.
[d] Pile driving is restricted to the hours of 7:00 a.m. to 7:00 p.m.
[e] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.
[f] During the day, concrete pours would occur at the same time as other earthmoving and heavy equipment activity.

Southern Complex and South Delta Conveyance Facilities

As noted above, the Southern Complex and South Delta Conveyance Facilities would be the same as Alternative 1, with the addition of the Jones Control Structure, Jones tunnel, Jones Outlet Structure and Delta-Mendota Control Structure in the approach channel of Jones Pumping Plant, all of which would be required for a pumping capacity of 7,500 cfs.

Construction of the Delta-Mendota Control Structure would require temporary installation of sheet piles for a bypass channel, which would be removed after facility buildout is complete. Pile driving would be done using vibratory methods. Noise levels during periods of pile driving are described in Section 24.3.1.2. The vibratory pile installation in combination with other heavy equipment at the

Southern Complex and South Delta Conveyance Facilities may produce a level of up to 97 dBA 1-hour L_{eq} as sheet piles are installed.

The results of the modeling analysis shown in Table 24-25 indicate heavy equipment may intermittently exceed the daytime noise level criterion of 60 dBA 1-hour L_{eq} at one residence during periods of pile driving. Nighttime use of heavy equipment would be restricted to certain concrete pours where continuous working of concrete is required. According to modeling, when night work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime criterion at one residence.

Table 24-25. Land Use Affected by Noise during Construction of the Southern Complex and South Delta Facilities, 7,500 cfs

Construction Location/Activity	Total duration of Construction Activity	Utilization (% of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
Delta-Mendota Control Structure				
Buildout	13 years	Up to 100%	None	None
Vibratory Pile Driving	101 hours total driving time, installed over 94 days	25%	1 residence	N/A [c]
Nighttime concrete pours	1 month [d]	100%	N/A [e]	1 residence

N/A = not applicable.
[a] Average % of time per hour equipment is at full power.
[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
[c] Pile driving is restricted to the hours of 7:00 a.m. to 7:00 p.m.
[d] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.
[e] During the day, concrete pours would occur at the same time as other earthmoving and heavy equipment activity.

Construction of Bridges, New Access Roads, Road Improvements, and Park-and-Ride Lots

Construction of these features under Alternative 2a would be the same as Alternative 1, with the addition of a new bridge over a drainage channel that would be constructed for the Intake A haul road. An additional three residences would exceed the daytime criterion during periods of pile driving for a period of 9 days.

Truck Traffic on Haul Roads

Haul Route to New Intake Access Roads, Twin Cities Launch Shaft, and Lambert Concrete Batch Plant

This route would connect new intake access roads from I-5 to Twin Cities, to Franklin Road and Lambert Road. Traffic noise modeling results are shown in Table 24-26. The results include temporary use of concrete mixer trucks during nighttime concrete pours. According to modeling, during nighttime concrete pours, the increase in traffic noise would exceed 5 dB along Lambert Road and new intake haul roads. This would exceed the traffic noise increase criterion at one residence on Lambert Road and two residences on Corky Lane for the duration of nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 month.

Table 24-26. Traffic Noise Levels on Intake Access Roads

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to Nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing Plus Project L_{dn}, dBA	Increase, dBA
I-5	57,700	490	100	74	74	0
Lambert Road	557	490	100	55	60 [b]	+5 [b]
Franklin Road	557	490	700	50	50	0
Intake A access road	N/A	150	100	55	58 [b]	+3
Intake B access road	N/A	300	100	55	60 [b]	+5 [b]
Intake C access road	N/A	490	100	55	61 [b]	+6 [b]
Twin Cities Road	5,558	240	75	60	61	+1

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level; N/A = not applicable.
[a] Based on noise measurement data or most recently counted traffic volumes, whichever value is greater.
[b] Value shown is for highest truck volumes during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 month. Once concrete pours are complete, values would be reduced by 2 dB.

Temporary Realignment of State Route 160

Segments of SR 160/River Road would be temporarily realigned inland from fish screen construction areas at Intake A in addition to Intakes B and C. The effects under Alternative 2a would be the same as Alternative 1.

Operations and Maintenance

The effects under Alternative 2a would be the same as Alternative 1.

Alternative 2b

Project Construction

The effects under Alternative 2b would be the same as Alternative 1, except Intake B and the Intake B access road would not be built, and as such, two residences on Corky Lane would not be affected by haul truck traffic as they would under Alternative 1. Under this alternative, one intake (Intake C) would be constructed instead of two, to accommodate the design capacity of 3,000 cfs.

Intake C (3,000 cfs Capacity)

Intake C under Alternative 2b was modeled using the same scenarios and criteria described for Alternative 1, applied to one intake instead of two. Predicted sound levels at receptors from pile drivers and heavy equipment are shown in Appendix 24B. The results of the modeling analysis shown in Table 24-27 indicate that during periods of vibratory pile driving, up to 17 residences would be exposed to construction noise exceeding the 60 dBA 1-hour L_{eq} daytime criterion. During intake construction activities apart from cofferdam construction and installation of foundation piers, heavy equipment may intermittently exceed the daytime noise criterion of 60 dBA 1-hour L_{eq} at two residences, with the highest noise level approaching 60 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours where continuous working of concrete is required. According to modeling, when night work is required, use of heavy equipment would exceed the 52 dBA 1-hour L_{eq} nighttime criterion at up to 12 residences.

Table 24-27. Land Use Affected by Noise during Construction of Intake C

Construction Activity	Total Duration of Construction Activity [1]	Utilization (Average % of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
Vibratory pile driving (cofferdam, foundation piers) and heavy equipment (intake components)	21 months for each intake [c]	25% for pile drivers, up to 100% for heavy equipment	17 residences	N/A [d]
Impact pile driving (cofferdam) and heavy equipment (intake components)	18 hours (2 minutes per pile) [c]	12% for pile drivers, up to 100% for heavy equipment	17 residences	N/A [d]
Nighttime concrete pours	up to 1 month [e]	100%	N/A [f]	12 residences
No pile driving, heavy equipment only	7 to 9 years	Up to 100%	2 residences	None

N/A = not applicable.
[a] Average % of time per hour equipment is at full power.
[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
[c] Accounting for active pile installation drive times only. The cofferdam pile installation would occur over a longer period of 4–5 months during regulatory in-water work periods.
[d] Pile driving is restricted to the hours of 7:00 a.m. to 7:00 p.m.
[e] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.
[f] During the day, concrete pours would occur at the same time as other earthmoving and heavy equipment activity.

Operations and Maintenance

The effects under Alternative 2b would be the same as Alternative 1.

Alternatives 3, 4c

Project Construction

The effects under Alternatives 3 and 4c would be the same as Alternative 1, except the tunnel shafts along the central alignment would not be built. Instead, the tunnel shafts would be built along the eastern alignment, as described below. In addition, different bridges would be constructed for haul routes under eastern alignment alternatives. Construction of Alternatives 3 and 4c would each require approximately 13 years to complete. However, the magnitude of noise levels reported in this analysis would occur on a nonconsecutive basis over this timeframe.

Tunnel Shafts, Lower Roberts RTM Stockpile, and Levee Improvements along the Eastern Alignment

Heavy equipment at the tunnel shafts and RTM stockpile along the eastern alignment were modeled at the perimeter of each site and at interior locations to model a range of sound levels that each individual receptor would potentially be exposed to over the construction period. Heavy equipment for levee improvements were modeled at each levee improvement location, at nearest locations relative to surrounding receptors. The types of heavy equipment used in the model are the three loudest types of equipment that may be used near one another at a given time. The heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization.

The results of the modeling analysis shown in Table 24-28 indicate heavy equipment may intermittently exceed the daytime noise criterion of 60 dBA 1-hour L_{eq} at 24 residences, with the highest receptor noise level approaching 70 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, when night work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime criterion at up to 42 residences.

Table 24-28. Land Use Affected by Noise during Construction of Tunnel Shafts and Levee Improvement Areas, Eastern Alignment

Construction Location/Activity	Total duration of Construction Activity	Utilization (% of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
New Hope Tract Maintenance Shaft				
Buildout, Shaft operations	13 years	Up to 100%	None	None
Nighttime concrete pours	Up to 1 week [c]	100%	N/A	34 residences
Canal Ranch Tract Maintenance Shaft				
Buildout, shaft operations	13 years	Up to 100%	None	None
Nighttime concrete pours	Up to 1 week [c]	100%	N/A	1 residence
Terminous Tract Reception Shaft				
Buildout, shaft operations	13 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	N/A	2 residences
King Island Maintenance Shaft				
Buildout, shaft operations	13 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	N/A	None
Lower Roberts Island Launch/Reception Shaft				
Buildout, shaft operations	13 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	N/A	5 residences
Lower Roberts Island Levee Improvements				
Earthwork	Up to 1 month in a given location	Up to 100%	19 residences	None
Lower Roberts Island RTM Stockpile				
Buildout, material handling	13 years	Up to 100%	5 residences	None
Upper Jones Tract Maintenance Shaft				
Buildout, shaft operations	13 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	N/A	None

N/A = not applicable; RTM = reusable tunnel material.
[a] Average % of time per hour equipment is at full power.
[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
[c] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.

