3.10 Noise

3.10.1 Study Area

The Study Area for this section is two-fold, relating to both airborne and underwater environments. In the case of airborne impacts the Study Area extends to the adjacent properties and buildings that could be affected by noise associated with construction and operation of the Project. In the case of underwater environments, the Study Area extends to the underwater space adjacent to the area of impact where a pulse from the anticipated noise source could travel.

3.10.2 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 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 noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which 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 listed in Table 3.10-1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (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 L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- 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 *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. The *Day/Night Average Sound Level* (*DNL* or L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Table 3.10- 1 Noise Terms (Airborne Noise)

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.
L01, L10, L50, L90	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.
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.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA DNL. Typically, the highest steady traffic noise level during the daytime is about equal to the DNL and nighttime levels are 10 dB lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12 to 17 dB with open windows. With standard construction and closed windows in good condition, the noise attenuation factor is around 20 dB for an older structure and 25 dB for a newer dwelling. Sleep and speech interference is therefore of concern when exterior noise levels are about 57 to 62 dBA DNL with open windows and 65 to 70 dBA DNL if the windows are closed. Levels of 55 to 60 dBA are common along collector streets and secondary arterials, while 65 to 70 dBA is a typical value for a primary/major arterial. Levels of 75 to 80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The DNL as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA DNL. At a DNL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the DNL increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a DNL of 60-70 dBA. Between a DNL of 70-80 dBA, each decibel increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the DNL is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundbourne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3.10-2 displays the reactions of people and the effects on buildings that continuous or frequent intermittent vibration levels produce. The guidelines in Table 3.10-2 represent syntheses of vibration criteria for human response and potential damage to buildings resulting from construction vibration.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of explosives, 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 cause 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. 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.

Structural damage can be classified as cosmetic only, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3.10-2 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from “Historic and some old buildings” to “Modern industrial/commercial buildings.” Construction-induced vibration that can be detrimental to the 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.

The annoyance levels shown in Table 3.10-2 should be interpreted with care since vibration may be found to be annoying at lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Table 3.10-2 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Fundamentals of Underwater Noise

When construction equipment contacts a structure, for example a pile driving hammer strikes a pile, a pulse is created that propagates through the pile and radiates sound into the water, the ground, and the air. The pulse amplitude and propagation are dependent on a variety of factors, including but not limited to size, type, sediment composition, water depth, and water properties (conductivity, temperature, and pressure). Generally, most of the acoustic energy is confined to frequencies below 2 kilohertz (kHz) and there is very little energy above 20 kHz.

Sound pressure pulse as a function of time is referred to as the waveform. In terms of acoustics, these sounds are described by the peak pressure, the root-mean-square pressure (RMS), and the sound exposure level (SEL). The peak pressure is the highest absolute value of the measured waveform and can be a negative or positive pressure peak. Another measure of the pressure waveform that can be used to describe the pulse is the sound energy itself. The total sound energy in the pulse is referred to in many ways, most commonly as the “total energy flux.” The “total energy flux” is equivalent to the un-weighted sound exposure level (SEL) for a plane wave propagating in a free field, a common unit of sound energy used in airborne acoustics to describe short-duration events. The unit used is dB re 1μPa^2-sec. In this report, peak pressures levels are expressed in decibels re 1 μPa; however, in other literature they can take varying forms such as a Pascals or pounds per square inch. The total sound energy in an impulse accumulates over the duration of that pulse. How rapidly the energy accumulates may be significant in assessing the potential effects of impulses on fish. Table 3.10-3 includes the definitions of terms commonly used to describe underwater sounds.

The variation of instantaneous pressure over the duration of a sound event is referred to as the waveform. The waveform can provide an indication of rise time or how fast pressure fluctuates with time. A plot showing the accumulation of sound energy over the duration of the pulse (or at least the portion where much of the energy accumulates) illustrates the differences in source strength and rise time.

Table 3.10-3 Definitions of Acoustical Terms (Underwater Noise)

Term	Definition
Peak Sound Pressure Level (dB re 1 μPa)	Peak sound pressure level based on the largest absolute value of the instantaneous sound pressure. This pressure is expressed in this report as a decibel (referenced to a pressure of 1 μPa) but can also be expressed in units of pressure, such as μPa or PSI.
Root-Mean-Square Sound Pressure Level (dB re 1 μPa)	The average of the squared pressures over the time that comprise that portion of the waveform containing 90 percent of the sound energy for one pile driving impulse.
Sound Exposure Level (dB re 1 μPa^2 sec)	Proportionally equivalent to the time integral of the pressure squared and is described in this report in terms of dB re 1 μPa^2 sec over the duration of the impulse. Similar to the unweighted Sound Exposure Level (SEL) standardized in airborne acoustics to study noise from single events.
Cumulative SEL (dB re 1 μPa^2 sec)	Measure of the total energy received through a pile-driving event (here defined as pile driving that occurs with a day).
Waveforms μPa over time	A graphical plot illustrating the time history of positive and negative sound pressure of individual pile strikes shown as a plot of μPa over time (i.e., seconds).
Frequency Spectra dB over frequency range	A graphical plot illustrating the distribution of sound pressure vs. frequency for a waveform, dimension in rms pressure and defined frequency bandwidth.

Existing Setting

Current noise conditions on and near the Project Site consist of local traffic on New Navy Base Road and adjacent operations related to nearby businesses. The Project Site is located on the Samoa Peninsula in Humboldt County, California. The Pacific Ocean is approximately 0.2 miles west and Humboldt Bay bounds the Project Site to the east. The Project Site is approximately 0.1 miles east of a water storage tank, 0.15 miles north of a woodchip distribution facility, 0.2 miles northeast of a biomass facility, and 2.3 miles south of the Samoa Dunes State Recreation Area. The nearest noise-sensitive residential land uses to the Terrestrial Development are located approximately 0.4 miles to the south and 0.8 miles to the north and the nearest schools are located over 1 mile from the site. Additional industrial and commercial land uses are in the City of Eureka, approximately 0.5 miles to the east. The modernization and revitalization of the two water intake structures would extend to approximately 1,100 feet of the nearest noise-sensitive residential land uses along Bayview Avenue.

