

3.11 Noise

This section evaluates potential impacts on humans related to noise and vibration during construction, invasive plant management, and maintenance of the Project. Construction activities include the earthwork involved in the estuarine restoration and infrastructure improvement portions of the Project. Invasive plant management activities include the removal of dense-flowered cordgrass (*Spartina densiflora*), European beachgrass (*Ammophila arenaria*), and dwarf eelgrass (*Zostera japonica*) using any one or a combination of the methods described in Section 2.5 (Proposed Invasive Plant Management). Maintenance activities include periodic repairs and improvements to the non-motorized boat put-in, trails, parking lots and road within the Project Area, and also include monitoring activities. The study area for this section includes the Project Area and adjacent lands where sensitive noise receptors may be impacted by noise that is expected to occur from implementation of the Project.

3.11.1 Setting

Fundamentals of Acoustics

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its pitch or its loudness. Pitch is the height or depth of a tone or sound, depending on the relative rapidity (frequency) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. Loudness is the intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several measurement scales which are used to describe noise in a particular location. A decibel (dB) is a unit of measurement that indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 3.11-1.

There are several methods of characterizing sound. The most common method in California is the A-weighted sound level or (dBA). This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called Leq.

The most common averaging period is hourly, but Leq can describe any series of noise events of arbitrary duration.

Since the sensitivity of noise receptors to noise increases during the evening and at night, and because excessive noise interferes with the ability to sleep, 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The Day/Night Average Sound Level (Ldn) is average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 PM and 7:00 AM. The Community Noise Equivalent Level (CNEL) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 PM - 10:00 PM) and a 10 dB addition to nocturnal (10:00 PM - 7:00 AM) noise levels.

Table 3.11-1 Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this section are A-weighted, unless indicated otherwise.
L ₀₁ , L ₁₀ , L ₅₀ , L ₉₀	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Equivalent Noise Level, Leq	The average A-weighted noise level during the measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 PM to 10:00 PM and after addition of 10 decibels to sound levels in the night between 10:00 PM and 7:00 AM.
Day/Night Noise Level, Ldn or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 PM and 7:00 AM.
L _{max} , L _{min}	The maximum and minimum A-weighted noise level during the measurement period.

Term	Definitions
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 PM to 10:00 PM and after addition of 10 decibels to sound levels in the night between 10:00 PM and 7:00 AM.
Day/Night Noise Level, Ldn or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 PM and 7:00 AM.
Lmax, Lmin	The maximum and minimum A-weighted noise level during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several methods are typically used to quantify the amplitude of vibration including Peak Particle Velocity (PPV) and Root Mean Square (RMS) velocity. PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. RMS velocity is defined as the average of the squared amplitude of the signal, usually measured in decibels referenced to one micro-inch per second (in/sec) and reported in velocity decibels (VdB). PPV and VdB vibration velocity amplitudes are used in this analysis to evaluate the effect of vibration on buildings and people in the vicinity of construction activities.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical

setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level, whereas the opposite is true for people in rural areas.

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to a building. Construction-induced vibration that can be detrimental to a building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

Existing Noise and Vibration Environment

Existing noise sources in the Project vicinity are associated with agricultural operations along the eastern and southern boundaries of the Project Area and the Pacific Ocean along the western boundary of the Project Area. Sources include irrigation equipment, diesel generators, forklifts, livestock, tractors, and other vehicles and equipment. According to the Humboldt County General Plan, “(t)he principal sources of noise in Humboldt County are highways, airports, rail, on-site construction, and industrial activities” (Section 3240). None of these sources are located in the Project Area. Noise within the Project Area is associated with seasonal hunting, offsite agricultural operations, several nearby rural residences, Table Bluff County Park, privately owned non-residential land, and vehicles passing by on Table Bluff Road and Copenhagen Road. Due to the Project location along the coast, wind both elevates background noise levels, and can attenuate heavy equipment noise. There are no known existing vibration sources in the Project Area.

Sensitive Receptors

Land uses that are generally sensitive to noise include residential areas, schools, convalescent and acute care hospitals, parks and recreational areas, and churches and other religious facilities. The only off-site sensitive receptors identified near the Project Area are rural residences. The closest residences in the Project vicinity are located northeast of the site along Indianola Reservation Road, which was previously part of the Wiyot Tribe’s Table Bluff Reservation. The nearest residence is located approximately 350 feet (107 meters) northeast of the Area D boundary and approximately 3,600 feet (1,097 meters) east of the Area A boundary.

