Environmental Impact Assessment of the Humboldt Offshore Wind Project

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ESM425

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2. Executive Summary

The Humboldt Offshore Wind Project is one of the first Offshore wind projects to be proposed off the coast of California. This project aligns with the global, state, and federal goals to decarbonize our current energy systems and invest in renewable energy sources. This project will have two locations: the onshore site located on the Samoa Peninsula along Humboldt Bay and the offshore site located 24 miles off the coast of Humboldt County. The onshore site is currently zoned as Industrial Coastal Dependent Development. The offshore site is located in federal waters and covers 12 square miles with water depths ranging from 600-1000 meters. The offshore area has relatively high wind speeds and can hold 200 wind turbines.

Due to the size and extent of this project, it may have impacts on Marine Mammals, Birds, plants, wetlands, hydrology, water quality, as well as socioeconomic impacts on Commercial Fishermen.

The proposed action would have significant impacts on biological resources like eel grass and wetlands. There would also be significant impacts on birds, marine mammals, and commercial fishermen. After analyzing the impacts to hydrology and water resources we found that there would be less than significant impacts.

The preferred alternative involves reconfiguring the arrangement of the turbines and utilizing a vertical axis rotor design, aiming to alleviate concerns regarding the impact of turbine arrangement on commercial fishermen as well as reducing fatal impact with pelagic bird species such as the Tufted Puffin. With a modified arrangement fishermen would no longer have to navigate to avoid the turbine farm but be able to have safe passage through it. These navigation channels would not only save time but the risk of vessel collision as well.

Introduction

3.1 - Project Setting

3.1.1 - Environmental Setting:

The Town of Samoa, where the project is located, has a mild, temperate cool summer Mediterranean climate that is largely influenced by the Pacific Ocean and the cold waters of Humboldt Bay. There are ongoing restoration efforts at the nearby Samoa and Manila Dunes and these areas are designated as nature preserves (Mintz & Union, 2022; State Coastal Conservancy, 2018). Here the temperature typically ranges from the low fifties in the winter to the high sixties in the summer, with rain occurring regularly throughout the year. Powerful winds suitable for renewable energy hit the Northern Californian coast from the Pacific Ocean, often from the northwest (Cart, 2023). The wind turbines used for offshore wind power generation will be constructed and maintained at the Redwood Marine Terminal One site. The site lies along the Humboldt Bay Harbor and Conservation District and is near the town of Samoa. Features surrounding the site include the timber museum, Tuluwat Island, railroad tracks, housing (in the town of Samoa), oyster farms, nearby wetlands and wildlife refuges, and trails used for recreational purposes.

3.1.2 - Site Description:

The offshore area that has been leased for the placement of offshore wind turbines is located in federal waters and spans a total of two hundred and seven square miles. An export cable connecting the site to the on-land grid will be located at the offshore site. The area that will be Redwood Terminal One is currently being used by local fishermen as a storage facility. The site currently holds crab pots, old fishing boats, old cars, cold storage fridges full of catch, and other fishing equipment. The condition of the project site is run-down with many structures unstable or rotting. The area of the proposed turbine assembly site is classified as MC or industrial coastal dependent. Since this area is already zoned as industrial no rezoning is necessary to make this area compliant to be a turbine assembly site. Also it is in compliance with coastal dependence. Lead agencies in planning are: the Bureau of Ocean and Energy Management, Humboldt County, and Humboldt Bay Harbor, Recreation, and

Conservation District. On the site is the USS LCI-L 1091, the vessel is owned by the LSI-L Museum Association (MuseumShips, 2022). The LCI 1091, saw action during World War II and the Korean War before being turned into a civilian boat in 1961 (Times-Standard, 2018). Following 1961, the LCI-L 1091 became a cannery ship operating in the Yukon River in Alaska until 1988 when it moved to Eureka until 2005 when it was donated to the Humboldt Bay Naval Sea/Air Museum (MuseumShips, 2022). Redwood Marine Terminal One was historically used as a timber property where redwoods were shipped along the west coast of the United States (Humboldt Bay Harbor, Recreation and Conservation District, 2024).