3.10.3 Regulatory Framework

Federal

NMFS Underwater Criteria for Fish and Marine Mammals

Fish

A Fisheries Hydroacoustic Workgroup (FHWG) that consisted of transportation officials, resources agencies, the marine construction industry (including Ports), and experts was formed in 2003 to address the underwater sound issues associated with marine construction. The first order of business was to document all that was clearly known about the effects of sound on fish. The result of this effort was a report prepared by Dr. Mardi Hastings and Dr. Arthur Popper, titled Effects of Sound on Fish. This report provided recommended preliminary guidance to protect fish. Research to further investigate the effects of pile driving sounds on fish was also recommended in this report. Some of these recommendations were taken up in an ongoing National Cooperative Highway Research Program (NCHRP 25-28). This NCHRP study is intended to develop guidelines for the prediction and mitigation of the impacts on fish from underwater sound pressure and particle motion caused by pile driving.

To provide additional explanation of the injury criteria recommended in the “Effects of Sound on Fish” and to provide a practical means to apply the criteria, Caltrans commissioned Dr. Popper and other leading experts to prepare a subsequent report. This report is entitled "Interim Criteria for Injury of Fish Exposed to Pile Driving Operations: A White Paper", (*White Paper*). This *White Paper* recommended a dual criterion for evaluating the potential for injury to fish from pile driving operations. The dual approach considered that a single pile strike with high enough amplitude, as measured by zero to peak (either negative or positive pressure) could cause injury. To account for the energy in a single strike, the SEL metric proposed by Hastings and Popper[4] was included as the second part of the duel criteria.

On June 12, 2008, NOAA's National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service, California, Oregon, and Washington Departments of Transportation, California Department of Fish and Game and the U.S. Federal Highway Administration agreed in principal to interim criteria to protect fish from pile driving activities (Table 3.10-4).

The primary difference between the adopted criteria and previous recommendations is that the single strike SEL was replaced with a cumulative SEL over a day of pile driving. NMFS does not consider sound that produce a SEL per strike of less than 150 dB to accumulate and cause injury. Thus, where underwater pile driving noise exceeds 206 dB or cumulatively exceeds 187 dB SEL it can cause injury to fish in that location. All fish species of concern for this project are assumed to be two grams or larger.

The adopted criteria listed in Table 3.10-4 are for pulse-type sounds (e.g., pile driving) and does not address sound from vibratory driving. There are no adopted criteria for impacts to fish therefore the SEL criteria are not applied to vibratory driving sounds.

Table 3.10- 4 Fish Criteria Used for Injury and Area of Effect

Interim Criteria	Sound Levels Agreed in Principle
Peak	206 dB re: 1 μPa (for all size of fish)
Cumulative SEL	187 dB re: 1 μPa^2-sec – for fish size of two grams or greater. 183 dB re: 1 μPa^2-sec – for fish size of less than two grams.

Marine Mammals

Under the Marine Mammal Protection Act, NMFS has defined levels of harassment for marine mammals. Level A harassment is defined as "Any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "Any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding or sheltering."

Table 3.10-5 below outlines the current adopted Level A and Level B criteria. The application of the 120 dB RMS threshold for vibratory pile driving can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations. For continuous sounds, NMFS Northwest Region has provided guidance for reporting RMS sound pressure levels. RMS levels are based on a time-constant of 10 seconds; RMS levels should be averaged across the entire event. For impact pile driving, the overall RMS level should be characterized by integrating sound for each acoustic pulse across 90 percent of the acoustic energy in each pulse and averaging all the RMS for all pulses.

NMFS has provided marine mammal acoustic technical guidance for predicting onset of permanent threshold shift (PTS) and temporary threshold shifts (TTS) in marine mammal hearing from sound sources. For this project location, the functional hearing groups are low-frequency cetaceans (humpback and gray whales), high-frequency cetaceans (harbor porpoises), phocid pinnipeds (harbor seals) and otariid pinnipeds (Stellar and California sea lions and northern elephant seals). For pile driving, the majority of the acoustic energy is confined to frequencies below 2 kilohertz (kHz) and there is very little energy above 20 kHz. The underwater acoustic criteria for marine mammals are shown in Table 3.10-5. Table 7 shows a summary of the functional hearing groups and their hearing ranges as defined by the NMFS guidance.

Table 3.10- 5 Underwater Acoustic Criteria for Marine Mammals

Species	Underwater Noise Thresholds					In Air Noise Thresholds
	(dB re: 1µPa)					(dB re: 20µPa)
	Vibratory Pile Driving Disturbance	Impact Pile Driving Disturbance	Marine Mammal Hearing Group (See Table 7)	PTS SEL_{cum} Threshold		Impact and Vibratory Driving Disturbance Threshold
	Threshold	Threshold		Peak – dB re 1µPa		
	(Level B Harassment)	*(Level B Harassment)*		(SEL_{cum} -dB re 1µPa^{2}sec)		
				Impulsive *(Impact Pile Driving)*	Non-Impulsive *(Vibratory Pile Driving)*	
Cetaceans	120 dB RMS	160 dB RMS	Low frequency	219 dB_{Peak} 183 dB SEL_{cum}	199 dB SEL_{cum}	NA
			Mid frequency	230 dB_{Peak} 185 dB SEL_{cum}	198 dB SEL_{cum}	NA
			High frequency	202 dB_{Peak} 155 dB SEL_{cum}	173 dB SEL_{cum}	NA
Pinnipeds	120 dB RMS	160 dB RMS	Phocid	218 dB_{Peak} 185 dB SEL_{cum}	201 dB SEL_{cum}	90 dB RMS
			Otariid	232 dB_{Peak} 203 dB SEL_{cum}	219 dB SEL_{cum}	100 dB RMS

Table 3.10- 6 Definition of Marine Mammal Hearing Group

Marine Mammal Hearing Groups	
Functional Hearing Group	**Functional Hearing Range**
Low-frequency cetaceans - gray whales	7 Hz to 35 kHz
Mid frequency cetaceans - Dolphins, toothed whales, beaked whales, bottlenose whales	150 Hz to 160 kHz
High frequency cetaceans - True porpoises, *Kogia*, river dolphins, cehalorhynchid, *Lagenorhynchus cruciger* & *L. australis*	275 Hz to 160 kHz
Phocid pinnipeds - True seals including harbor seals	50 Hz to 86 kHz
Otariid pinnipeds - Sea lions and fur seals	60 Hz to 39 kHz