Construction of Road Improvements, New Access Roads, and Park-and-Ride Lots

The modeling approach under Alternatives 3 and 4c would be the same as Alternative 1.

Road construction would require building of new bridges and reconstruction of some existing bridges for project facility access roads to eastern conveyance alignment facilities. Piles and piers would be installed for bridge supports and trestles. Noise levels during periods of pile driving are described in Section 24.3.1.2. Specifications of pile driving for new bridges and bridge widenings to accommodate new access roads are provided in Appendix 24F. The model assumes an average percentage of time pile driving would be active, accounting for equipment set up time when the pile hammer would be idle. The total number of days required for pile installation at bridges would vary between 1 and 9 days. As for other features, pile driving would only be done during daytime hours of 7:00 a.m. to 7:00 p.m. and vibratory driving would be used where possible, although it is anticipated impact pile driving would be required for bridge support piles. Accounting for all bridges, daytime noise level criteria would be exceeded at up to 193 residences for a period of 1 to 9 days. Noise level contours for bridges, road improvements, new access roads, and park-and-ride lots are shown in Appendix 24A.

Construction of Utilities and SCADA Lines

The modeling approach under Alternatives 3 and 4c would be the same as Alternative 1, using SCADA routes for the eastern alignment. Noise level contours for SCADA line construction are shown in Appendix 24A.

Truck Traffic on Haul Roads, Eastern Alignment

Haul traffic would be the same as Alternative 1 for haul routes to new intakes, Twin Cities Complex Launch Shaft, Lambert Road concrete batch plant, and the Southern Complex. Haul traffic would not occur on other features described under Alternative 1. Additional haul routes required for the eastern alignment alternatives are as described below.

Haul Route to New Hope Tract Maintenance Shaft, Eastern Alignment

This haul route would construct a new haul road to the shaft site and would include I-5, Walnut Grove Road, and Blossom Road. Traffic noise modeling results are shown in Table 24-29. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. The modeling results indicate that the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-29. Traffic Noise Levels on New Hope Tract Access Roads, Eastern Alignment

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing plus Project L_{dn}, dBA	Increase, dBA
I-5	57,700	70	100	74	74	0
Walnut Grove Road	3,638	70	75	58	58	0
Blossom Road	240	70	75	50	54 [b]	+4

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level.
[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

[b] Value shown is for highest truck volumes during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 week. During concrete pours occurring only during daytime hours, Ldn values would be reduced by 2 dB.

Haul Route to Canal Ranch Tract Maintenance Shaft

This route would connect the new maintenance shaft to West Peltier Road. Traffic noise modeling results are shown in Table 24-30. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. The modeling results indicate that the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-30. Traffic Noise Levels on Canal Ranch Tract Access Road

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing plus Project L_{dn}, dBA	Increase dBA
I-5	57,700	65	100	74	74	0
West Peltier Road	2,894	65	200	50	50	0

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level.
[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

Haul Route to Terminous Tract Reception Shaft

This route would connect the new reception shaft to SR 12. Traffic noise modeling results are shown in Table 24-31. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. The modeling results indicate that the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-31. Traffic Noise Levels on Terminous Tract Access Road

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing plus Project L_{dn}, dBA	Increase, dBA
I-5	57,700	70	100	74	74	0
SR 12	18,200	70	100	69	69	0

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level; SR = State Route.
[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

Haul Route to King Island Maintenance Shaft

This route would connect the new maintenance shaft to West Eight Mile Road. Traffic noise modeling results are shown in Table 24-32. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. The modeling results indicate that the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-32. Traffic Noise Levels on King Island Access Road

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing plus Project L_{dn}, dBA	Increase, dBA
I-5	57,700	70	100	74	74	0
West Eight Mile Road	1,000	70	50	56	57	+1

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level.
[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

Haul Route to Lower Roberts Island Launch and Reception Shaft

This haul route would add a new road to the reception shaft site, which would be accessed from West House Road and SR 4. The stockpile area would be accessed via a new bridge and haul road from the Port of Stockton. Traffic noise modeling results are shown in Table 24-33. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. The modeling results indicate that the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-33. Traffic Noise Levels on Lower Roberts Island Access Roads

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing plus Project L_{dn}, dBA	Increase, dBA
SR 4	15,400	140	100	68	68	0
House Road	368	140	75	52	55 [b]	+3
New Access Road	N/A	140	75	52	55 [b]	+3

ADT = average daily traffic; dBA = A-weighted decibel; L_{dn} = day-night level; SR = State Route; N/A = not applicable.
[a] Based on noise measurement data, or traffic volumes, whichever value is greater.
[b] Value shown is for highest truck volumes during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 week. During concrete pours occurring only during daytime hours, L_{dn} values would be reduced by 1 dB.

Haul Route to Upper Jones Maintenance Shaft

This haul route would construct a new road to the shaft site that would be accessed from South Bacon Island Road and SR 4. Traffic noise modeling results are shown in Table 24-34. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. The modeling results indicate that the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-34. Traffic Noise Levels on Upper Jones Tract Access Road

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing plus Project L_{dn}, dBA	Increase, dBA
SR 4	15,400	70	100	68	68	0
Bacon Island Road	178	70	50	52	55 [b]	+3
New Access Road	N/A	70	50	52	55 [b]	+3

ADT = average daily traffic; dBA = A-weighted decibel; L_{dn} = day-night level; SR = State Route; N/A = not applicable.

[a] Based on noise measurement data, or traffic volumes, whichever value is greater.

[b] Value shown is for highest truck volumes during nighttime concrete pours, which would occur on a nonconsecutive basis for approximately 1 week. During concrete pours occurring only during daytime hours, L_{dn} values would be reduced by 1 dB.

Park-and-Ride Lots

Park-and-ride lots under Alternatives 3 and 4c would be the same as Alternative 1, except that the Rio Vista lot would not be built.

New Rail Infrastructure

Lower Roberts Island Railway Connection

The new rail spur on Lower Roberts Island would connect to existing UPRR or BNSF tracks at the Port of Stockton. The spur would travel over a new bridge that would be built over Burns Cutoff, leading to the west stockpile and tunnel segment storage area. At the closest point of approach, the new track would be approximately 1,000 feet away from waterfront residences on the other side of the San Joaquin River facing the port. However, the segment of track at this distance is only about 1,000 feet in length and would turn away from the shoreline as the new track leads to the stockpile area. The track would terminate approximately 1,500 feet south of Windmill Cove Road. The rural setting of Lower Roberts Island is similar to Bacon Island, and the existing ambient sound level would be about 52 dBA L_{dn} based on noise measurements obtained at Bacon Island. There are projected to be two train movements per 24-hour day on the Lower Roberts rail spurs, and train use at the facility may result in a noise level increase of about 1 dBA compared to existing levels. An increase of this magnitude would not be noticeable above ambient conditions and would be categorized as "no impact" under FTA criteria.

Operations and Maintenance

The effects under Alternatives 3 and 4c would be the same as Alternative 1.

Alternative 4a

Project Construction

The effects under Alternative 4a would be the same as Alternative 2a for intakes, intake access roads, and the Southern Complex. The effects would be the same as Alternative 3 for tunnel shafts. Construction of Alternative 4a would require approximately 14 years to complete.

Operations and Maintenance

The effects under Alternative 4a would be the same as Alternative 1.

Alternative 4b

Project Construction

The effects under Alternative 4b would be the same as Alternative 2b for intakes, intake access roads, and the Southern Complex. The effects would be the same as Alternative 3 for tunnel shafts. Construction of Alternative 4b would require approximately 13 years to complete.

Operations and Maintenance

The effects under Alternative 4b would be the same as Alternative 1.

Alternative 5

The effects under Alternative 5 would be the same as Alternative 1 for intakes and intake access roads. The effects would be the same as Alternative 3 for tunnel shafts, except the Lower Roberts Island shaft would be used as a dual launch shaft, Upper Jones maintenance shaft would be in a different location, and a maintenance shaft at Union Island would be added. RTM stockpiles would be permanent on Lower Roberts Island and at the Twin Cities Complex; however, the effects in terms of noise levels would be similar to Alternative 3. Under Alternative 5, the Southern Complex and South Delta Conveyance Facilities would not be built. Instead, the Bethany Reservoir Pumping Plant would be built to convey flows through a new Bethany Reservoir Aqueduct to a new Bethany Reservoir Discharge Structure along the shoreline of Bethany Reservoir. Construction of Alternative 5 would require approximately 13 years to complete. However, the magnitude of noise levels reported in this analysis would occur on a nonconsecutive basis over this timeframe.