3.11.2 Regulatory Framework

Federal

No federal standards related to noise and vibration would be applicable to the Project.

State

California Department of Transportation – Construction Vibration

Caltrans recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards. A conservative vibration limit of 0.25 to 0.30 in/sec PPV has been used for older buildings that are found to

be structurally sound but cosmetic damage to plaster ceilings or walls is a major concern. For historic buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. All of these limits have been used successfully and compliance to these limits has not been known to result in appreciable structural damage. All vibration limits referred to herein apply on the ground level and take into account the response of structural elements (i.e., walls and floors) to groundborne excitation (Caltrans 2013).

Regional and Local

Lands within the Project Area are owned by CDFW or are under the jurisdiction of the State Lands Commission, and therefore will not require a Conditional Use Permit from Humboldt County nor adherence to the Humboldt County General Plan or the Local Coastal Program Eel River Area Plan. Potential impacts within each resource category extending beyond the Project boundary, such as noise impacts on adjacent land uses, are analyzed utilizing local regulatory documents such as the Humboldt County General Plan and the Local Coastal Program Eel River Area Plan. Applicable local and regional regulatory policies are summarized below.

Humboldt County General Plan: Noise Element Standards

The Noise Element of the Humboldt County General Plan sets forth policies related to noise and land use compatibility. The most applicable policies to the proposed Project are listed below:

- N-P1. Minimize Noise from Stationary and Mobile Sources. Minimize stationary noise sources and noise emanating from temporary activities by applying appropriate standards for average and short-term noise levels during permit review and subsequent monitoring.
- N-S7. Short-term Noise Performance Standards (Lmax). The following noise standards, unless otherwise specifically indicated, shall apply to all property within their assigned noise zones and such standards shall constitute the maximum permissible noise level within the respective zones.

Table 3.11-2 Short-term Noise Standards (Lmax)

Zoning Classification	Day (maximum) 6:00 a.m. to 10:00 p.m.	Night (maximum) 10:00 p.m. to 6:00 a.m.
MG, MC, AE, TPZ, TC, AG, FP, FR, MH	80	70
MB, ML, RRA, CG, CR C-1, C-2, C-3	75	65
RM, R-3, R-4	65	60
RS, R-1, R-2	65	60

Exceptions:

The short-term noise levels shown in the above table shall not apply to certain uses, including but not limited to the following:

1. Portable generator use in areas served by public electricity when electrical service is interrupted during emergencies as determined by the Planning Director.
2. Temporary events in conformance with an approved Conditional Use Permit.
3. Use of chainsaws for cutting firewood and power equipment used for landscape maintenance when accessory to permitted on-site uses.
4. Heavy equipment and power tools used during construction of permitted structures when conforming to the terms of the approved permit.
5. Emergency vehicles.

3.11.3 Evaluation Criteria and Significance Thresholds

The Project would cause a significant impact related to noise, as defined by the CEQA Guidelines (Appendix G), if it would:

- Result in the generation of 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;
- Result in generation of excessive groundborne vibration or groundborne noise levels; or
- Located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and expose people residing or working in the Project area to excessive noise levels.

Areas of No Project Impact

As explained below, the Project would not result in impacts related to one of the significance criteria identified in Appendix G of the current CEQA Guidelines:

- **Located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and expose people residing or working in the Project area to excessive noise levels?** The proposed Project is not located within the vicinity of a private airstrip, an airport land use plan, or within two miles of a public airport. Therefore this significance criterion is not applicable and is not discussed further.

3.11.4 Methodology

The noise and vibration impact assessment evaluates both short term construction noise and noise associated with long-term maintenance and invasive plant management activities. For purposes of this discussion, short-term impacts from implementation of the estuarine restoration portion of the Project assume a two-field-season construction period, with each season extending approximately 180 days between May and October. Upon completion of the estuarine restoration portion of the Project, invasive plant management activities would cause occasional

increases in noise above background levels in various locations throughout the study area.

For construction noise, the potential for impacts was assessed by considering several factors, including the proximity of Project-related noise sources to noise-sensitive land uses (i.e., sensitive receptors), typical noise levels associated with construction equipment, the potential for construction noise levels to interfere with daytime activities, and the duration that sensitive receptors would be affected.

For invasive plant management and maintenance noise, the potential for impacts was assessed by evaluating the noise generation potential of invasive plant management and maintenance activities and recreational uses, proximity of sensitive receptors, and the potential for such noise to exceed established local limits at the nearest receptors.