Marbled Murrelets

The Marbled Murrelet, which is a federally threatened species, are known to forage in Humboldt Bay, and an increase in underwater noise levels could affect seabird behavior. Other terrestrial birds (e.g., Osprey; California Department of Fish and Wildlife Watch List species) are potentially present in or immediately adjacent to the Project Site may be impacted by elevated in-air noise levels due to blasting (i.e., 140 dBA to avoid hearing damage to birds). Table 3.10-7 shows the guidance for injury and harassment for the Marbled Murrelet. Airborne noise from construction activities may have a behavioral effect resulting in disturbance to Marbled Murrelets.

Table 3.10- 7 Proposed Guidelines for Impacts to Marbled Murrelet

Species	Underwater Noise			Terrestrial Noise
	Mortality and Potential Mortal Injury	Recoverable Injury	Behavior	Airborne
Marbled Murrelet	208 dB SEL	202 dB SEL	150 dB RMS	92 dBA

State

There are no federal noise regulations that apply to the Project.

Local

Humboldt County General Plan

The following noise-related performance standards contained in the 2017 Humboldt County General Plan, while non-binding in a regulatory sense, are used to inform the analysis in this section. The standards contained in Table 4-11 are considered non-binding because the 2017 General Plan does not apply within the Coastal Zone, because it has yet to be certified by the Coastal Commission. For additional detail on this topic, see Section 1.5.1 (Project Regulatory Setting).

> *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-P2. Guide to Land Use Planning*
>
> *Evaluate current noise levels and mitigate projected noise levels when making community planning and zoning decisions to minimize the exposure of community residents to nuisance noise levels. Minimize vehicular and aircraft noise exposure by planning land uses compatible with transportation corridors and airports and applying noise attenuation designs and construction standards. Avoid zoning patterns that permit people to "move to the nuisance" unless mitigated through project conditions or recorded notice.*
>
> *N-P4. Protection from Excessive Noise*
>
> *Protect persons from existing or future excessive levels of noise which interfere with sleep, communication, relaxation, health, or legally permitted use of property.*
>
> *Policy N-S1. Land Use/Noise Compatibility Matrix*
>
> *The Land Use/Noise Compatibility Standards [Included in this EIR as Table 3.10-7] shall be used as a guide to ensure compatibility of land uses. Development may occur in areas identified as "normally unacceptable" if mitigation measures can reduce indoor noise levels to "Maximum Interior Noise Levels" and outdoor noise levels to the maximum "Normally Acceptable" value for the given Land Use Category.*
>
> *N-S4. Noise Study Requirements*
>
> *When a discretionary project has the potential to generate noise levels in excess of Plan standards, a noise study together with acceptable plans to assure compliance with the standards shall be required. The noise study shall measure or model as appropriate, Community Noise Equivalent Level (CNEL) and Maximum Noise Level (L_{max}) levels at property lines and, if feasible, receptor locations. Noise studies shall be prepared by qualified individuals using calibrated equipment under currently accepted professional standards and include an analysis of the characteristics of the project in relation to noise levels, all feasible mitigations, and projected noise*

impacts. The Noise Guidebook published by the U.S. Department of Housing and Urban Development, or its equivalent, shall be used to guide analysis and mitigation recommendations.

N-S7. Short-term Noise Performance Standards (Lmax)

The following noise standards (Table 3.10- 8), 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 3.10- 8 Land Use/Noise Compatibility Standards

Land Use Category	Maximum Interior Exposure (Ldn1)	Land Use Interpretation for Ldn Value			
		Clearly Acceptable	Normally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential Single-Family, Duple, Mobile Homes	45	Under 55	55-60	60-75	Above 75
Residential- Multi-Family, Dormitories, etc.	45	Under 55	55-60	60-75	Above 75
Transient Lodging	45	Under 65	65-70	70-80	Above 80
School Classrooms, Libraries, Churches	45	Under 60	60-65	65-75	Above 75
Hospitals, Nursing Homes	45	Under 60	60-65	65-75	Above 75
Auditoriums, Concert Halls, Music Shells	35	Under 50	50-60	60-70	Above 70
Sports Arenas, Outdoor Spectator Sports	N/A	Under 60	60-65	65-75	Above 75
Playgrounds, Neighborhood Parks	N/A	Under 55	55-65	65-75	Above 75
Golf Courses, Riding Stables, Water Rec., Cemeteries	N/A	Under 60	60-70	70-80	Above 80
Office Buildings, Personal, Business, Professional	50	Under 65	65-75	75-80	Above 80
Commercial- Retail, Movie Theatres, Restaurants	50	Under 65	65-75	75-80	Above 80
Commercial- Wholesale, Some Retail, Ind. Mfg., Util.	N/A	Under 70	70-80	80-85	Above 85
Manufacturing Communications (Noise Sensitive)	N/A	Under 55	55-70	70-80	Above 80
Livestock Farming, Animal Breeding	N/A	Under 60	60-75	75-80	Above 80
Agriculture (except Livestock), Mining, Fishing	N/A	Under 75	Above 75	N/A	N/A
Public Right-of-Way	N/A	Under 75	75-85	Above 85	N/A
Extensive Natural Recreation Areas	N/A	Under 60	60-75	75-85	Above 85

Table 3.10-9 Short-term Noise Standards in L_{max}

Zoning Classification	Day (Maximum) 6:00 a.m. to 10:00 p.m. dBA	Night (Maximum) 10:00 p.m. to 6:00 a.m. dBA
MG, MC, AE, TPZ, TC, AG, FP, FR, MH	80	70
CN, 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, NR	65	60

Humboldt County Code– Section 103.1 Industrial Performance Standards

101.3.1. Noise

All noise generating operations shall be buffered so that they do not exceed the exterior ambient noise level by more than 5 dB(A).