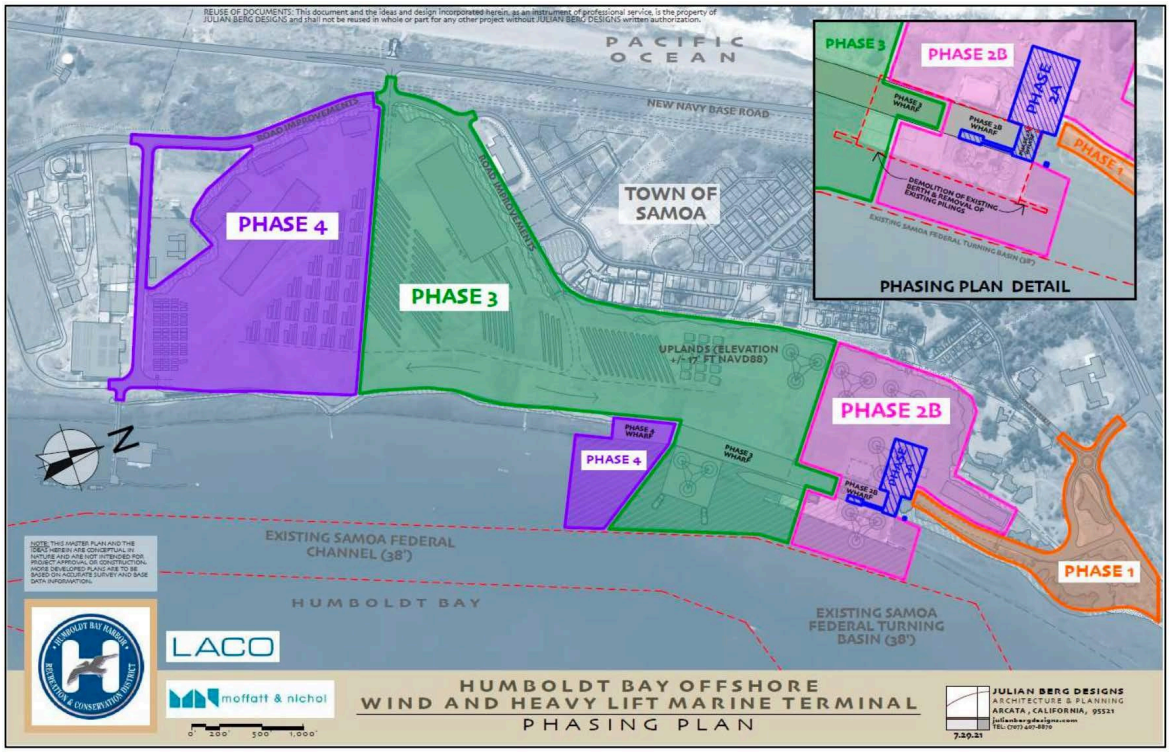

Figure 3.1

The Redwood Marine Terminal One will be the main assembly area for the offshore wind turbines and is within Assessor's Parcel Numbers (APN) 401-031-040 and 401-031-055 and parts of parcel number 401-031-070. The total area of the project site is 60 acres including a large dock, one 36,000-square-foot warehouse, and one 24,000-square-foot warehouse. The site is owned by the Humboldt Bay Harbor, Recreation, and Conservation District and will be leased out for the offshore wind project. The general plan designates the project site as MC - Industrial, Coastal Dependent - and allows for industrial uses that are necessarily coastal. Its combined zoning code is MC/A, where A implies archeological significance.

Figure 3.2
Redwood Marine Terminal 1 Warehouse
Shown above is the 36,00 square foot warehouse along with some of the crab pots that are currently being stored on the site. The photo was Taken by Lesina Burdick on 1/31/2024.

Figure 3.3
Redwood Marine Terminal 1 Main Dock
Shown above is the dock that would be used for unloading materials to construct the Windmills and loading them to be shipped out to the offshore wind site. The photo was taken by Lesina Burdick on 1/31/2024.

Figure 3.4
Redwood Marine Terminal 1 Site Overview
The above photo depicts the warehouse, dock, and extent of project phases 2A and 2B in the context of Humboldt Bay. The photo was taken by Ben Stock on 1/31/2024.

Figure 3.5
LCI-L 1091 Historical Landmark
Shown above is the LCI-L 1091 landmark on the project site. Restoration efforts are ongoing. Photo taken by Ben Stock on 1/31/2024.

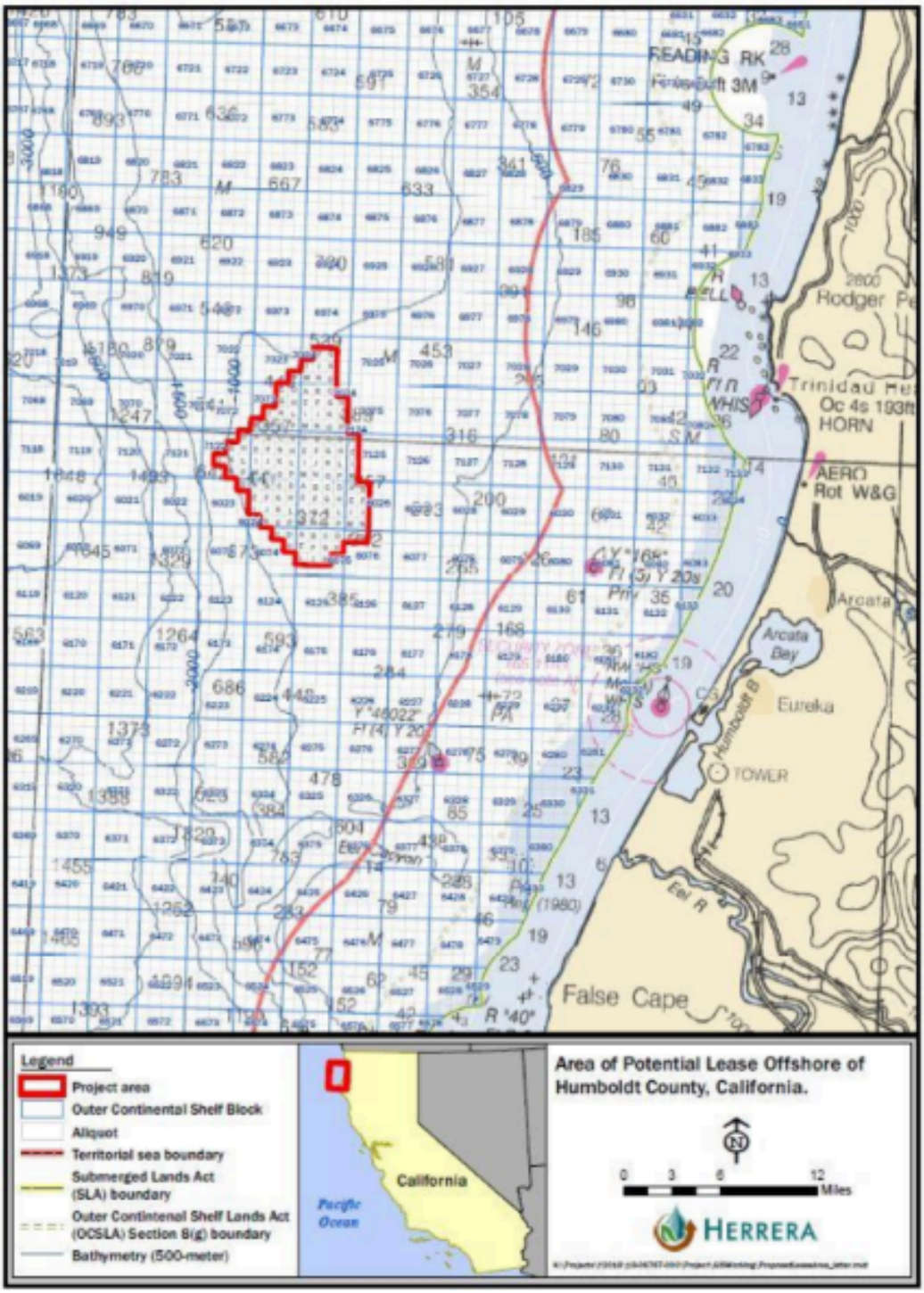

Figure 3.6
Locator Map of the offshore lease area in reference to Humboldt County and California at large.