The Caltrans guidelines for vibration are the basis for the significance criteria for annoyance and potential building damage. As described above, Caltrans recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.08 in/sec PPV for very old buildings or buildings that are documented to be structurally weakened. Based on Caltrans guidance, this analysis establishes 0.08 in/sec PPV given the presence of structurally weakened buildings located in the Project Area and local vicinity.

3.11.5 Impacts and Mitigation Measures

Impact NOI-1: Would the Project result in generation of a substantial temporary or permanent increase in ambient noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

To evaluate the Project's potential noise impacts on adjacent land uses, this evaluation utilizes Humboldt County's Short-term Noise Performance Standards established in General Plan Policy N-S7. The Short-term Noise Performance Standards identify a threshold of 65 dBA L_{max} at residential land uses during the daytime (6:00 a.m. to 10:00 p.m.) and a 60 dBA L_{max} during the night-time (10:00 p.m. to 6:00 a.m.). The Project would only generate noise during the daytime due to the proposed construction and maintenance hours.

Several residences are located along Indianola Reservation Road northeast of the Project Area and Copenhagen Road east of the Project Area. The residences along Indianola Road are in relatively close proximity (350 feet [107 meters]) to the Project Area, with the second closest residential land uses located along Copenhagen Road being approximately 3,600 feet (1,097 meters) east of Area A.

During the construction phase, the potential exists for intermittent noise levels to exceed the 65 dBA L_{max} threshold at the residential use within 350 feet of Area D. Table 3.11-3 summarizes the noise levels produced by various types of construction equipment. Activities such as channel excavation, levee lowering/removal, installation of ditch blocks, and high marsh elevation fill would occur within the

Project Area. The types of construction equipment used for earthmoving typically generates noise levels between 70–85 dBA at a distance of 50 feet (15 meters) when the equipment is operating. Sound from a point source is known to attenuate at a rate of -6 dB for each doubling of distance. For example, a noise level of 85 dBA (e.g., a grader) as measured at 50 feet (15 meters) from the noise source would attenuate to 79 dBA at 100 feet (30 meters) from the source, to 73 dBA at 200 feet from the source, and to 67 dBA at 400 feet from the source. Given that some construction equipment used under the Project could generate noise levels as high as 85 dBA at 50 feet (15 meters), and that that noise would only attenuate to about 67 dBA at 400 feet, the residences located 350 feet (107 meters) from Area D may be exposed to noise that exceeds the County’s 65 dBA threshold when construction occurs in Area D. The residential uses located along Copenhagen Road are located approximately 3,600 feet (1,097 meters) east of Area A, and construction noise would attenuate well below 65 dBA L_{max} threshold at this distance.

Table 3.11-3 Construction Equipment Noise Emission Reference Levels

Equipment Description	Actual Measured L_{max} @ 50 feet (dBA) (Samples Averaged)
Bulldozer	85
Chainsaw	85
Compactor (ground)	83
Crane	81
Drum Mixer	80
Dump Truck	76
Excavator	81
Flat Bed Truck	74
Front Bed Loader	79
Grader	85
Generator	81
Pickup Truck	75
Pneumatic Tools	85
Roller	80
Tractor	84
Pumps	81

Source: U.S. Department of Transportation 2006

Although Project construction activities may exceed the County's short-term noise standard, Policy N-S7 lists exceptions to the thresholds, including heavy equipment and power tools used during construction. Therefore, the temporary noise increase that could exceed the short-term residential threshold would be an exception and considered a less than significant impact.

Invasive plant management activities would occur in several areas, including Area D. The invasive plant management activities in Area D would focus on dense-flowered cordgrass removal. In the first year of invasive plant management, one primary treatment, such as mowing and grinding, and one secondary treatment, such as prescribed burning or herbicide application, would be implemented, with follow-up treatments conducted annually thereafter, as needed and as funding allows for up to ten years or as long as needed to achieve control and/or eradication. Implementation of the primary treatment may utilize hand-held gas-powered equipment or other heavy equipment. The use of heavy equipment could result in an intermittent increase in the noise environment.

As the closest sensitive receptor is located 350 feet (107 meters) northeast of Area D, noise levels could slightly exceed the County's 65 dBA L_{max} short-term noise threshold for residential uses. However, an exception to the short-term noise thresholds includes use of chain saws and other equipment for landscape maintenance. As the proposed invasive plant management activities would utilize similar equipment to what is utilized for landscape management, the noise at the closest sensitive receptors would be similar or less than what would occur during landscape management activities. Therefore, noise associated with invasive plant management activities within Area D would be less than significant. Noise associated with invasive plant management in other locations within the Project Area would be located further away from sensitive receptors and would not exceed any applicable policy or threshold.