101.3.4. Vibrations

No perceptible vibrations shall be permitted off the building site.

Humboldt Bay Area Plan – Local Coastal Program

There are no applicable policies in the Humboldt Bay Area Plan related to noise.

3.10.4 Evaluation Criteria and Thresholds of Significance

Evaluation Criteria	Significance Thresholds	Sources
Would the Project 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?	Land Use/Noise Compatibility Standards (Table 13-C)	CEQA Guidelines Appendix G, Checklist Item XIII (a) General Plan Land Use/Noise Compatibility Standards (Table 13-C)
Would the Project result in the generation of excessive groundborne vibration or noise levels?	Peak particle velocity of 0.3 in/sec	CEQA Guidelines Appendix G, Checklist Item XIII (b)
Would the Project be 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, exposing people residing or working in the Project Area to excessive noise levels?	Location of Project in area exposed to effects of airport noise	CEQA Guidelines Appendix G, Checklist Item XIII (c)

3.10.5 Methodology

Impact analysis for this section is partially based on technical analysis completed in the Samoa Peninsula Land-Based Aquaculture Project Construction Noise, Vibration, and Hydroacoustic Assessment (Appendix J, Illingworth & Rodkin). The assessment of potential noise impacts was conducted using the anticipated noise that would be produced during demolition, construction, and operation of the Project as compared to noise level thresholds established by the regulatory criteria. The assessment of vibration impacts was conducted using information on anticipated vibration levels generated during construction of the Project.

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 demolition and construction equipment, the potential for demolition or construction noise levels to interfere with daytime activities, and the duration that sensitive receptors would be affected. Demolition and construction-generated noise is exempted from the short-term noise level standards identified by the Humboldt County General Plan. Therefore, the short-term thresholds of 60 dBA Leq and 5 dBA Leq or more above the ambient for a period greater than one year is applied.

For operational noise, the potential for impacts was assessed by evaluating the noise generation potential of Project noise sources, proximity of sensitive receptors, and the potential for operational noise to exceed the applicable land use noise compatibility standards provided by the Humboldt County General Plan and identified in Table 3.10-8. The nearest receptors are single-family residences located approximately 0.4 miles to the south and 0.8 miles to the north of the proposed Terrestrial Development component. The modernization and revitalization of the two water intake structures would extend to within approximately 1,100 feet of the nearest noise-sensitive residential land uses along Bayview Avenue. The applicable noise compatibility standard is 60 dBA.

The Caltrans guidelines for vibration are the basis for the significance criteria for annoyance and potential building damage. 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 ancient buildings or buildings that are documented to be structurally weakened. This analysis assumes that proposed construction areas would not be in the vicinity of fragile structures, but that older structures exist within the vicinity of the project sites. Based on Caltrans guidance, this analysis establishes 0.3 in/sec PPV as the significance threshold for construction vibration to avoid damage to buildings from vibration sources.

3.10.6 Impacts and Mitigation Measures

Impact NOI-a: Would the Project result in 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? (Less than Significant)

Terrestrial Development

Current noise conditions on and near the Terrestrial Development Site consist of local traffic on New Navy Base Road and adjacent operations related to nearby businesses. The nearest noise-sensitive residential land uses are located approximately 0.4 miles to the south and 0.8 miles to the north and the nearest schools are located over 1 mile from the site. Additional industrial and commercial land uses are in the City of Eureka, approximately 0.5 miles to the east.

Construction and Demolition

Land Use/Sensitive Receptors

Construction of the Terrestrial Development component would temporarily increase noise in the immediate vicinity of the Project Site. Noise impacts resulting from construction would depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise sensitive land uses or habitats, or when construction lasts over extended periods of times. Construction activities generate considerable amounts of noise, especially during earthmoving activities when heavy equipment is used.

The noise and vibration evaluation considered both construction phasing, as detailed in Section 2.2.2 and three potential construction methods; rammed aggregate piles, vibro displacement columns, and vibro soil densification compaction. Based on a review of the equipment anticipated, construction noise levels of all three methods are anticipated to be below 88 dBA Leq at 50 feet (see Table 3.10-10). However, the construction method options would be similar to vibratory pile driving, in which case, noise levels could be up to 93 dBA Lmax at 50 feet (see Table 3.10-10). Therefore, it was assumed that deep foundation piling could generate continuous noise levels of 88 dBA Leq and intermittent noise levels of up to 93 dBA Lmax at 50 feet. These levels were used as conservative levels to assess impacts on nearby land uses (Appendix J).

Table3.10- 10 Construction Equipment 50-Foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Table 3.10- 11 Estimated Construction Noise Levels at Nearby Land Uses

Phase	Calculated Hourly Average L_{eq} at Noise-Sensitive Receptors, dBA			Calculated RMS, at Nearest Shoreline Areas, dB	
	Industrial South (800 feet)	Residential South (2,000 feet)	Residential North (4,500 feet)	Humboldt Bay East (215 feet)	Pacific Ocean West (1,200 feet)
Demolition	64	56	49	75	60
Ground Clearing	60	52	45	71	56
Grading & Excavation	64	56	49	75	60
Trenching & Foundation	64	56	49	75	60
Building Erection	55	47	40	66	51
Finishing	60	52	45	71	56
Calculated L_{max}					
Maximum Levels	69	61	54	80	65

Humboldt County does not establish quantitative limits for construction-related noise, and the Humboldt Bay Area Plan does not include applicable noise-related policies. Based on criteria commonly used throughout California, this analysis considers construction noise impacts to be significant where noise from construction activities exceeds 60 dBA Leq and exceeds the ambient noise environment by at least 5 dBA Leq at noise-sensitive uses (residential) in the Project vicinity for a period exceeding one year. For commercial uses, a significant impact would be identified if construction noise were to exceed 70 dBA Leq and exceeds the ambient noise environment by at least 5 dBA Leq for a period exceeding one year. The nearest sensitive residential receptors along Fay Street to the south would be exposed to levels between 47 to 56 dBA Leq and sensitive residential receptors along Cutten Street to the north would be exposed to levels between 40 to 49 dBA Leq. This is below 60 dBA Leq. The nearest commercial/industrial uses adjacent to the Terrestrial Development Site on Vance Avenue would be exposed to levels between 55 to 64 dBA Leq, which would be below 70 dBA (Table 3.10-11). A less than significant impact would occur. While construction duration will last longer than one year, and may intermittently exceed ambient levels at nearby receptors, construction operations would not be anticipated to result in a substantial temporary increase in noise levels at the nearest land uses (Appendix J). Any potential impact would be less than significant.