Noise contour maps depicting noise level from new facilities are shown in Appendix 24A. Tables of predicted sound levels under each of the modeling scenarios are shown in Appendix 24B.

Project Construction

Tunnel Shafts along the Bethany Reservoir Alignment

Heavy equipment at tunnel shafts was modeled at the perimeter of each feature and at interior locations to model a range of sound levels that each individual receptor would potentially be exposed to over the construction period. The types of heavy equipment used in the model are the three loudest types of equipment that may be used near one another at a given time. The heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization.

The existing measured ambient daytime sound level is 44 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet daytime criteria for project-related noise that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime noise limit for the Bethany Complex.

The existing measured ambient nighttime sound level is 38 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet nighttime criteria for project-related noise that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 50 dBA 1-hour L_{eq} is used as the nighttime noise limit for the Bethany Complex.

The results of the modeling analysis shown in Table 24-35 indicate heavy equipment may intermittently exceed the daytime noise criterion of 60 dBA 1-hour L_{eq} at 25 residences, with the highest noise level approaching 70 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, when night work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime criterion at up to six residences.

Table 24-35. Land Use Affected by Noise during Construction of Tunnel Shafts and Levee Improvement Areas, Bethany Reservoir Alignment

Construction Location/Activity	Total Duration of Construction Activity	Utilization (% of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
Lower Roberts Island Dual Launch Shaft				
Buildout, shaft operations	8 to 10 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	None	5 residences
Lower Roberts Island Levee Improvements				
Earthwork	Up to 1 month in a given location	Up to 100%	19 residences	None
Lower Roberts Island RTM Stockpile				
Buildout, material handling	8 to 10 years	Up to 100%	5 residences	None
Upper Jones Tract Maintenance Shaft				
Buildout, shaft operations	8 to 10 years	Up to 100%	1 residence	None
Nighttime concrete pours	1 week [c]	100%	N/A [d]	1 residence
Union Island Maintenance Shaft				
Buildout, shaft operations	8 to 10 years	Up to 100%	None	None
Nighttime concrete pours	1 week [c]	100%	None	None

N/A = not applicable; RTM = reusable tunnel material.
[a] Average % of time per hour equipment is at full power.
[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.
[c] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.
[d] During the day, concrete pours would occur at the same time as other earthmoving and heavy equipment activity.

Bethany Complex

Heavy equipment used during construction of the Bethany Complex, including the Bethany Reservoir Pumping Plant and Surge Basin, Bethany Reservoir Aqueduct, and the Bethany Reservoir Discharge Structure was modeled both at the perimeter of each feature and at interior locations to describe the range of sound levels that each individual receptor would potentially be exposed to over the entire period of construction, which is estimated to be 13 years. However, the magnitude of noise levels reported in this analysis would occur on a nonconsecutive basis over this timeframe.

Construction of the Bethany Reservoir Discharge Structure would require installation of sheet piles. Pile driving would be done using vibratory methods. Noise levels during periods of pile driving are described in Section 24.3.1.2. The vibratory method in combination with other heavy equipment at the discharge structure may produce a level of up to 97 dBA 1-hour L_{eq} as sheet piles are installed. For general construction exclusive of pile driving, the heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization.

There would be two concrete batch plants at the pumping plant and one controlled low strength material plant along the aqueduct operating continuously during daytime hours, and these were modeled as fixed sources. Each plant would have a sound level of 84 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization. One of the concrete plants would operate during nighttime hours for certain continuous concrete pours at the complex. Predicted sound levels from heavy equipment are shown in Appendix 24B.

The existing measured ambient daytime sound level is 44 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet daytime criteria for project-related noise that both exceeds 60 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 60 dBA 1-hour L_{eq} is used as the daytime noise limit for the Bethany Complex and associated facilities.

The existing measured ambient nighttime sound level is 38 dBA 1-hour L_{eq}, based on the nearest monitoring location at Clifton Court Forebay. To meet nighttime criteria for project-related noise that both exceeds 50 dBA 1-hour L_{eq} and increases ambient levels by 5 dB or more, a value of 50 dBA 1-hour L_{eq} is used as the nighttime noise limit for the Bethany Complex and associated facilities.

The results of the modeling analysis shown in Table 24-36 indicate heavy equipment may intermittently exceed the daytime noise criterion of 60 dBA 1-hour L_{eq} at 12 residences, with the highest noise level approaching 64 dBA 1-hour L_{eq}. Nighttime use of heavy equipment would be restricted to certain concrete pours, where continuous working of concrete is required. According to modeling, when night work is required, use of heavy equipment would exceed the 50 dBA 1-hour L_{eq} nighttime criterion at up to 23 residences.

Table 24-36. Land Use Affected by Noise during Construction of Bethany Reservoir Complex

Construction Location/ Activity	Total Duration of Construction Activity	Utilization (% of time per hour equipment is at full power) [a]	Receptors Exceeding Daytime Criteria [b]	Receptors Exceeding Nighttime Criteria [b]
Bethany Reservoir Pumping Plant, Surge Basin and Aqueduct				
Buildout, concrete production	13 years	Up to 100%	12 residences	None
Nighttime concrete pours	2 months [c]	100%	N/A [d]	23 residences
Bethany Reservoir Discharge Structure				
Buildout	2 years	Up to 100%	None	None
Vibratory pile driving	5 hours total driving time, installed over 10 days	25%	None	N/A [e]

N/A = not applicable.
[a] Average % of time per hour equipment is at full power.
[b] Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.

[c] Total estimated time required, but not consecutive; work would be completed at various times during facility construction.
[d] During the day, concrete pours would occur at the same time as other earthmoving and heavy equipment activity.
[e] Pile driving is restricted to the hours of 7:00 a.m. to 7:00 p.m.

Construction of Bridges, Road Improvements, New Access Roads, and Park-and-Ride Lots

The modeling approach under Alternative 5 would be the same as Alternative 1.

Road construction would require building of new bridges and reconstruction of some existing bridges for project facility access roads to eastern conveyance alignment facilities. Piles and piers would be installed for bridge supports and trestles. Noise levels during periods of pile driving are described in Section 24.3.1.2. Specifications of pile driving for new bridges and bridge widenings to accommodate new access roads are provided in Appendix 24F. The model assumes an average percentage of time pile driving would be active, accounting for equipment set up time when the pile hammer would be idle. The total number of days required for pile installation at bridges would vary between 4 and 9 days. As for other features, pile driving would only be done during daytime hours of 7:00 a.m. to 7:00 p.m. and vibratory driving would be used where possible, although it is anticipated impact pile driving would be required for bridge support piles. Accounting for all bridges, the daytime criteria would be exceeded at up to 163 residences for a period of 4 to 9 days during periods of pile driving. Noise level contours for bridges, road improvements, new access roads, and park-and-ride lots are shown in Appendix 24A.

Construction of Utilities and SCADA Lines

The modeling approach under Alternative 5 would be similar to Alternative 1, using SCADA routes for the Bethany Reservoir alignment. Two transmission towers would also be built: one at the existing Tracy Substation and one at the new pumping plant site. Helicopters would not be used. Noise level contours for SCADA line construction are shown in Appendix 24A.

<u>*Truck Traffic on Haul Roads, Bethany Alternative*</u>

Haul traffic would be the same as Alternative 3 for haul routes to new intakes, Twin Cities Complex launch shaft, Lambert Road concrete batch plant, New Hope Tract maintenance shaft, Canal Ranch Tract maintenance shaft, Terminous Tract reception shaft, and King Island maintenance shaft. Lower Roberts Island would have a dual launch shaft, instead of a launch and reception shaft under Alternative 3. Haul traffic would travel to a different location for the Upper Jones Tract maintenance shaft as compared to Alternative 3, and the Union Island Maintenance Shaft access road would be added. The Southern Complex would not be built. Instead, haul routes would be constructed to access the Bethany Complex and associated facilities. Additional haul routes are as described below.

Haul Route to Lower Roberts Island Dual Launch Shaft

This haul route would add a new road to the shaft site, which would be accessed from West House Road and SR 4. The stockpile area would be accessed via a new bridge and haul road from the Port of Stockton. Traffic noise modeling results are shown in Table 24-37. The results include temporary use of concrete mixer trucks during nighttime concrete pours. According to modeling, during nighttime concrete pours, the increase in traffic noise would exceed 5 dB above existing levels along West House Road and the new access road. This would exceed the traffic noise increase criterion at two residences for the duration of nighttime concrete pours, which would occur for approximately 1 week.