Allowable Use Types	IG or MG	IR	MC	MB
Industrial				
Aquaculture	X	X	X	
Coastal-Dependent Industrial	X		X	
Coastal-Related Industrial	X		X	
Hazardous Industrial	X	X		
Heavy Industrial	X	X	X	
Research/Light Industrial	X	X		X
Surface Mining	X	X	X	
Metallic Mining	X	X		
Timber Products Processing	X	X		
Agricultural				
Agricultural Products Processing	X	X		
Feed Lot/Slaughter House	X	X		
Hog Farming	X	X		
Intensive Agriculture	X	X		
Timber				
Timber Production	X	X	X[1]	
Commercial				
Heavy Commercial	X	X		
Neighborhood Commercial				X
Office & Professional	X		X	X
Warehousing, Storage, & Distribution	X	X	X	X
Retail Services				X
Transient Habitation				X
Civic				
Administrative	X			X
Essential Services	X		X	X
Extensive Impact Civic Uses	X		X	
Solid Waste Disposal	X			
Utilities and Energy Facilities	X	X	X	
Other				
Public Access Facilities	X	X	X	X
Public Recreation	X	X	X	X
Residential Subordinate to Principal Use	X	X	X	X
Similar Compatible Uses	X	X	X	X
Development Standards				
Max. Floor Area Ratio	3	3	3	3
Maximum Structure Height and other development standards	per zoning	per zoning	per zoning	per zoning

1. Conditionally permitted.

Table 3.1

This table provides an overview of the kinds of projects allowable for the current zoning code (MC).

3.2 - Project Description

The Humboldt Offshore Wind Project will be constructed in two locations: an offshore location and an onshore location. The offshore location is approximately 12-square miles in area and located 21-29 nautical miles off the coast of Humboldt County west of Humboldt Bay in federal waters. Up to 200 floating wind turbines will be installed in this location. The water depth ranges from 600 to 1000 meters. This location experiences highly consistent wind speeds which will help to maximize the energy capacity of the project. Wind speed averages annually between 9 m/s and 10 m/s in the proposed lease area.

The Humboldt Bay Harbor, Recreation, and Conservation District owns the onshore project location known as Redwood Marine Terminal (RMT1), which includes Assessor's Parcel Numbers (APN) 401-031-040 and 401-031-055 and parts of parcel number 401-031-070. These parcels are designated by the County for use Industrial/Coastal Dependent (MC) uses with an Archaeological Resources overlay zone (A). The parcels surrounding the Project area are designated as Industrial/Coastal Dependent (MC/A), Natural Resources (NR), and Wetlands (W). These parcels include shops, a cookhouse, a museum, homes, and undeveloped dunes and wetlands. The project site currently contains 60 acres of storage space, and two warehouses at 36,000 square-feet (SF) and 24,000 SF and will be used for the staging, storage, fabrication, and assembly operations for the wind turbines.

3.2.1 - Facilities to be Developed:

<u>Onshore Facilities:</u>

Facilities at the Port of Humboldt Bay will be developed to serve as the final assembly, hull load-out, turbine installation, and future maintenance base for WindFloat. There is ample space at harbor facilities for staging, storage, fabrication, and assembly operations. Any modifications and/or upgrades necessary for RMT1 will take into account sea level rise.

3.2.2 - Project Construction:

The construction phase includes demolition and removal of existing structures, reconstruction of the existing dock, assessment and remediation of contaminated soils, and construction of warehouses to manufacture and assemble the parts, some of which will be imported by ship or barge.

Turbines:

Up to 200 offshore wind turbines sized to generate 12 MW each will be built at the onshore site. With the possibility of incrementally building the required infrastructure for other offshore wind lease areas, Humboldt Bay could become a hub for offshore wind along the West Coast.

Floating Platform:

The WindFloat is a unique semi-submersible type, column-stabilized, offshore platform with water-entrapment plates, an asymmetric mooring system, and an offshore wind turbine located on one of the columns. Three columns (Figure 3, item 1) provide buoyancy to support the turbine and provide stability from the water plane inertia. Columns are spaced about 75 m apart, laid out in a triangle, to counteract the large wind-induced overturning moment.

The columns are interconnected with a truss structure composed of main beams (Figure 3, item 2) connecting columns and bracings (Figure 3, item 3). The secondary structure includes a boat landing (Figure 3, item 4) on one of the columns, deck space and railings on top of columns and between columns to enable personnel access (Figure 3, item 5), and equipment to support the onboard crane, array cable hang off, etc. The WindFloat substructure is designed to keep wind turbine motions within the manufacture-specified design envelope (Figure 3, item 8).

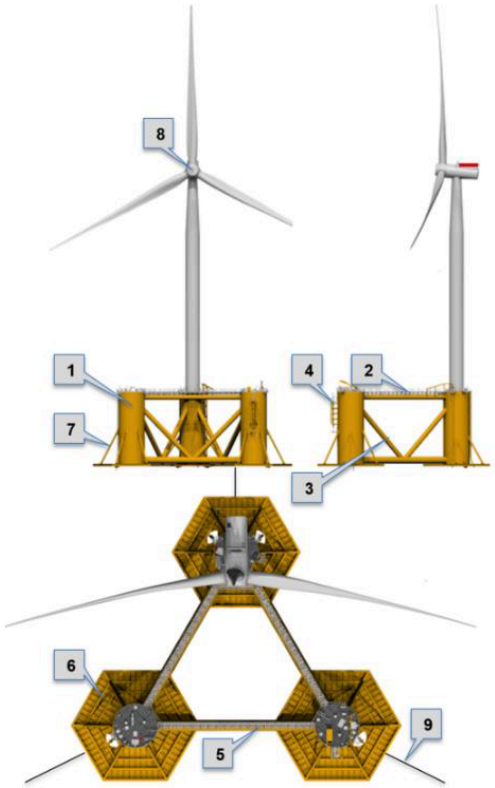

Figure 3.7
Front, Top, and Side Views of the WindFloat.