Marine Mammals & Birds

Table 3.10-11 also shows anticipated noise levels at the nearest shorelines for comparison with airborne acoustic thresholds for pinnipeds and Marbled Murrelets. The production modules building located near the southeastern corner of the Terrestrial Development Site would be as close as approximately 215 feet from the shoreline of Humboldt Bay. At this distance, the highest noise levels could be up to 75 dBA L_{eq} and during deep foundation piling, could be up to 80 dBA L_{max}. The shoreline of the Pacific Ocean would be approximately 1,200 feet from the nearest building to the west of the Terrestrial Development Site. At this distance, the highest noise levels could be up to 60 dBA L_{eq} and during deep foundation piling, could be up to 65 dBA L_{max}. These levels are below the 90- and 100-dB RMS in-air thresholds for pinnipeds and below the 92 dBA for Marbled Murrelets. Therefore, the construction phase would not exceed thresholds established for pinnipeds and Marbled Murrelets. A less than significant impact would occur.

There is the potential for implosion (explosive demolition) of the concrete chimney stack which is approximately 445 meters (1,460 feet) from Humboldt Bay and 465 meters (1,525 feet) from the Pacific Ocean. Blasting source levels would be 94 dBA L_{max} at 50 feet at 445 meters (1,460 feet) the airborne nose level would be 66 dBA L_{max} well below any noise criteria for marine mammals. A less than significant impact would occur.

Operation

Noise and vibration resulting from operation of the Terrestrial Development component would comply with the Industrial Performance Standards as established in Humboldt County Code Section 313-103-1. Operational noise would primarily consist of vehicles entering and leaving the Project Site, consistent with the overall industrial zoning and use of the vicinity. Operational activities would not result noise in excess of established noise thresholds for industrially zoned areas. Operational activities would be primarily based inside the facility; any resulting noise would be buffered by the buildings. Exterior operational noise would be related to vehicles coming and going from the Project Site, loading/unloading trucks, and general site maintenance (e.g., landscaping).

The two backup generators would be installed inside the facility and would be operational for approximately 10 hours annually. Backup generators may be operational outside of daytime hours in the event of a nighttime power outage. Otherwise, use of the generators for standard testing and maintenance would occur during daytime hours. The generators would be installed with sound dampening enclosures that would reduce sound levels to a maximum of 80 dBA within 3-feet per OSHA standards. Given the nearest sensitive receptors (residential housing) are located 0.4 miles to the south and 0.8 miles to the north, operational noise would be consistent with existing commercial/industrial operational noise at and near the Project Site, and operational noise in excess of noise thresholds would not occur, any potential impact related to operational noise would be less than significant.

Mitigation Measures: No mitigation is necessary.

Level of Significance: Less than Significant

Ocean Discharge

The Ocean Discharge component of the Project would not require any construction and therefore no construction related noise would potentially exceed established noise thresholds. Similarly, operation of the Ocean Discharge component would discharge water from the Terrestrial Development portion of the Project. Noise levels at the discharge point would occur approximately 1.5 miles off-shore and is not anticipated to exceed any existing noise thresholds. No impact would occur.

Mitigation Measures: No mitigation is necessary.

Level of Significance: No Impact

Humboldt Bay Water Intakes

The modernization and revitalization of the two water intake structures would extend to within approximately 1,100 feet of the nearest noise-sensitive residential land uses along Bayview Avenue.

Construction

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise sensitive land uses or habitats, or when construction lasts over extended periods of times.

Construction activities generate considerable amounts of noise, especially during excavation activities when heavy equipment is used. Intake construction noise would primarily result from the excavation of trenches, which would be accomplished by a backhoe or similar equipment. As shown in Table 3.10-12, construction noise levels associated with the Humboldt Bay Intakes are anticipated to reach 78 dBA L_{max} and produce and hourly average noise level of 74 dBA L_{eq} at 50 feet. At the nearest land uses, these levels would attenuate to between 43 and 54 dBA L_{max} and 39 and 50 dBA L_{eq}. Construction noise levels associated with the intakes would not exceed the criteria for residential or commercial land uses in the area, nor the in-air thresholds for pinnipeds or Marbled Murrelets. A less than significant impact would occur.

Table 3.10- 12 Estimated Construction Noise Levels at Nearby Land Uses from Intakes

Phase	Calculated Hourly Average L_{eq} at Noise-Sensitive Receptors, dBA			Calculated RMS, at Nearest Shoreline Areas, dB	
	Industrial South (800 feet)	Residential North (1,100 feet)	Residential East (2,800 feet)	Humboldt Bay East (50 feet)	Pacific Ocean West (2,700 feet)
Intakes	50	47	39	74	39
Calculated L_{max}					
Maximum Levels	54	51	43	78	43

Operation

The primary noise sources associated with the operations of the dock intake structures would be the two intake pumps that are proposed to be mounted above each intake structure on a concrete pad. The proposed design includes up to two new vertical turbine pumps per dock, providing up to a maximum of 2,750 gpm. The pumps will operate on variable speed drives in order to provide a variable flow rate depending on demand and pipe pressure.

A pump selection analysis has not been completed at the time of this analysis to determine the precise pump specifications. Preliminary calculations indicate that the power requirements for the Red Tank dock pumps will be 75-100 hp, and RMT II dock pumps will be 100-125 hp. Assuming a speed rating on 1,600 to 1,800 rpm, the operation of two pumps would produce a noise level of approximately 95 dBA L_{max}/L_{eq} at 3 feet. These pumps would also be enclosed which may further reduce the noise level produced during operation.

The nearest receptor to the north (residential land uses along Bayview Avenue) would be approximately 1,600 feet from the Red Tank dock pumps and approximately 4,300 feet from the RMT II pumps, and would be exposed to a combined operational noise level of 41 dBA L_{max}/L_{eq} and 47 dBA CNEL assuming 24-hour per day operations of all four pumps.