Table 24-37. Traffic Noise Levels on Lower Roberts Island Access Roads

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing plus Project L_{dn}, dBA	Increase, dBA
SR 4	15,400	370	100	68	68	0
West House Road	368	370	75	52	58 [b]	+6
New Access Road	N/A	370	75	52	58 [b]	+6

ADT = average daily traffic; dBA = A-weighted decibel; L_{dn} = day-night level; SR = State Route; N/A = not applicable.
[a] Based on noise measurement data, or traffic volumes, whichever value is greater.
[b] Value shown is for highest truck volumes during nighttime concrete pours, which would be done for up to one month. During concrete pours occurring only during daytime hours, L_{dn} values would be reduced by 2 dB.

Haul Route to Upper Jones Tract Tunnel Maintenance Shaft

This route would include construction of a new haul road that would be accessed from South Bacon Island Road. Traffic noise modeling results are shown in Table 24-38. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. The modeling results indicate that the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-38. Traffic Noise Levels on Upper Jones Tract Access Road

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing plus Project L_{dn}, dBA	Increase, dBA
SR 4	15,400	70	100	68	68	0
Bacon Island Road	176	70	50	52	55 [b]	+3
New Access Road	N/A	70	50	52	55 [b]	+3

ADT = average daily traffic; dBA = A-weighted decibel; L_{dn} = day-night level; SR = State Route; N/A = not applicable.
[a] Based on noise measurement data, or traffic volumes, whichever value is greater.
[b] Value shown is for highest truck volumes during nighttime concrete pours, which would be done for up to one month. During concrete pours occurring only during daytime hours, L_{dn} values would be reduced by 1 dB.

Haul Route to Union Island Tunnel Maintenance Shaft

This haul route would include Bonetti Road, Clifton Court Road, and Tracy Boulevard. Traffic noise modeling results are shown in Table 24-39. The results include temporary use of concrete mixer trucks during nighttime concrete pours, which would occur for approximately 1 week. The modeling results indicate that the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-39. Traffic Noise Levels on Union Island Access Road

Road	Existing ADT	Project Haul Trucks ADT	Centerline Distance to Nearest Receptor (feet)	Existing L_{dn}, dBA [a]	Existing Plus Project L_{dn}, dBA	Increase, dBA
SR 4	15,400	70	100	68	68	0
I-205	83,000	70	100	75	75	0
Tracy Boulevard	4,585	70	100	56	56	0
Clifton Court Road	363	70	100	49	51 [b]	+2
Bonetti Road	108	70	100	49	51 [b]	+2

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level; SR = State Route.
[a] Based on noise measurement data, or traffic volumes, whichever value is greater.
[b] Value shown is for highest truck volumes during nighttime concrete pours, which would be done for up to 1 month. Once concrete pours are complete, values would be reduced by 1 dB.

Haul Routes to Bethany Complex

This route would connect new facility access roads to Byron Highway. A new interchange would be built on Byron Highway at Lindemann Road, a new haul road would connect this interchange to the Bethany Reservoir Pumping Plant site, and a new bypass road would be built from West Grant Line Road to Mountain House Road. Additional haul roads would be built parallel to Mountain House Road and from Mountain House Road to Bethany Reservoir, both of which would be more than 1,000 feet away from the nearest receptors, including Mountain House School. Traffic noise modeling results are shown in Table 24-40. The modeling results indicate that the increase in traffic noise is not expected to exceed the criterion of 5 dB above existing levels at receptors along any of the haul route segments.

Table 24-40. Traffic Noise Levels on Bethany Complex Access Roads

Road [a]	Existing ADT	Project Haul Trucks ADT	Centerline Distance to Nearest Receptor (feet)	Existing L_{dn}, dBA [b]	Existing Plus Project L_{dn}, dBA	Increase dBA
I-205	83,000	600 [c]	100	75	75	0
Byron Highway	11,504	600 [c]	100	67	67	0
Lindemann Haul Road	N/A	600 [c]	400	50	52 [d]	+2 [d]
Grant Line Road	1,000	600 [c]	400	50	52 [d]	+2 [d]
Mountain House Road/Bypass	1,000	600 [c]	400	50	52 [d]	+2 [d]

ADT = average daily traffic; dBA = A-weighted decibel; I- = Interstate; L_{dn} = day-night level; N/A = not applicable.
[a] Access roads where receptors are more than 1,000 feet away are not included in the modeling.
[b] Based on noise measurement data, or traffic volumes, whichever value is greater.
[c] Assuming a maximum daily haul volume of approximately 1,200 trucks in a day, distributed among north and south routes.
[d] Value shown is for highest truck volumes during nighttime concrete pours, which would be done for up to 1 month. Once concrete pours are complete, values would be reduced by 1 dB.

Park-and-Ride Lots

Park-and-Ride lots under Alternative 5 would be the same as Alternative 1, except that the Rio Vista, Byron, and Bethany lots would not be built.

Operations and Maintenance

Long-term operation of the project would involve the periodic and sometimes continuous use of pumps within the Bethany Reservoir Pumping Plant. To accommodate the capacity of flow that may be required to the reservoir, 14 pumps would each operate using 25,000 horsepower motors. Without any attenuating features, pumps at this rating could produce a steady-state sound level of up to 104 dBA at 50 feet, and a combined sound level of up to 116 dBA with all pumps running at full power. However, the pumps would operate deep within the underground structure of the pumping plant and would not produce a significant amount of noise aboveground compared to the air handlers required for equipment cooling.

Large ventilation fans would be used for equipment air handling, building HVAC, pumping plants, and shaft sites. Operation of this equipment may result in audible noise outside of facilities where the equipment is housed. To reduce fan noise from pumping plants, noise-attenuating enclosures would be installed, and fans would be located inside facility ductwork, rather than at an exterior location. Walls and sound absorptive panels would be installed at the outlets of air handling systems at the Bethany Complex. At shaft sites, exhaust silencers may also be used. Noise-attenuating measures would be specified and implemented so that facilities are in compliance with local noise level performance standards. The nearest receptor to the pumping plant at the Bethany Complex is located approximately 0.75 mile away on Kelso Road, and at this distance the operation of the pumps in combination with attenuating features would not be noticeable above ambient sound levels.

Routine operation would require daily maintenance visits to each of the intakes, shaft sites, and other permanent facilities. Maintenance site visits would involve four to six one-way vehicle trips per day to each facility for inspection and janitorial service. Quarterly and annual maintenance activities would involve periodic use of trucks, heavy equipment, and pumps to remove sediment and conduct other required activities among the tunnel shafts, intakes, and complex sites. These activities would generally occur during daytime hours and would only involve a small number of pieces of equipment. The operation and maintenance activities would occur only occasionally and would not be a noticeable source of noise on a long-term permanent basis.

Field Investigations—All Project Alternatives

Field investigations for the project would consist of geotechnical borings, cone penetration testing, test pit, and geophysical surveys. These would be done during daytime hours and would include use of drill rigs, heavy trucks, and worker vehicles. Barges would be used for over water testing. These investigations would occur at different locations within the study area at different times. At any given location, use of equipment would be short-term, generally 1 to 2 days in most locations, or up to 20 days where ground improvement or settlement studies would be conducted.

A pilot study would be conducted to test cofferdam pile installation methods at one of the intake sites. Test piles would be driven from a barge near one of the cofferdam locations, to test pile drivability using impact and vibratory methods up to the required pile tip depth. It is anticipated that sound levels would be measured during the process of pile testing, to determine sound-level values using each method and the performance requirements for potential mitigation options. Pile testing is expected to occur at one site selected among the three intake locations and would take up to 3 days total. This would occur before the intake construction period, and sound levels during testing would use the same modeling assumptions as the cofferdams in the analysis of Intake B. The pile testing would be short-term and would occur during daytime hours. Aerial surveys may involve use of small aircraft, such as drones, helicopters or fixed-wing aircraft. These would occur during daytime hours and would only occur for a brief period of time.

Field investigation activities would occur at a given location for a short amount of time during daytime hours and would cease once the testing is complete. However, depending on testing locations, field investigations may exceed the daytime noise limit at nearby receptors.

CEQA Conclusion—All Project Alternatives

Construction of intakes, shaft sites, control structures, the Southern Complex (or Bethany Complex under Alternative 5), and related facilities would involve the use of heavy equipment at associated construction sites for several years (up to 14 years accounting for all project components), as the tunnels, intakes, and complex facilities are built. According to modeling, heavy equipment noise levels at construction sites for each of these project components would exceed daytime and nighttime noise level criteria at noise-sensitive receptors under all alternatives. The number of receptors affected varies by alternative. The duration of the exceedance of daytime or nighttime criteria relative to noise-sensitive receptors would depend on the type of facility and proximity of receptors to those facility work areas, as described in the above analysis of project alternatives. A summary of receptors where daytime and nighttime criteria would be exceeded according to modeling is shown in Table 24-41.