Mooring System and Inter-Array Cables:

Three mooring lines (Figure 3, item 9) are arranged asymmetrically to provide a mooring system. The mooring system is made of conventional components: chain, polyester rope, and heavy chain, connected to anchors. The inter-array electrical cable configuration between the units is also shown in Figure 3. Inter-array cables will use subsurface buoys and will be submerged to a safe depth.

Power Transmission and Grid Interconnection:

An electrical transmission system that involves the connection of the Humboldt Wind Energy Project to the grid with one parallel 115 kV export cable from a floating substation moored at the site. This configuration will need to be compared to a configuration with two parallel cables of 66kV directly connected to an onshore

transformer that allows for full power transfer and minimizes the single-point-of-failure risk exposure.

The proposed route of the approximately 24-mile offshore power cable will travel from the easternmost WindFloat unit in a straight line to shore. From that point, the power cable will be installed beneath the beach and the south spit of Humboldt Bay via horizontal drilling to a point inland to connect to the existing electrical grid infrastructure. The route will be subject to change based on design optimization, subsea conditions, and avoidance of sensitive areas.

3.3 - Purpose & Need

Offshore wind development is a powerful opportunity to aid us in meeting the objective of transitioning our energy transition away from fossil fuel reliance towards sustainable, renewable energy sources. With the accelerating threat of anthropogenic climate change and the pressing need to reduce greenhouse gas emissions that are exacerbating the climate crisis, offshore wind offers a solution that directly aligns with the global, state, and federal goals to decarbonize energy systems. The purpose of offshore wind lies in its capacity to generate vast quantities of clean electricity – up to 200 turbines providing 12 MW each (Redwood Coast Energy Authority, 2018) – and in its ability to harness the untapped, renewable power of oceanic winds. Oceanic wind speeds tend to be consistently higher and more reliable than some land-based wind energy systems, with an average of 15.75 m/s in the lease area (Redwood Coast Energy Authority, 2018). This project will diversify our energy sources at the federal and state levels, reduce reliance on finite and climate-worsening fossil fuels, and make substantial progress towards achieving climate targets outlined in international agreements like the Paris Agreement and national or state objectives. California Senate Bill 100 – otherwise known as the 100 Percent Clean Energy Act – requires the state to meet a transition to 60% carbon-free energy by 2030 and 100% by 2045 (SB 100, De León; California Energy Commission, 2021). There are 22 other states in addition to California that have outlined plans to move toward 100% carbon-free energy systems by 2045 or 2050, providing much support for the national shift away from fossil fuel

dependence (Clean Energy States Alliance, 2023). This means that the need being fulfilled by this project will be achieved since it is not merely an offshore wind project in California. Rather, nearly half the nation is committing to clean energy transitions that are needed at scale to achieve the need this project fulfills. The *Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050* describes the current Department of State plans for reducing emissions to 50% less than 2005 levels and completely decarbonizing energy production by 2050 (US Department of State, 2021).

Offshore wind projects, especially when scaled up to a state level, create employment opportunities and stimulate economic growth, fostering innovation and investment in green technologies, while increasing energy security for coastal communities. Given that much of our existing energy infrastructure is predominantly reliant on fossil fuel use and production – employing roughly 17% of energy workers as of 2019 – the need to decarbonize our economy will essentially require the creation of green jobs to replace the reliance on fossil fuel companies for livelihoods (California Energy Commission, 2020). Moreover, offshore wind development addresses a central need within the energy landscape by offering a solution to meet both growing energy demands and green energy transition. By upscaling offshore wind development, particularly serving coastal regions where populations are concentrated and energy demands are high, this project will help California achieve this need.

According to Assembly Bill 525, the California Energy Commission has been directed to provide a statewide evaluation of the offshore wind energy capacity of California in collaboration with the California Coastal Commission, the State Lands Commission, OPR, the Ocean Protection Council, CDFW, the Governor's Office, and other relevant federal, state, and local agencies (AB 525, Chiu; California Energy Commission, 2023). This will provide insights into future Offshore Wind developments aimed at pushing California and the US to reach the remainder of their wind energy development goals and guide future projects in terms of best practices for site evaluation and project implementation. Also following the Humboldt County General Plan's energy goals and policies –such as energy self-sufficiency, conservation, efficiency, and shifting to a reliance on renewable energy sources – the development of

offshore wind farms will help supply energy from local renewable resources (Humboldt County 2017).

3.4 - Scoping Considerations/Permits Required

Due to the scale of potential impact and development necessary for both the offshore and onshore sites for the proposed Humboldt Offshore Wind Project multiple permits must be obtained. For the onshore site, a Coastal Development Permit is required from the Coastal Commission; this permit is necessary because the onshore project will include construction and demolition in the coastal zone. Another permit required for the onshore site is a Building Permit from Humboldt County. A Building Permit is required to build anything in Humboldt County and is necessary for this project so we can build the dock, offices, and warehouses. The last set of permits needed for the onshore site are the Clean Water Act Section 404 Permit and 401 Certification. These are required for discharge, dredge, or fill material into Humboldt Bay and will help protect water quality during the construction and maintenance of the dock.