To the to the south (residential land uses along Bay Street), the nearest sensitive receptor would be approximately 2,600 feet from the RMT II Dock pumps and approximately 5,300 feet from the Red Tank dock pumps, and would be exposed to a combined operational noise level of 40 dBA L_{max}/L_{eq} and 46 dBA CNEL assuming 24-hour per day operations of all four pumps.

The nearest receptor to the east (marina) would be approximately 2,600 feet from the RMT II Dock pumps and approximately 3,500 feet from the Red Tank Dock pumps, and would be exposed to a combined operational noise level of 40 dBA L_{max}/L_{eq} and 46 dBA CNEL assuming 24-hour per day operations of all four pumps.

Operational noise levels produced by the intake pumps would be well below the Humboldt County noise levels thresholds of 60 dBA CNEL, 80 dBA Lmax (daytime), and 70 dBA Lmax (nighttime) at the property lines of the nearest sensitive receptors. Therefore, the operation of the Humboldt Bay Intakes component would not exceed established thresholds. No impact would occur.

Mitigation Measures: No mitigation is necessary.

Level of Significance: Less than Significant

Compensatory Off-Site Restoration

As stated above, Humboldt County does not establish quantitative limits for construction-related noise, and the Humboldt Bay Area Plan does not include applicable noise-related policies. Based on criteria commonly used throughout California, this analysis considers construction noise impacts to be significant where noise from construction activities exceeds 60 dBA Leq and exceeds the ambient noise environment by at least 5 dBA Leq at noise-sensitive uses (residential) in the Project vicinity for a period exceeding one year. For commercial uses, a significant impact would be identified if construction noise were to exceed 70 dBA Leq and exceeds the ambient noise environment by at least 5 dBA Leq for a period exceeding one year.

The Compensatory Off-Site Restoration component would require the use of an excavator with a vibratory hammer, and timber clamp to remove the creosote piles at Kramer Dock. The Project would remove a small number of piles approximately 50 feet from a commercial use. No residential or other sensitive uses are located within the vicinity of the Kramer Dock. The nearest residential use is approximately 1,200 feet away along Civic Avenue. The pile removal would be linear, moving along the shoreline as the piles are removed. This would result in intermittent noise increases along the shoreline. The noise associated with pile removal would be temporary, specifically, the noise increase that would occur within 50 feet of the commercial use is not anticipated to last longer than 2-3 days, before moving further away, where no other sensitive uses exist. Noise levels generated from a vibratory pile driving could be up to 93 dBA Lmax at 50 feet (see Table 3.10-10). Given the short duration of pile removal, less than within 50 feet of a commercial use and the fact that the overall pile removal activity would last less than one year, it is assumed that this would not result in a significant impact. A less than significant impact at the Kramer Dock would occur.

Furthermore, pile removals conducted via vibratory methods have been identified as not producing levels of sound capable of influencing the behavior of listed salmonids (NMFS 2017). This is also assumed to be the case for other listed fish species and marine mammals. Therefore. It is unlikely to impact marine species present within the vicinity of the Kramer Dock pile removal area. A less than significant impact would occur.

The Spartina removal aspect would utilize mechanical equipment to clear the chosen area. Although it may be located within close proximity to residential uses, it would last less than one week and be intermittent. Therefore, a less than significant impact would occur.

Once implemented, the Compensatory Off-Site Restoration component would not generate any noise. Therefore, no operational impact would occur.

Mitigation Measures: No mitigation is necessary.

Level of Significance: Less than Significant

Impact NOI-b: **Would the Project result in generation of excessive groundborne vibration or noise levels? (Less than Significant)**

Terrestrial Development

Land Use/Sensitive Receptors

Humboldt County does not establish vibration limits to minimize the potential for cosmetic damage to buildings. However, the California Department of Transportation (Caltrans) recommends a vibration limit of 0.5 in/sec peak particle velocity (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 ancient buildings or buildings that are documented to be structurally weakened (Appendix J). No known ancient buildings or buildings that are documented to be structurally weakened adjoin the Project Area. Conservatively, groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in a significant vibration impact (Appendix J).

The noise and vibration evaluation assessed typical vibration levels that could be expected from construction equipment at a distance of 25 feet, inclusive of required equipment and methods for all four potential construction options. Terrestrial Development construction activities, such as drilling, the use of jackhammers, rock drills, and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. In particular, any of the deep foundation piling options could generate substantial vibration in the immediate vicinity. The equipment specifications for each deep foundation piling option were reviewed and calculated for comparison at a common reference level of 25 feet (Appendix J).

A 270-foot-tall smokestack will be imploded as part of the demolition proposed for the Terrestrial Development component. The smokestack is 900 feet from a water tank located to the west, 1,500 feet from a woodchip facility located to the south, and 2,500 feet from the nearest residences located to the south. Vibration caused by the collapse of the structure and the air overpressure (noise) caused by the detonation of the explosives are of primary concern at these receptors.

Caltrans and others have established criteria relating the likelihood of damage to structures from vibration. For residences, vibration levels should not exceed 0.5 to 1 in/sec PPV in order to avoid “threshold damage”. Threshold damage is defined as “loosening of paint; small plaster cracks at joints between construction elements; lengthening of old cracks”. The damage threshold for load bearing masonry walls, engineered structures, heavy commercial buildings, or higher levels of damage to residential structures, is 2 in/sec PPV or greater. Damage to old or poorly glazed windows does not occur until air-overpressure reaches about 150 dB(L) according to the United States Department of the Interior, Bureau of Mines (USBM).

Ground vibration from implosion of the smokestack would occur when the imploded structure impacts the ground. Data from a larger implosion project (JEA St. John’s River Power Plant Boilers and Chimney), was reviewed to credibly estimate worst-case vibration levels expected with the proposed implosion of the 270-foot-tall smokestack. The similar implosion project involved the implosion of two boiler units and one 650-foot-tall stack. At distances of approximately 800 to 1,100 feet, ground vibration levels produced by the larger implosion project ranged from 0.160 to 0.610 in/sec PPV. At distances of 1,300 to 1,500 feet, ground vibration levels produced by the larger implosion project ranged from 0.150 to 0.360 in/sec PPV. Vibration levels would be less at distances of 2,500 feet or further, representing the nearest residential receptors. The data from the similar, but larger implosion project indicate that the residential threshold (0.5 to 1 in/sec) or engineered structures (2 in/sec PPV or greater) thresholds would not be exceeded with the implosion of the 270-foot-tall smokestack.