Table 24-41. Count of Receptors Exceeding Construction Noise Level Criteria, by Project Alternative

	Total Count of Receptors Exceeding Daytime Noise Level Criteria [a, b]		Total Count of Receptors Exceeding Nighttime Noise Level Criteria [a, b]
Project Alternatives	Long-term Buildout of Intakes, Conveyance and Southern Complex or Bethany Complex [c]	Impact and Vibratory Pile Driving for Intakes, Conveyance, and Southern Complex or Bethany Complex [d]	Concrete Pours [e]
1	14 residences	125 residences	177 residences
2a	20 residences	148 residences	193 residences
2b	7 residences	25 residences	42 residences
2c	14 residences	125 residences	177 residences
3	19 residences	130 residences	214 residences
4a	25 residences	153 residences	230 residences
4b	12 residences	30 residences	79 residences
4c	19 residences	130 residences	214 residences
5	35 residences	143 residences	230 residences

[a] Criteria from California Department of Water Resources 2005:01570-12. Daytime = 7:00 a.m. to 10:00 p.m.; nighttime = 10:00 p.m. to 7:00 a.m.

[b] Receptors for this analysis were located within 2 miles of the construction sites.

[c] Duration of project buildout is estimated to be 12 to 14 years, depending on project alternative. However, the magnitude of noise levels reported in this analysis would occur on a nonconsecutive basis over this timeframe. Levee improvement work, estimated to occur for up to 1 month at a given location, is not included in receptor counts for long-term buildout because levee work would be short-term relative to each receptor as construction progresses along the alignments of levees.

[d] Duration of pile driving at project facilities is estimated to be up to 21 months, which would be done on a nonconsecutive basis at intakes during facility buildout. For other facilities and bridges, pile driving is estimated to require 1 to 45 days to complete. A description of pile driving for bridge locations is included in Appendix 24F.

[e] Duration of concrete pours would be 1 week to 1 month for most facilities. Near concrete batch plants, night activity is estimated to occur for up to 4 months.

Construction of roads, park-and-ride lots and utilities would involve use of non-impact heavy equipment on a temporary, short-term basis relative to a given receptor location. Nighttime construction of roads and utilities may be needed in some cases.

Haul trucks and worker commutes would result in increased traffic noise levels along haul routes, which include existing roads connecting to new roads that would be constructed to access project intakes, tunnel shaft sites, and new facilities. Truck use on haul routes would be limited to daytime hours, except for certain concrete pours at intakes, shaft sites, South Delta Conveyance Facilities (under all alternatives except Alternative 5), and the Bethany Complex (under Alternative 5). Concrete mixer trucks would use haul routes at night during these concrete pours, which would take up to one month to complete for each facility. Accounting for nighttime use of concrete mixer trucks, the modeling results indicate that the increase in traffic noise would exceed the criterion of 5 dB above existing levels at a total of three residences for Alternatives 1, 2a, 2c, 3, 4a, and 4c, one residence for Alternatives 2b and 4b, and five residences for Alternative 5. These residences are included in the total impacts shown in Table 24-41.

The realignment of SR 160 at intakes is not expected to result in a noticeable increase in traffic noise at any nearby receptors. New park-and-ride lots at Charter Way, Byron, and Bethany would be located within 100 feet of the nearest receptors, but the increase in terms of L_{dn} levels from operation of park-and-ride lots is not expected to be noticeable at the nearest receptors.

New rail spurs extending from UPRR track would be added to move RTM, and/or tunnel segments and other building materials. Noise from train activity on rail spurs may result in an increase of up to 1 dB at Twin Cities Complex launch shaft, 5 dB at the Southern Complex (in terms of L_{dn}), and 1 dB at the Lower Roberts Island (under Alternatives 3, 4a, 4b, 4c, and 5), which is not considered to be a noticeable increase, and would be categorized as “no impact” under FTA guidelines, as depicted in Figure 24-3. Tugboats pulling barges are expected to be an intermittent source of noise near the end of the construction of intakes, but would not be a substantial source of noise, as they would occur only on an infrequent basis.

Long-term operation of the project would involve the periodic, and sometimes continuous use of pumps and ventilation fans within the South Delta Pumping Plant, (or the Bethany Reservoir Pumping Plant under Alternative 5). The noise from the pumps and ventilation equipment would be attenuated by facility structures, exhaust silencers, and enclosures and is not expected to be audible at the nearest receptors. Maintenance activities would occur occasionally on a periodic basis and would not be a noticeable source of noise on a long-term permanent basis. Based on these factors, noise levels from long-term operation of the project would not exceed criteria for project operation noise.

Construction-related noise would exceed daytime and nighttime noise level criteria at intakes, shaft sites, the Southern Forebay (under all alternatives except Alternative 5), the Bethany Complex (under Alternative 5), and associated infrastructure under all alternatives. Depending on facility location relative to noise-sensitive receptors, the duration of daytime criteria exceedance would vary from 1 week to up to 14 years on a nonconsecutive basis. The duration of nighttime criteria exceedance would vary from 1 week to 5 months on a nonconsecutive basis. The exceedance of daytime and nighttime noise level criteria for these durations would result in a significant impact. Mitigation Measure NOI-1: *Develop and Implement a Noise Control Plan* would reduce noise levels through pre-construction actions, sound-level monitoring, best noise control practices, and installation of noise barriers.

Mitigation Measure NOI-1 would reduce the severity of this impact to less-than-significant levels if property owners elect to participate in the sound insulation program to reduce noise impacts. DWR cannot ensure that property owners will voluntarily participate in the program and accept sound insultation improvements. If a property owner does not elect to participate in the sound insulation program, the impact would remain significant and unavoidable. Conservatively, the impact due to construction noise is determined to be significant and unavoidable after mitigation. However, if improvements required to avoid significant impacts are accepted by all eligible property owners, impacts would be less than significant with mitigation.

Mitigation Measure NOI-1: Develop and Implement a Noise Control Plan

DWR and project contractors will develop and implement a noise control plan consisting of pre-construction actions, sound-level monitoring, best noise control practices, and noise barriers constructed in locations where sound levels from construction are anticipated to exceed daytime or nighttime noise level criteria. The frequency and duration of construction noise are also considered as factors in the implementation of these measures.

Pre-construction Actions

Future investigations test pile sound-level monitoring. Prior to construction, pile testing would be done in the vicinity of one of the future intake locations as a part of field investigations (see discussion under Impact NOI-1). During pile testing, sound-level monitoring would be conducted to measure source sound levels from in-water pile driving. Noise modeling will be updated based on result of test pile sound-level monitoring.[1] Updated sound-level modeling will be used to determine where impacts would occur to receptors due to pile driving, to update the construction noise analysis for all facilities, based on daytime and nighttime noise level criteria described in Section 24.3.2, *Thresholds of Significance*.

Sound Insulation Program.

DWR will coordinate a program to offer sound insulation to property owners of residences and businesses where sound levels during construction of project facilities are predicted to exceed daytime or nighttime noise level criteria for a specified duration, notwithstanding other noise mitigation measures described below. The program would consist of, but would not be limited

[1] Sound level modeling in this Draft EIR is developed for environmental review, to determine whether noise impacts would occur. Modeled source levels used in the Delta Conveyance Project noise analysis are conservative. Source levels measured during test-pile installation would be representative of construction, and inclusion of measured data would improve the accuracy of the model.

to, installation of dual pane windows, new or improved exterior doors, and new HVAC systems for qualifying homes.[2] Updated modeling will identify locations of sensitive receptors that would qualify for sound insulation.[3] The following two categories of residences would be eligible.

- Residences where construction would exceed the daytime criterion of 60 dBA 1-hour L_{eq} for more than 12 months.
- Residences where night work would exceed the nighttime criterion of 50 dBA 1-hour L_{eq} for more than 21 days.

Replacement or acoustical treatment of windows and doors can result in a noise reduction of 5 dB or more in interior rooms, depending on condition of existing construction. New HVAC systems would provide regulated internal temperatures of residential buildings, allowing for inhabitants to close their windows. To reduce the level of impact due to construction noise, this measure would require voluntary participation of all property owners and occupants of residences affected by project-related construction noise. The sound insulation program would continue to be available for property owners to opt in after facility construction begins.

Sound-Level Monitoring

To address additional noise concerns during construction, SLMs will be installed at locations outside construction work areas to collect sound-level data continuously during long-term buildout of facilities (Intakes A, B and C, Twin Cities, and Bethany). SLMs will be located as near as possible to a location equidistant from the construction boundary to the nearest sensitive receptor, at a location where property access for this purpose is allowed. Sound-level data collected at each site will be used to verify compliance with daytime and nighttime noise limits. All SLMs will be programmed to run continuously and have the capability to access data remotely, so that data reviews and compliance reporting can be done on a weekly basis.