For the offshore site, there are more permits required, one of the required permits is a Geological Survey Permit from the California State Lands Commission for any activity that is performed on sovereign lands, tidelands, submerged lands, and navigable waterways. Another Permit required for the offshore site is an Incidental Take Permit from the California Department of Wildlife for any wildlife that may be harmed during operations between the onshore and offshore sites or once the wind turbines are placed in the offshore site. The last permit required for the offshore site is a Private Aids to Navigation Permit from the U.S. Coast Guard. This permit is for the protection of vessel traffic and to ensure the safety of the marine environment of other vessels. This permit is needed for towing the turbines in and out of the bay.

Not only is the onshore development site located on the unceded, ancestral lands of the Wiyot tribe, but the likely reach of impacts associated with the Offshore Wind Project as a whole extends to include impacts to the Blue Lake Rancheria, the Bear River Band of Rohnerville Rancheria, the Trinidad Rancheria, the Karuk Tribe, and the Yurok Tribe. This is due to the extensive impacts on wildlife - the interconnectivity of species and ecosystems; salmonids moving upstream, migratory birds, and other

factors. The Karuk Tribal Consultation Policy provides decision makers and state institutions with a blueprint for how to effectively and adequately consult indigenous peoples and will be referenced for consultation during the environmental impact assessment of the project. One key recommendation is to adequately consult with the tribes via ongoing communication throughout the project. Another key takeaway is to take into consideration cultural and historical resources. Thirdly, it is important to involve tribes centrally in decisions that may have significant impacts on tribal cultural resources and to support tribal sovereignty, self-determination, and self-governance.

Aside from federal or state agencies and First Nations, key stakeholders will include the general public, conservation NGOs such as The Nature Conservancy, environmental advocacy groups such as North Coast Environmental Center Groups, energy companies, the fishing community of Humboldt Bay, and other affected individuals.

The Nature Conservancy is involved in this project in protecting the environment and wildlife species that may be affected by this project. We plan to work with them to assess what wildlife species may be affected, and how to minimize impacts that may be caused by the project. The California Coastal Commission is involved as the construction of the project is within a coastal zone. We plan to work with them to make sure the project is following all requirements for industrial development in the coastal zone. The US Department of Energy is involved as this project is involved in a national objective to shift toward the generation and use of renewable energy. This agency will be worked with to move towards the completion of this goal. The California Energy Commission is involved in this project as this project will contribute significantly to California’s goal of shifting to a dependence on renewable energy sources. They will be worked with to ensure that we are complying with offshore wind energy specifications and aligning with the strategic plan. Community members in local and surrounding areas are involved in this project, as it will impact where they live, and possibly their daily lives. They will be worked with to ensure that their voices are heard and to hear any significant issues that may need to be addressed. The Bureau of Ocean Energy Management is involved in this project as this agency will be issuing the leasing agreement. It is planned to work with them to create a leasing agreement and follow all

regulations in federal waters. California Fish and Wildlife, NMFS, & USFWS are involved as we will need to obtain permits from them and assess whether there are impacts to any fish or wildlife. We will work with them to minimize impacts to species in the area. The Advisory Council on Historic Preservation is involved as we will need to work with them to determine if there are any cultural artifacts or resources in the project area. We plan to work with them to ensure artifacts are not damaged during construction or any other processes during the life of this project. The U.S. Coast Guard is involved in this project as we will need a permit from them and will need to work with them to make sure it is safe to transport the windmills. We plan to work with them to coordinate when the windmills are being transported back and forth to make sure it does not impact the safety of people or other environmental factors. North Coast Environmental Center Groups are involved in this project as we will need to work with them to make sure that we minimize negative impacts on the environment as reasonable. We plan to listen to and address their concerns for all aspects of the Offshore Wind Project.

Public and stakeholder outreach will consist of various public meetings to inform the public of the project plan, as well as to listen and hear input on concerns of this project. We will address any concerns regarding the projects, and go over all changes made to the plan. We plan on inviting speakers to present the current project, as well as inviting interest groups and community representatives to listen and address concerns. In addition to public meetings, we plan to reach these target audiences by sending out emails, and mail, calling key community group leaders, and advertising in local newspapers and businesses. Different means of outreach are important in this process to ensure as many people are involved and address concerns and questions they may have.

Resource Categories: Impact Analysis

4.1 - Biological Resource Category: Plants/Wetlands - Ben Stock

4.1.1 - Environmental Setting

Humboldt Bay is a haven for eelgrass (*Zostera marina*), hosting roughly 41% of California's total eelgrass population - or approximately 4,670 acres - which contributes nearly half the total productivity of Humboldt Bay (NOAA, 2014; Schlosser & Eicher, 2012). The large contribution of eelgrass to Humboldt Bay's productivity makes it essential for supporting trophic webs in the bay as well as nearby estuaries and marine ecosystems. *Z. marina* provides critical spawning and rearing habitat for important marine species such as Pacific herring and salmonids as well as a variety of aquatic invertebrates that serve as a substantial food source for fish, migratory birds, and sea turtles (NOAA, n.d.). Eelgrass meadows in the bay are euryhaline - able to adapt to fluctuating salinity - and thus are found between the low intertidal zone and up to 6 meters in depth (CDFW, 2021). The areas in the bay that will experience disturbance from dredging and operational activities are host to patchy or continuous eelgrass communities (Figure 4.1.1). As such, *Z. marina* is vulnerable to disruption by increased operational activities associated with such a large-scale project as offshore wind.

The pivotal role *Z. marina* plays in the life cycles of many ecologically important fish and wildlife species makes them foundational to trophic systems within their bays and estuaries. As wetlands habitat of significant ecological value, eelgrass meadows in Humboldt Bay are also protected under numerous laws and regulations, including the California Coastal Act, the Clean Water Act, the Rivers & Harbors Act, and the National Wetlands Mitigation Action Plan. Necessarily then, any activities undertaken with the potential to disrupt eelgrass meadows and habitat warrant careful consideration and robust mitigation strategies where impacts may be significant. The established presence of *Z. marina* in Humboldt Bay is well-documented and sets a strong baseline for determining any impacts to these meadows resulting from operational and developmental activities associated with the proposed offshore wind project.