At distances of approximately 800 to 1,100 feet, air-overpressure levels produced by the larger implosion project ranged from 142 to 150 dB(L), and at distances of 1,300 to 1,500 feet, air-overpressure levels produced by the larger implosion project ranged from 141 to 142 dB(L). Air-overpressure levels would be less at distances of 2,500 feet or further, representing the nearest residential receptors. Air-overpressure levels resulting from the implosion of the 270-foot-tall smokestack would be expected to fall below 150 dB(L) at any buildings having windows at the woodchip facility and at the nearest residences to the south.

Vibration levels would vary depending on soil conditions, construction methods, and equipment used. The water storage tank to the west would be as close as 600 feet from the shared property line. Vibrations may be slightly perceptible but would be unlikely to cause damage to any structure. The woodchip distribution facility, biomass facility, and residential buildings located further to the south would be exposed to lower vibration levels (Appendix J). Ground vibration from implosion of the smokestack would not exceed residential, or engineered structures thresholds. As reported in the noise and vibration evaluation, this would result in a less-than-significant impact to sensitive land uses and structures near the Terrestrial Development Site.

Fish& Marine Mammals

General Demolition

The use of hammer hoes, excavators, trucks, dozers are the primary noise sources associated with the demolition of buildings and concrete slabs. These sources are mobile and will be at any given area in the overall work area for a short period of time. The maximum noise level associated with these types of equipment is 90 dBA Lmax at 50 feet and the maximum vibration levels would be 0.089 in/sec PPV at 25 feet. At the closet point to Humboldt Bay, approximately 50 meters (165 feet), these levels will be below any of the adopted thresholds of significance for marine mammals. There is the potential for implosion (explosive demolition) of the concrete chimney stack which is approximately 445 meters (1,460 feet) from Humboldt Bay and 465 meters (1,525 feet) from the Pacific Ocean. Blasting source levels would be 94 dBA L_{max} at 50 feet at 445 meters (1,460 feet) the airborne nose level would be 66 dBA L_{max} well below any noise criteria for marine mammals.

Sheet Piles

The predicted noise levels for Marine Mammal impacts with the vibratory driving of the Sheet Piles are not anticipated to reach the Level B Harassment level of 120 dB_{RMS} in the water. There are no adopted injury thresholds for continuous noise sources such as vibratory pile driving, therefore the only threshold would be the harassment threshold of 150 dB_{RMS} for fish. The vibration associated with vibratory pile driving to install the sheet piles levels are not expected to reach or approach the harassment threshold for fish.

Foundation

There are three alternatives for the preparation of the foundation for the Terrestrial Development component:

– Rammed Aggregate Piles (RAP) - Rammed Aggregate Pier installation using the Geopier system is constructed by drilling out a volume of compressible soil to create a cavity and then ramming select aggregate into the cavity in thin lifts using the patented beveled tamper.
– Vibro Displacement Columns (VDC) - VDC is a soil-displacement, sand, aggregate, soil cement, and grout column ground improvement method commonly called vibro compaction and vibro replacement. VDC uses dynamic, vibratory energy and displacement technology to construct strong, engineered, “composite ground” for support of slabs and foundations and to reduce liquefaction settlement.
– Vibro Compaction (VC) **-** VC is a soil-displacement, sand, aggregate, soil cement, and grout column ground improvement method commonly called vibro compaction and vibro replacement. VC uses dynamic, vibratory energy and displacement technology to construct strong, engineered, “composite ground” for support of slabs and foundations and to reduce liquefaction settlement.

All three of these methods were evaluated for their potential to harm fish and marine mammal species. For the RAP, VDC, and VC alternatives, the predicted noise levels to reach the Level B Harassment level of 120dB_{RMS} out to 100 meters. The distance to the PTS Threshold for all Cetaceans and Pinnipeds is anticipated to be approximately 5 meters or less.

There are no adopted injury thresholds for continuous noise sources such as RAP, VDC, or VC, therefore the only threshold would be the harassment threshold of 150 dB_{RMS} for fish. The RMS levels are not expected to reach or approach the harassment threshold for fish species. Based on previous studies prepared, as detailed in the Construction Noise, Vibration, and Hydroacoustic Report (Appendix J), predictions were made to determine a conservative estimate of the hydroacoustic vibrations and were then adjusted for distance. These were assumed to have a worst-case noise level similar to the maximum noise of vibratory pile installation. There will be some sheet piles installed for shoring around foundations these sheet piles would be installed by vibratory methods up to 30 feet deep. Underwater sound levels would not be expected to exceed the 150 dB RMS in the water, therefore, there would be no impact to fish or marine mammals if either the RAP, VDC, or the VC alternatives are used.

Mitigation Measures: No mitigation is necessary.

Level of Significance: Less than Significant

Ocean Discharge

No construction is required for the Ocean Discharge component and therefore, no groundborne vibration would be generated. No impact would occur.

Mitigation Measures: No mitigation is necessary.

Level of Significance: No Impact

Humboldt Bay Water Intakes

Construction of the Intake work would consist of limited in-water work performed by divers. Vibration from these activities would be minor in the water and would not have any effect on species in the vicinity. Therefore no impact related to vibration would occur. During operation, no vibration impacts are expected. Therefore, no operational impact related to vibration would occur.

Mitigation Measures: No mitigation is necessary.