Once invasive plant management activities are completed, the noise environment is anticipated to be similar to existing conditions and would not result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or applicable standards of other agencies.

Mitigation Measures: No mitigation necessary.

Level of Significance: Less than significant.

Impact NOI-2: **Would the Project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?**

Construction of the Project includes breaching and lowering levees, constructing tidal channels, and installing recreational components. Major sources of groundborne vibration, such as the use of impact pile drivers, are not proposed as part of the Project. Sheet piles may be placed for temporary water control. If used, sheet piles would be advanced or pushed into the ground with an excavator.

Table 2-4 in Chapter 2 (Project Description), was reviewed to identify the specific pieces of construction equipment that would result in the highest vibration levels at nearby receptors. A large bulldozer (or scraper or large excavator) would be used during the estuarine restoration portion of the Project. Table 3.11-4 presents the

vibration levels that could be expected from identified construction equipment at a distance of 25 feet (8 meters). As indicated in Table 3.11-4, vibration levels produced by a large bulldozer could reach 0.089 in/sec, PPV at a distance of 25 feet (8 meters). Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

Table 3.11-4 Vibration Source Levels for Project Construction Equipment

Equipment	PPV at 25 feet (in/sec)	Approximate Lv at 25 feet (VdB)
Large bulldozer	0.089	87
Loaded trucks	0.076	86
Small bulldozer	0.003	58

Source: U.S. Department of Transportation 2006

The nearest sensitive receptor would be located more than 300 feet (91 meters) from the nearest earthwork. At that distance vibration levels would be well below the 0.08 in/sec PPV threshold used to avoid cosmetic damage to buildings that are very old or buildings that are documented to be structurally weakened. Vibration levels produced by other equipment proposed as part of the Project and at locations further from receptors would also be well below the 0.08 in/sec PPV threshold. A barn is located outside of the Project Area, adjacent to where a parking lot is proposed. It is not anticipated any of the equipment utilized in this area would generate substantial levels of vibration. Loaded trucks that may pass through the area generate 0.076 in/sec PPV of vibration, which is below the 0.08 in/sec PPV threshold. Therefore, it is not anticipated that the barn would be affected by vibration generated by Project activities. The impact would be less than significant.

Invasive plant management would occur seasonally for up to ten years or as long as needed to achieve control and/or eradication. The management techniques include mowing, grinding, excavation, mechanical removal, prescribed burning, and/or herbicide application methods. Mechanical removal of the invasive plant species may utilize a bulldozer or an excavator, which could result in vibration. As described above, the use of construction equipment on the site would not result in groundborne vibration proximate to or significant enough to damage any existing structures. As a result, this impact would be less than significant.

Maintenance activities would be infrequent and temporary and would typically not involve the use of heavy equipment. No vibrations or ground disturbance is anticipated. No impact from maintenance activities would occur.

Mitigation Measures: No mitigation is necessary.

Level of Significance: Less than significant.

3.11.6 Cumulative Impacts

Impact NOI-C-1: Would the Project contribute to a cumulatively significant impact from noise?

As discussed in Section 3.11.3, the Project would not result in impacts relative to being located near a public airport or private airstrip. Therefore, implementation of the Project would not contribute to any related cumulative impact on these resources.

The Project would have less-than-significant noise impacts relative to local standards (Impact NOI-1) and vibration impacts (Impact NOI-2). Similar to the Project, implementation of cumulative projects identified in Table 3-1 (Projects Considered for Cumulative Impacts), such as the Salt River Ecosystem Restoration Project and the Eel River Estuary Preserve and Centerville Slough Enhancement, may result in the generation of construction noise and construction-related vibration impacts. However, the distance between the Project Area and the identified cumulative projects would prevent the potential for cumulative impacts in the Project Area related to noise levels and vibration, and the cumulative impact would be less than significant.

Mitigation Measures: No mitigation is necessary.

Level of Significance: Less than significant.

3.11.7 References

California Department of Transportation. 2013. Transportation Noise and Construction Vibration Guidance Manual. September.

Humboldt County. 2017. Humboldt County General Plan: Chapter 13. Noise Element. Eureka, CA. Retrieved from:
<https://humboldt.gov/DocumentCenter/View/61989/Chapter-13-Noise-Element-PDF>

U.S. Department of Transportation, Federal Highway Administration (U.S. DOT FHWA). 2006. Construction Noise Handbook, August.