4.1.2 Impact Analysis

Thresholds of Significance

The primary criteria to be used for assessing impact is the No-Net-Loss Policy, as stated in the California Eelgrass Mitigation Policy (NOAA, 2014) as well as by the Bush administration (USACE & EPA, 2002) and the Obama administration (Office of the Press Secretary, 2015). It requires that any agency action that has the potential to significantly alter wetlands must first minimize and avoid impacts before planning for mitigation. If necessary, compensatory mitigation is required as outlined by the 2008 final rule on compensatory mitigation (USACE, EPA, & DoD). The No-Net-Loss policy encompasses the entirety of the project, such that impairments to wetlands or eelgrass habitat are compensated for somewhere else in Humboldt Bay. The California Coastal Act (1979) Section 30121 definition of wetlands includes eelgrass beds, and thus demands their protection under the National Wetlands Mitigation Action Plan (USACE & EPA, 2002).

Another criteria that will be evaluated is the impairment of wetlands resulting from dredging activities as stated under Section 404 of the 1977 Clean Water Act (USACE, DoD, & EPA, 2008). While this is not a No-Net-Loss policy, it does require that all appropriate and practicable mitigation measures are taken to avoid such impacts after carefully weighing the practicability of less impactful alternatives (CWA § 404(b)(1), 1977). Additionally, Section 10 of the Rivers & Harbors Act (1899) regulates activities below the ordinary high water level, including modifications to navigable waterways such as dredging. The utilization of these criteria in evaluating the impact to eelgrass meadows and wetlands and ensuring adherence to pertinent legislation will support the goals of the California Eelgrass Mitigation Policy (NOAA, 2014).

Impacts

The proposed project will require extensive dredging activities for operational maintenance of the wind terminal, thus there is a substantial concern that wetlands and eelgrass meadows within the vicinity of the project site will be adversely impacted. As such, it is necessary to ensure that any potential losses due to offshore wind developmental or operational activities are mitigated at a No-Net-Loss standard. Regulatory frameworks such as the California Eelgrass Mitigation Policy and the

Humboldt Bay Eelgrass Comprehensive Management Plan protect vital wetland habitats and particularly eelgrass meadows through the goal of maintaining ecological integrity and productivity. These frameworks, alongside the California Coastal Act (1979) regulate impacts to these ecosystems, notably from dredging and fill activities from the project.

BIO-1.1: Eelgrass

The proposed project will cause significant temporary and permanent impacts to the eelgrass population in the vicinity of the project site and along operational channels in the bay due to the project's plans to maintain the channel for operational use by regularly dredging as it fills with sediment from influent watersheds. Specifically, the proposal entails dredging down to a depth of 60 feet. Since the eelgrass biomass in Humboldt Bay is predominantly found at or below the mean lower-low tide level, the implementation of dredging activities has a significant potential to disrupt and reduce critical eelgrass habitat (Keller & Harris, 1966). This is resultant from the disturbance of substrate and subsequent disestablishment of root systems in addition to potential physical impairments from contact with operational equipment. Notably, higher-elevation areas of eelgrass habitat have been shown to already be particularly vulnerable to disturbance (Gilkerson, 2008). Due to the escalating loss of seagrasses globally, any impacts to eelgrass habitat must be considered with increasing significance (Waycott et al., 2008).

BIO-1.2: Wetlands

Wetlands provide many services such as improving water quality, providing habitat and supporting biodiversity (EPA, 2024). The impact to wetlands will be measured in terms of the conversion or destruction of wetland areas due to development of onshore facilities at Redwood Marine Terminal 1. The construction of a new dock at Redwood Marine Terminal 1 threatens a substantial impact to wetlands due to conversion of wetlands to a different land use, particularly of freshwater forested/shrub wetlands as well as estuarine and marine wetlands (Figure 4.1.2). This would lead to the loss of critical ecosystem services provided by wetlands such as habitat, flood resilience, and biodiversity (EPA, 2024). Due to the continual nature of the plans to dredge navigation channels for operational efficiency and the establishment of

a permanent new dock structure, many impacts to wetlands in the project site's vicinity will be permanent.