A daytime exceedance would occur if on-site equipment or truck noise during daytime hours (7:00 a.m. to 10:00 p.m.) is measured to exceed a daily average of 60 dBA 1-hour L_{eq} for a period of more than 3 days in any 14-day period, or a daily average of 70 dBA 1-hour L_{eq} for a period of more than 1 day in any 14-day period. A nighttime exceedance would occur if on-site equipment or truck noise during nighttime hours (10:00 p.m. to 7:00 a.m.) is measured to exceed a daily average of 50 dBA 1-hour L_{eq} for a period of more than 3 days in any 14-day period.

In the event of an exceedance, DWR will contact affected residents to offer short-term relocation assistance and/or measures stated above for the duration of the time construction is expected to exceed the specified levels.

To reduce the significance of Impact NOI-1 due to construction noise, this measure would require voluntary participation of all property owners of residences affected by project-related construction noise.

Best Noise Control Practices

- <u>Construction hours</u>**.** Construction activities will be restricted to certain hours of the day.

[2] Furnace/heat pump systems are included so that residents can close their windows, reducing interior noise. Homes already with newer systems (installed within the last 8 years) would not qualify for replacement.

[3] The program would be done in coordination with Mitigation Measure AQ-6: *Avoid Residential Exposure to Localized Diesel Particulate Matter*.

  - Pile driving will be limited to the hours between 7:00 a.m. and 7:00 p.m.
  - Construction will not occur during nighttime hours (10:00 p.m. to 7:00 a.m.), except for concrete pours, which, when they occur, will be done on a 24-hour basis as required at each new facility.[4]
  - Off-site haul truck trips on local roads will be limited to the hours between 7:00 a.m. and 7:00 p.m., except for 24-hour concrete deliveries during continuous pours.
  - Where workplace safety standards allow, dedicated backup monitors will be used instead of backup beepers on heavy equipment between 10:00 p.m. and 7:00 a.m.
- Noise shrouds for pile drivers. Shrouds will be used to reduce noise from pile driving. A shroud or noise blanket of sufficient mass installed on pile-driver scaffolding is effective as a noise-reduction method for noise from impact hammers or vibratory pile drivers. A noise blanket has been shown to reduce pile hammer noise by 8 to 23 dBA (Teachout and Cushman 2005:8; Washington State Department of Transportation 2018:7-13).
- Implementation of Quiet Zones around work areas. Construction work areas will include signage indicating areas that will be operated as "Quiet Zones." These signs will be located within areas where residences are more likely to be affected by noise from heavy equipment or trucks. Quiet Zones will limit truck idling time and require shut down of equipment (no idling). The zone will end at a distance approximately 700 feet from the nearest residence.[5]
- Installation of enclosures around noise-generating equipment. If there are one or more dominant sources of noise in fixed locations where enclosures make a noticeable difference in overall ambient levels, then the use of this measure will be appropriate. This measure will substantially reduce levels from a single piece of equipment in a fixed location, such as a generator or ventilation fan. The achievable amount of noise reduction relative to a receptor will vary depending on the enclosure type and the location of equipment. For a given piece of equipment, sound reductions from an enclosure or silencer will typically be in the range of 8 to 25 dBA.

Installation of Temporary Sound Barriers at Work Areas

In the event of an exceedance during sound-level monitoring as defined above, a temporary sound barrier will be used to reduce noise from work areas where it is determined that use of barriers would be effective to reduce noise levels at sensitive receptor locations. A barrier of sufficient dimensions can effectively reduce noise from heavy equipment activity occurring at a construction site to levels below daytime and nighttime noise level criteria at sensitive receptors.

[4] The total durations of continuous pours would range from 1 week to 4 months and are specified for each facility under Impact NOI-1. Pours at a given facility would not be consecutive over the total duration specified for nighttime pours.

[5] This is the distance where heavy equipment noise is expected to be 60 dBA 1-hour L_{eq} or lower, according to modeling.

Mitigation Impacts

Compensatory Mitigation

Although the Compensatory Mitigation Plan described in Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, does not act as mitigation for noise and vibration impacts from project construction or operations, its implementation could result in noise and vibration impacts to sensitive receptors. Construction of compensatory mitigation at the I-5 ponds and Bouldin Island would involve the use of non-impact heavy equipment. Refer to Appendix 3F for a description of the compensatory mitigation activities. The analysis assumes that the three loudest types of equipment that may be used near one another at a given time, relative to a nearby receptor. The heavy equipment types assumed in the model are a bulldozer, a truck, and an excavator, with a combined sound level of 89 dBA 1-hour L_{eq} at 50 feet, assuming up to 100% equipment utilization.

The sound-level results shown in Table 24-42 indicate that noise-sensitive land uses within 650 feet of an active construction area could be exposed to heavy equipment noise in excess of the daytime (7:00 a.m. to 10:00 p.m.) noise criterion of 60 dBA 1-hour L_{eq}. No night work is anticipated. However, construction of the compensatory mitigation would affect different locations at different times, as equipment progresses over time in the habitat improvement areas. As such, noise levels at a given location are expected to exceed the indicated criteria for a short period relative to individual receptors. There are two residences located adjacent to Pond 6 and two residences located adjacent to Ponds 7 and 8 that could exceed the daytime criteria on an intermittent basis. Bouldin Island faces the community of Terminous to the east about 800 feet away and Brannan Island to the west about 1,000 feet away. Construction may exceed daytime criteria on an intermittent basis at the I-5 ponds and at communities facing Bouldin Island.

Table 24-42. Heavy Equipment Noise Levels from Construction of Compensatory Mitigation

Distance between Source and Receiver (feet)	Calculated 1-hour L_{eq}
50	89
100	81
150	76
200	73
300	68
400	65
500	63
650	61
800	57
1,000	55
1,200	53
1,300	52

Notes: Calculations are based on Federal Transit Administration 2018:172–187. Calculations do not include the effects, if any, of local shielding from walls, topography, or other barriers that may reduce sound levels further.
1-hour L_{eq} = equivalent sound level over 1 hour.

While construction-related noise would exceed daytime noise level criteria for compensatory mitigation projects, the duration of such an exceedance would not be substantial considering the size of the work areas and proximity of sensitive receptors to work areas. No night work is anticipated. As such, the construction of compensatory mitigation implemented at Bouldin Island and the I-5 ponds would not contribute to a significant impact.

As described in Appendix 3F, compensatory mitigation would also involve construction at undetermined tidal wetland or channel margin restoration sites within the North Delta Arc. It cannot be known at this time precisely what equipment would be used or what sensitive receptors would be present that would be affected by construction activities at these sites. However, equipment types used are expected to be similar to the Bouldin Island and I-5 ponds compensatory mitigation areas and night work is not anticipated. Although noise from heavy equipment used for compensatory mitigation projects would exceed the daytime noise level criteria at the nearest receptors on an intermittent basis, the duration of such an exceedance would not be substantial. Therefore, the project alternatives combined with compensatory mitigation implemented at tidal wetland or channel margin restoration sites would not contribute to a significant impact.

Other Mitigation Measures

Apart from compensatory mitigation, implementation of mitigation measures identified in the Draft EIR would generally not result in increased noise levels. Some measures, such as the construction of visual barriers or temporary noise barriers, may require use of trucks and heavy equipment for a short duration of time. Night work would not be required.

As such, implementation of other mitigation measures would be unlikely to exceed daytime or nighttime noise criteria.

Overall, increased ambient noise impacts for construction of compensatory mitigation and implementation of other mitigation measures, combined with impacts of project alternatives, would not change the significant and unavoidable impact conclusion.

Impact NOI-2: Generate Excessive Groundborne Vibration or Groundborne Noise Levels

All Project Alternatives

Project Construction

Pile Driving

Sheet piles would be driven at several project components, including intake cofferdams, control structures, bypass structures, and bridges where new roads would be built or existing roads would be widened. Pile drivers may produce perceptible levels of groundborne vibration in the immediate vicinity of the pile hammer. Sheet piles would primarily be driven using vibratory methods, with impact drivers used only in certain situations where hard soils are encountered. Vibration from intermittent sources may be perceptible at a level of 0.04 in/sec PPV. Buildings of fragile construction may be damaged at a vibration level of 0.12 to 0.20 in/sec PPV. Impact drivers produce a level of vibration of 0.04 in/sec PPV at a distance of up to 280 feet under worst-case conditions; however, according to geotechnical studies, impact drivers would be used only where vibratory hammers are not able to penetrate layers where hard soils are encountered. Vibratory drivers produce a level of vibration of 0.04 in/sec PPV at a distance of up to 160 feet and 0.12 in/sec PPV at a distance of up to 75 feet. The nearest receptors to intake pile driving are about 600 feet away. Each of the control structures and bypass structures at the Southern Complex would be located more than 1,000 feet from the nearest sensitive receptor under all alternatives except Alternative 5. The discharge structure and surge basins that would be constructed under Alternative 5 would be located more than 1,000 feet from the nearest sensitive receptor. For new bridges to be reconstructed under the project, pile driving would occur nearer to residences in some locations. The Hood-Franklin bridge would involve driving piles as near as 300 feet away from the nearest residence in the town of Hood, and piles driven for the SR 12 bridge over Little Potato Slough would occur as near as 400 feet away from the nearest residence in the community of Terminous. According to modeling, vibratory drivers would not exceed maximum groundborne vibration levels for annoyance or building damage at any of these locations. Even if impact drivers are briefly used, groundborne vibration levels would still be below annoyance or building damage criteria.