Level of Significance: No Impact

Compensatory Off-Site Restoration

The Compensatory Off-Site Restoration component would require the use of an excavator with a vibratory hammer, and timber clamp to remove the creosote piles at Kramer Dock. Vibratory hammers range from 0.734 to 0.170 PPV at 25 feet (in./sec) and from 0.079 in/sec PPV to 0.342 in/sec. PPV at 50 feet. As mentioned above, the California Department of Transportation (Caltrans) recommends a vibration limit of 0.5 in/sec peak particle velocity (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 ancient buildings or buildings that are documented to be structurally weakened (Appendix J). No known ancient buildings or buildings that are documented to be structurally weakened adjoin the Kramer Dock area. Conservatively, groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in a significant vibration impact. The nearest building is located approximately 50 feet away at the northern most area where piles are to be removed. Vibration levels are highest close to the source, and then attenuate with increasing distance at the rate $PPV_{ref}(25/D)_{1.1}$, where D is the distance from the source in feet and PPV_{ref} is the reference vibration. Given the small size of piles and that temporary nature of the removal at this distance, it is unlikely to result in a significant impact from vibration. A less than significant impact would occur.

Furthermore, pile removals conducted via vibratory methods have been identified as not producing levels of sound capable of influencing the behavior of listed salmonids (NMFS 2017). This is also assumed to be the case for other listed fish species and marine mammals. Therefore. It is unlikely to impact marine species present within the vicinity of the Kramer Dock pile removal area. A less than significant impact would occur.

The Spartina removal aspect would include mowing, grinding, excavation, and other mechanical means of removal that may utilize a marsh master of other mechanical equipment, which could result in vibration. However, due to the intermittent nature of the activities, work would not occur in water, and that the Spartina removal would exceed the 0.3 In/sec PPV threshold, a less than significant impact would occur.

During operation, no vibration sources would be utilized, therefore, no operational impact would occur.

Mitigation Measures: No mitigation is necessary.

Level of Significance: Less than Significant

Impact NOI-c: **Would the Project for a Project 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, would the Project expose people residing or working in the Project Area to excessive noise levels? (No Impact)**

Terrestrial Development

As discussed in Section 3.8 (e), publicly owned Samoa Field Airport is located approximately 1.5 miles from the Project Site. The airstrip is used infrequently by small craft airplanes only. Noise from these infrequent small craft airplanes would not affect workers at the Terrestrial Development Site, and vice versa. No impact would result.

Mitigation Measures: No mitigation is necessary.

Level of Significance: No Impact

Ocean Discharge

As discussed in Section *3.8 (e*), the Ocean Discharge component is located underground and terminates approximately 1.5 miles offshore within the Pacific Ocean. No people are present in this location, therefore, safety hazards due to proximity to an airstrip or inclusion in an Airport Land Use plan do not apply. No impact would occur.

Mitigation Measures: No mitigation is necessary.

Level of Significance: No Impact

Humboldt Bay Water Intakes

As discussed in Section 3.8 (e), Samoa Field Airport is located approximately 1.5 miles from the most southern portion of the Humboldt Bay Water Intakes component. The unattended airstrip is publicly owned by the City of Eureka. The airstrip is infrequently used by small craft airplanes. Noise from these infrequent small craft airplanes would not affect workers maintaining the Humboldt Bay Water Intakes component, or vice versa. No impact would result.

Mitigation Measures: No mitigation is necessary.

Level of Significance: No Impact

Compensatory Off-Site Restoration

As discussed in Section 3.8 (e), the Compensatory Off-Site Restoration component consists of the pile removal at Kramer Dock and Spartina removal at an unknown location. The Kramer Dock aspect is not located within an ALUP, nor is it located within two miles of an airport. The nearest airport to the Kramer Dock restoration site is approximately 3.8 miles to the north. Therefore, no impact is anticipated to occur. Regarding the Spartina removal, although the site is yet to be determined, the vegetation removal would occur a week at a time and likely be repeated several times. Additionally, the majority of airports within the Humboldt Bay area are utilized by small craft airplanes. Noise from these infrequent small craft planes is not anticipated to affect workers clearing the Spartina. Therefore, no impact is anticipated to occur.

Mitigation Measures: No mitigation is necessary.

Level of Significance: No Impact

3.10.7 Cumulative Impacts

Impact NOI-C-1: **Would the Project contribute to a cumulatively significant impact to noise? (Less than Significant)**

The Terrestrial Development and Humboldt Bay Intakes components would both generate construction noise. There are no sensitive noise receptors within the vicinity of the Project Site, the nearest sensitive receptors would be located approximately 0.4 miles to the south and 0.8 miles to the north of the proposed Terrestrial Development component and approximately 1,100 feet of the Humboldt Bay Intakes component. Operational noise would be limited to primarily vehicular noise and is not considered impactful. The closest noise generating projects listed in Table 3-1 involve the construction of the collection system for the Samoa Wastewater Treatment Facility and the Renewable Energy Port Project. Other projects listed in Table 3-1 would not generate noise (e.g., marine discharge under the NPDES program) or are located sufficiently far from the Project Site as to be noise independent, including improvements in the town of Samoa or construction of the Samoa Wastewater Treatment facility itself. Construction of the collection system would be located on and near the Project Site and require standard construction techniques including excavation, trenching, and grading to install new sub-surface sewer piping and associated infrastructure; pile driving, or similar construction methods known to generate extremely high levels of noise are not anticipated. Construction of the collection system within the vicinity of the Project Site would be short-term in duration. Construction timing of the Renewable Energy Port is not known at this time, however given the extended construction phase of the proposed Project, there is potential for overlap. Given there are no sensitive noise receptors, and a noise-related impact would not result from the proposed Project, the combined cumulative impact should construction of the collection system for the Samoa Wastewater Treatment Facility and the Renewable Energy Port is not anticipated to result in a cumulative impact. The Project’s contribution to cumulative construction noise impacts will not be cumulatively considerable, and therefore will be less than significant.

Mitigation Measures: No mitigation is necessary.

Level of Significance: Less than Significant

3.10.8 References

Illingworth &Rodkin, Inc. 2021. Samoa Peninsula Land-Based Aquaculture Project Construction Noise, Vibration, and Hydroacoustic Assessment. July.

National Marine Fisheries Service. 2017. Endangered Species Act Section 7(a)(2) Concurrence Letter and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Humboldt Bay Harbor, recreation, and Conservation District's Mariculture Pre-Permitting Project in Eureka, Humboldt County, California (Corps File Number 2016-00401).