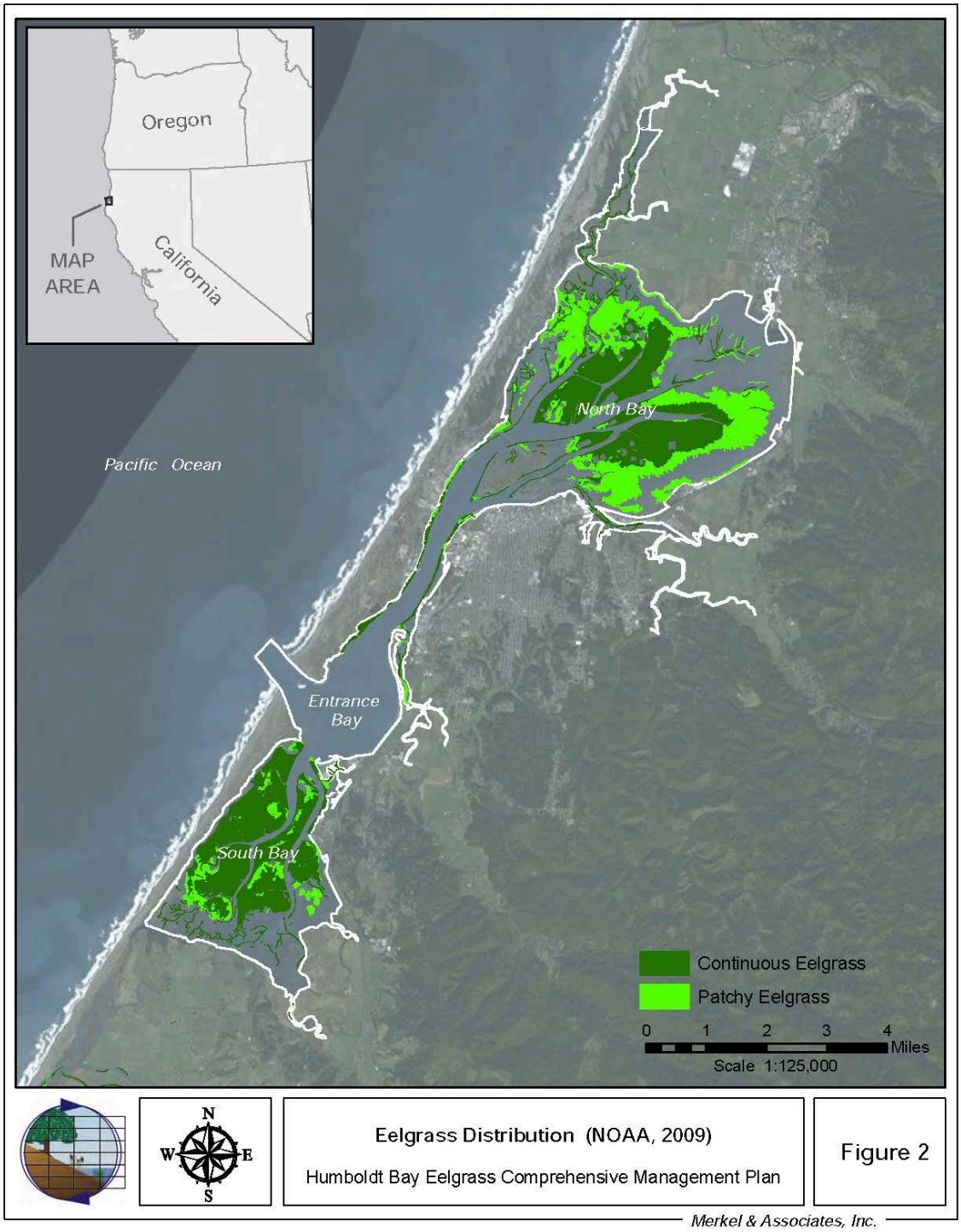

Figure 4.1.1

Eelgrass distribution of Humboldt Bay in 2009. (Merkel & Associates, n.d.).

Figure 4.1.2

Wetland types within the vicinity of Redwood Marine Terminal 1. (Humboldt County GIS Portal, n.d.).

4.1.3 - Mitigation Measures

BIO-MM1.1 Eelgrass:

In-kind mitigation measures will entail “the creation, restoration, or enhancement of habitat to mitigate for adverse impacts to the same type of habitat”, achieving a final mitigated ratio of 1.2:1 across the project area (NOAA, 2014). This will require restoration activities to implement a higher ratio of mitigation such as the median applied ratio of 2.8:1 (Ward & Beheshti, 2023) so as to achieve a minimum ratio of 1.2:1 after accounting for unsuccessful mitigation efforts. Due to the longer life cycle of eelgrass and the time it takes to become established compared to the rapid rate of harm from the project’s disruptive activities, an upfront planting ratio of 4.82:1 will be implemented, as required in the California Eelgrass Mitigation Policy to account for the historic trend of 25% survival after eelgrass restoration activities (Merkel & Associates,

n.d.). The potential for the final mitigated ratio to be well above the minimum 1.2:1 required would only result in net benefits gained which would support the California Eelgrass Mitigation Plan and thus should not be considered as excess at high implementation success rates.

To achieve this ratio despite potential losses to existing eelgrass beds, eelgrass will need to be planted or replanted in areas without existing eelgrass. Since not all sites in Humboldt Bay are favorable to eelgrass plantings (Figure 4.1.3), modification of substrate in barren areas may be a supplementary method of increasing plantable habitat. Where transplanting of substrate is required to expand suitable eelgrass habitat, dredged material from impacted eelgrass communities will be reused so as to foster habitat conditions already shown to be favorable. Steps will need to be taken to ensure that the density of created or replanted eelgrass vegetation is comparable to the impacted habitat if restoration activities are to achieve effective mitigation (Merkel & Associates, n.d.). Sourcing of eelgrass for planting or transplanting must follow all regulatory frameworks serving to protect existing eelgrass distribution in Humboldt Bay, such as harvesting eelgrass for transplanting only in areas of continuous eelgrass and only to an extent that does not expose barren substrate in healthy meadows (Ward & Beheshti, 2023). Additionally, efforts to grow eelgrass from seed will offset impacts to existing eelgrass meadows but has not been shown to be viable as a singular source of donor eelgrass (Ward & Beheshti, 2023). Lastly, stem density has been shown to increase over time following restoration activities so it follows that the impact of conservative partial harvesting of some continuous eelgrass beds will be a temporary one.

BIO-MM1.2 Wetlands:

The final rule on compensatory mitigation requires “the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or preservation of wetlands, streams and other aquatic resources” (EPA 2023; USACE, DoD, & EPA, 2008). As such, compensatory mitigation will entail creating new wetlands outside the project area as well as rehabilitating degraded wetlands in the vicinity of the project site and offsite. Primarily, any impactful activities will be reduced to the fullest reasonable extent so as to achieve the preservation goal of compensatory mitigation,

but the aforementioned mitigation strategies will be relied upon as well to offset any unavoidable impacts from the project. A central objective of such mitigation measures is to ensure there is no loss in the productivity of Humboldt Bay and its unique ecosystem services.

While the U.S. Army Corps of Engineers (USACE) only requires a final mitigated ratio of 1:1 for degraded or significantly altered wetlands, the California Coastal Act requires that unavoidable impacts from approved land implement a 4:1 ratio for permanent impacts to wetlands within the Coastal Zone (California Coastal Commission Transportation Program Staff, 2022). Any temporary impacts to wetlands due solely to developmental activities will be mitigated at the 1:1 ratio required by USACE and the California Coastal Act for temporary impacts to wetlands.