Non-Impact Heavy Equipment

Construction of project facilities, levees, roads, and utilities as well as decommissioning activities would involve the use of non-impact heavy equipment. Non-impact equipment such as bulldozers generate perceptible levels of vibration within approximately 25 feet from the equipment. No sensitive receptors are within 25 feet of any of the project construction areas. During construction of roads and park-and-ride lots, vibratory rollers may be used during rolling of asphalt and construction of embankments, levees, and shaft pads; rollers produce a vibration level of 0.04 in/sec PPV up to 75 feet away from the source. This would potentially produce a perceptible level of vibration at receptors nearest to road and park-and-ride lot construction areas, but vibration at this level would occur at most for a very short time while the roller is in motion along the asphalt surface. Similarly, use of vibratory rollers during construction of embankments and levees may produce a perceptible level of vibration for very short period of time for structures located within 75 feet of work areas, but any perceptible level of vibration would occur only while equipment is operated near structures. Vibration effects from the construction of roads, park-and-ride lots, embankments, levees, and shaft pads would be short-term and intermittent, and the use of heavy equipment in these locations would cease once construction is complete. Therefore, according to modeling, maximum levels of vibration for annoyance or building damage would not be exceeded at any sensitive receptors during use of heavy equipment for project construction.

Tunnel Boring Equipment

ALTERNATIVES 1, 2A, 2B, 2C, 3, 4A, 4B, 4C

The use of TBMs during construction would potentially cause groundborne vibration or groundborne noise in the immediate vicinity of tunnel construction areas. Vibration sources include the TBM and conveyors moving soil, equipment, and construction workers between tunnel shaft sites. The depth of the main tunnel crown would be approximately 103 feet below mean sea level at Intake B, with elevation decreasing at a constant rate to 128 feet below mean sea level at the Southern Forebay’s South Delta Outlet and Control Structure.

Based on the geologic studies conducted to date, the TBM is expected to progress, on average, approximately 40 feet per day based on similar tunneling operations, although the rate of tunneling would depend on soil types encountered. The TBM would operate 20 hours per day, 5 days per week.

For both the central and eastern alignment, the types of receptors nearest to the tunnel alignment are seven single-family residential structures within 50 horizontal feet of the tunnel alignment. Two of these structures are along SR 160 between Intakes A and B, three are at the east end of the town of Hood, one is on Lambert Road, and one is located on Walnut Grove Road. Outdoor use areas are generally not considered to be sensitive to vibration. At locations where residences are within 50 feet of the tunnel, the depth of the tunnel crown would be more than 100 feet below the existing ground surface. At the shallowest tunnel depth of 110 feet, groundborne vibration from a TBM is estimated to be 0.003 in/sec PPV, which is well below the vibration perception limit of 0.04 in/sec PPV and the most stringent building damage vibration level of 0.12 in/sec PPV. As demonstrated by measured ground vibration data from modern tunneling projects, the deep soil cover over the tunnel would effectively dampen and absorb propagated energy from the tunnel crown and the tunnel floor.

During tunnel construction, conveyors hauling workers and material inside of the tunnel would produce localized groundborne vibration. However, conveyors would be operated at slow speeds and would not result in excessive vibrations or groundborne noise from the tunnel floor. Groundborne vibration from tunneling operations is therefore not predicted to exceed limits for groundborne vibration or groundborne noise at sensitive receptors nearest to the tunnel conveyance.

ALTERNATIVE 5

Effects of tunnel boring under Alternative 5, including tunnel sections between the Intakes and the Bethany Reservoir Pumping Plant, would be similar to Alternatives 3, 4a, 4b, and 4c. Some of Bethany Reservoir Aqueduct sections under Alternative 5 would use a road header excavator to construct short tunnel sections between the pumping plant and the discharge structure at Bethany Reservoir. Vibration source data from this type of equipment is assumed to be similar to auger drilling, as shown in Table 24-7. These tunnels are 1,000 feet away from the nearest receptors and vibration would not be perceptible at this distance. Groundborne vibration from tunneling operations is, therefore, not predicted to exceed limits for groundborne vibration or groundborne noise at sensitive receptors nearest to the tunnel conveyance.

Operations and Maintenance

Project operations would involve periodic and sometimes continuous operation of pumps, which are not a significant source of vibration. While pumps and air handlers produce vibration, it would be at levels that would only be noticeable within a localized area, generally less than 50 feet away from equipment. During maintenance, non-impact heavy equipment would occasionally be used within the footprint of conveyance facilities, intakes, and reservoir areas. Non-impact equipment such as bulldozers generate perceptible levels of vibration within approximately 25 feet from the equipment. The use of this equipment would not result in perceptible vibration at the sensitive uses nearest to these facilities, nor would vibration during maintenance result in damage to buildings.

Field Investigations—All Project Alternatives

Field investigations for the project would include installation of piles to test driving methods at one of the intake sites. Pile testing is expected to occur at one site selected among the three intake locations and would take up to 3 days total. The pile testing would be short-term and would occur during daytime hours. Impact drivers produce a level of vibration of 0.04 in/sec PPV at up to 280 feet under conservative conditions. Vibratory drivers produce a level of vibration of 0.04 in/sec PPV at up to 160 feet and 0.12 in/sec PPV at up to 75 feet. Field investigations would be at all facility locations and along the tunnel alignment and would not cause noticeable vibration levels at the nearest residences. Heavy equipment such as bulldozers generate perceptible levels of vibration within approximately 25 feet from the equipment; as such, vibration from heavy equipment is not expected to produce perceptible levels of vibration inside of the nearest residences. Field investigation activities would occur at a given location for a short amount of time during daytime hours and would cease once the testing is complete. For these reasons, vibration during field investigations would not result in perceptible vibration inside of structures or result in building damage.

CEQA Conclusion—All Project Alternatives

Pile drivers would be used during construction of intake cofferdams, control structures, bypass structures, and bridges. The most pile driving would be performed at intakes for the construction of cofferdams and foundation piers. During cofferdam and foundation construction at each intake, vibratory driving would occur intermittently for up to 255 hours, and impact driving would occur intermittently for up to 18 hours over the course of up to 21 months per intake (Delta Conveyance Design and Construction Authority 2022c:8). The analysis compares project vibration levels to the most sensitive building damage vibration level of 0.12 in/sec PPV. With regard to human perception of vibration, impact drivers produce a level of vibration of 0.04 in/sec PPV at a distance of up to 280 feet under worst-case conditions, while vibratory drivers produce this level of vibration at a distance of up to 160 feet. With regard to the building damage criterion, impact drivers produce a level of vibration of 0.08 in/sec PPV at a distance of up to 180 feet under worst-case conditions, while vibratory drivers produce this level of vibration at a distance of up to 100 feet. All sensitive receptors are more than 280 feet away from locations where piles would be installed. Therefore, vibration during pile driving at construction sites is not expected to result in annoyance to sensitive receptors or result in building damage.

Construction of project facilities, levees, roads, and utilities would also involve the use of non-impact heavy equipment. Non-impact equipment such as bulldozers generate perceptible levels of vibration within about 25 feet from the equipment. There are no sensitive receptors located within 25 feet of any of the facility construction areas. Heavy equipment may produce a perceptible level of vibration at receptors nearest to road and park-and-ride lot construction areas, but vibration at perceptible levels would occur only for a short time while equipment passes by structures. The construction of roads and park-and-ride lots would be short-term, and the use of non-impact heavy equipment would cease once construction is complete.

Project operation would involve periodic operation of pumping plants, and at times pumps would run continuously 24 hours a day. Pumps are not a significant source of vibration. During maintenance, non-impact heavy equipment would sometimes be used within the footprint of conveyance facilities, intakes, and Southern Forebay (Bethany Reservoir Pumping Plant under Alternative 5). The use of this equipment would not result in perceptible vibration at the sensitive uses nearest to these facilities, nor would vibration during maintenance result in damage to buildings.

According to modeling, groundborne vibration from construction at project intakes, work areas, and associated infrastructure would not exceed levels associated with building damage or annoyance of receptors inside of structures. The impact of groundborne vibration during construction, operation, and maintenance of the project would be less than significant.

Mitigation Impacts

Compensatory Mitigation

Although the Compensatory Mitigation Plan described in Appendix 3F does not act as mitigation for noise and vibration impacts from project construction or operations, its implementation could result in groundborne vibration and noise impacts during construction.

Construction of ponds and habitat areas for compensatory mitigation would involve the use of heavy equipment including vibratory rollers, which would be used during construction and alteration of levee embankments. Vibratory rollers may produce perceptible levels of groundborne vibration within about 50 feet of the equipment. Non-impact equipment types, such as bulldozers, generate perceptible levels of vibration within about 25 feet from the equipment. There are unlikely to be sensitive receptors located within 50 feet of work areas for channel margin and tidal habitat restoration sites within the North Delta Arc, the I-5 ponds or Bouldin Island, however heavy equipment may occasionally pass by occupied structures. In the event heavy equipment passes by occupied structures, a perceptible level of vibration may occur only briefly while equipment is operated near structures, which would be a very infrequent occurrence. Outdoor use areas are generally not considered to be sensitive to vibration. Therefore, the project alternatives combined with compensatory mitigation would not change the overall impact conclusion of less than significant.

Other Mitigation Measures

Implementation of mitigation measures identified in the Draft EIR would not involve vibration-producing equipment. Some measures, such as the construction of visual barriers or temporary noise barriers, may require use of trucks and heavy equipment for a short duration of time. Night work would not be required.

As such, implementation of other mitigation measures would be unlikely to exceed criteria for groundborne vibration at sensitive receptors.

Overall, groundborne vibratory and noise impacts for construction of compensatory mitigation and implementation of other mitigation measures, combined with project alternatives would not change the impact conclusion of less than significant.

Impact NOI-3: Place Project-Related Activities in the Vicinity of a Private Airstrip or an Airport Land Use Plan, or, Where Such a Plan Has Not Been Adopted, within 2 Miles of a Public Airport or Public Use Airport, Resulting in Exposure of People Residing or Working in the Project Area to Excessive Noise Levels

All Project Alternatives

There would be no impacts related to the influence of noise from aircraft or airports for the project. The nearest public use airports in the study area are Byron Airport, about 1 mile from the Southern Complex (under Alternatives 1, 2a, 2b, 2c, 3, 4a, 4b, and 4c) and about 3 miles from Bethany Reservoir (under Alternative 5), and Franklin Field, 1 mile east of the Twin Cities Complex. (Figure

25-5 in Chapter 25, *Hazards, Hazardous Materials, and Wildfire*, shows airports within 2 miles of project facilities). The project facilities would be outside the 60 L_{dn} noise level contour and outside the Airport Influence Area of each of these airports. Several airports are located in the surrounding area within 10 miles of the central, eastern, and Bethany Reservoir alignments, including Sharpe AAF, Stockton Municipal Airport, Kingdon Airpark, Lodi Airpark, Franklin Field, Clarksburg Airport, Walnut Grove Airport, Lost Isle Seaplane Base, and several private airstrips. Aircraft operations from these airports contribute to existing noise levels in the study area and would continue to do so in the future. However, the project would not add sensitive uses that would be affected by aircraft noise. Workers would not be exposed to excessive airport noise.

Field Investigations—All Project Alternatives

The level of impact during field investigations would be the same as described for the project, above. The project would not add sensitive uses that would be affected by aircraft noise, and workers would not be exposed to excessive airport noise.

CEQA Conclusion—All Project Alternatives

The project facilities would be located outside the 60 L_{dn} noise level contour and outside the Airport Influence Area of the airports nearest to the study area. The project would not add sensitive uses that would be affected by aircraft noise. There would be no impact.

Mitigation Impacts

Compensatory Mitigation Impacts

Although the Compensatory Mitigation Plan described in Appendix 3F does not act as mitigation for noise and vibration impacts from project construction or operations, its implementation could result in noise and vibration impacts.

The compensatory mitigation at the I-5 ponds and Bouldin Island would not occur in the vicinity of private or public airports such that it would expose people residing or working in the area to excessive noise from aircraft or airports. Ponds 6, 7, and 8 are more than 3 miles west of the nearest airports at Kingdon Airpark and Lodi Airpark. The nearest airport to these compensatory mitigation sites is the Rio Vista Municipal Airport, about 5 miles to the northwest of Webb Tract. The compensatory mitigation at the I-5 ponds and Bouldin Island would not add sensitive uses that would be affected by aircraft noise. It is not known where within the North Delta Arc the channel margin and tidal habitat restoration would occur, but there are no airports in the general area of the North Delta Arc and it is likely the restoration sites would not occur in the vicinity of private or public airports. Workers would not be exposed to excessive airport noise. Therefore, the project alternatives combined with compensatory mitigation would not change the overall impact conclusion of no impact.

Other Mitigation Measures

Other mitigation measures proposed would not have impacts on noise from aircraft or airports because project facilities would be located outside the 60 L_{dn} noise level contour. The nearest public use airports in the study area are the Byron Airport (about 1 mile from the Southern Complex) and Franklin Field (1 mile east of the Twin Cities Complex) and are outside the study area Airport Influence Area. Mitigation measures would not add sensitive uses that would be affected by aircraft noise. Therefore, implementation of mitigation measures would not exceed thresholds associated with noise from aircraft or airports, and there would be no impact.

Overall, noise from aircraft or airports impacts for construction of compensatory mitigation and implementation of other mitigation measures, combined with project alternatives, would not change the no impact conclusion.

24.3.4 Cumulative Analysis

Implementation of the project would result in noise and vibration effects associated with construction and operation of new intake and conveyance facilities and habitat restoration measures. To assess the contribution of the project alternatives to cumulative noise and vibration conditions, noise and vibration from construction and operation of the project is evaluated in conjunction with noise and vibration generated by past, present, and probable future projects within the study area. These projects are shown in Table 24-43.

Table 24-43. Cumulative Impacts on Noise and Vibration from Plans, Policies, and Programs

Program/Project	Agency	Status	Description of Program/ Project	Impacts on Noise and Vibration
Delta Dredged Sediment Long-Term Management Strategy	USACE	Ongoing	Maintenance and improvement of channel function, levee rehabilitation, and ecosystem restoration	Potential increase in temporary construction and traffic noise levels. Negligible effects on vibration.
Delta Levees Protection Program	DWR	Ongoing	Strengthening of existing levees and construction of embankments inside some levees	Potential increase in temporary construction and traffic noise levels. Negligible effects on vibration.
California EcoRestore	Multiagency (e.g., DWR)	Ongoing	Initiative to coordinate and advance at least 30,000 acres of habitat restoration including land in the Sacramento–San Joaquin Delta	Potential increase in temporary construction and traffic noise levels. Negligible effects on vibration.
McCormack-Williamson Tract Restoration Project	DWR	Planning phase	Tidal marsh restoration	Potential increase in temporary construction and traffic noise levels. Negligible effects on vibration.
Sherman Island Restoration Projects	DWR	Planning phase	Wetland Restoration, 3,900 acres	Potential increase in temporary construction and traffic noise levels, especially in the area of compensatory mitigation. Negligible effects on vibration.
Twitchell Island West End Wetland	DWR	Planning phase	Wetland Restoration, 1,250 acres	Potential increase in temporary construction and traffic noise levels, especially in the area of compensatory mitigation. Negligible effects on vibration.

DWR = California Department of Water Resources; USACE = U.S. Army Corps of Engineers.

24.3.4.1 Cumulative Impacts of the No Project Alternative

The ongoing projects and programs in the study area under the No Project Alternative would require use of heavy equipment on an ongoing basis however, the distances between projects are large enough that equipment noise is unlikely to combine to increase noise level noticeably in any given area, although this could occur occasionally. Vibration levels would only be perceptible in the immediate area of heavy equipment use, and these effects are not expected to combine between projects. Due to the distance between projects, the suite of all ongoing projects and programs in the Delta are not expected to collectively result in substantial impacts related to noise or vibration. Because the effects of cumulative projects on noise and vibration are described in the environmental documentation for each project standard noise mitigation measures would reduce localized noise effects, and this cumulative impact is considered minor.

24.3.4.2 Cumulative Impacts of the Project Alternatives

The geographic scope of the cumulative analysis is shown in Figure 24-1. The Delta Conveyance Project, in combination with other cumulative projects that affect noise levels, may result in increased noise levels at sensitive receptors in the noise and vibration study area; however, the level of increase from use of heavy equipment is unlikely to be noticeable, given the distance between cumulative projects and project construction work areas. Vibration levels would only be perceptible in the immediate area of heavy equipment use, and this is not expected to occur under the project, or in combination with the projects in Table 24-43. Combined with other past, present and probable future projects and programs in the study area, the noise and vibration cumulative impacts would be less than significant and the project alternatives' contribution would not be cumulatively considerable because of the distance between cumulative projects and minor effect on localized noise levels.