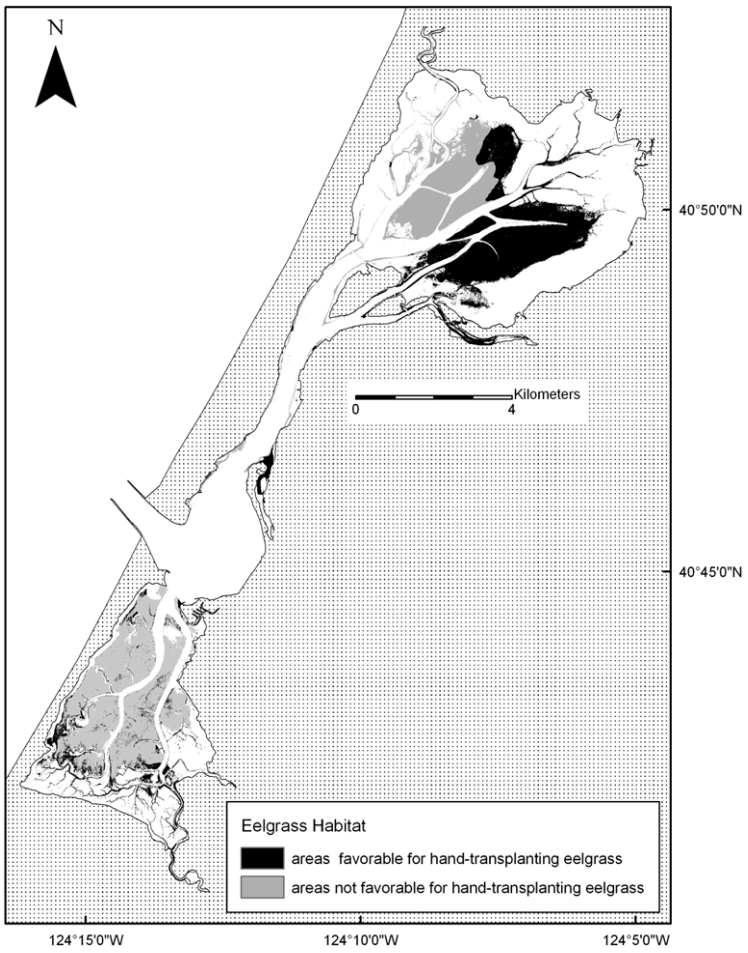

Figure 4.1.3

Eelgrass distribution of Humboldt Bay in 2009. (Gilkerson.).

4.1.4 - Determination and Summary of Impacts and Mitigation Measures Table

BIO-1.1: Eelgrass - After mitigating developmental and operational activities, the impacts to eelgrass habitat will be less than significant with mitigation incorporated.

BIO-1.2: Wetlands - After incorporating onsite and offsite restoration activities, the impacts to wetlands will be less than significant with mitigation incorporated.

Table 4.1.1

Determination and Summary of Impacts and Mitigation Measures for the Biological Resource Category of Plants and Wetlands.

Impact	Criteria/Threshold	Mitigation Measures	Significance After Mitigation
BIO-1: Eelgrass (ESHA - Environmentally Sensitive Habitat Area)	No Net Loss	BIO-MM1: In-kind Mitigation	Less than Significant
BIO-2: Wetlands	No Net Loss	BIO-MM2: Compensatory Mitigation	Less than Significant

4.2 - Biological Resource Category: Marine Mammals - Zach Schwartz

4.2.1 - Environmental Setting

The offshore site of the Humboldt Offshore Wind Energy Project has the following setting characteristics. Much, if not all, of the Humboldt Offshore Wind Energy Project offshore site is within the Eastern North Pacific gray whale migration area pictured below.

Figure 4.2.1

Eastern North Pacific gray whale migration area.

The Eastern North Pacific gray whales migrate from the Arctic regions to Baja California beginning in the fall to mate and give birth “during migration or in the shallow lagoons and bays of Mexico from early January to mid-February.” (Fisheries, 2023) before making the return trip from mid-February through May. Eastern North Pacific gray whales are primarily found in the “shallow coastal waters in the North Pacific Ocean.”

(Fisheries, 2023). Typically, this is in the Arctic regions between and along the Alaska coastline and along the coast of far East Russia. While the Western North Pacific gray whale is listed as endangered according to the Endangered Species Act and depleted according to the Marine Mammal Protection Act with an estimated 300 or fewer individuals, the Eastern North Pacific gray whale used to be listed as endangered under the Endangered Species Act but was delisted in 1994 after successfully recovering as a species.

On the other hand, the onshore site of the Humboldt Offshore Wind Energy Project is in North Humboldt Bay, which is an area where river otters are known to be. According to the U.S. Forest Service, North American river otters are found in streams, lakes, wetlands, reservoirs, and coastal areas. The species is found across most of North America and is “considered reasonably secure overall.” (Boyle, 2006). Severe declines in the 1800s from unregulated fur harvest and habitat destruction severely reduced the river otter population across the United States. However, thanks to the “Regulation of trapping, improved water quality, and intensive management, including translocations, have re-established the species to much of its former range in North America.” (Boyle, 2006).

4.2.2 - Impact Analysis

Gray Whales are susceptible to vessel strikes which could occur if construction of the offshore site takes place during their migration(s). Also, pile driving at the onshore site could have negative effects on river otters.

<u>Thresholds of Significance</u>

The two thresholds of significance I will use are acoustic thresholds and susceptibility to vessel strikes. Thresholds will be in accordance with CEQA’s biological impact significance thresholds.

Would the project:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or

by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or US Fish and Wildlife Service?
- Interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory corridors, or impede use of native wildlife nursery sites?
- Conflict with local policies or ordinances protecting biological resources, such as tree preservation policy or ordinance?
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Impacts

BIO-2.1: Gray Whales

The offshore site where wind turbines are to be towed by ships into place to produce wind energy is directly in the path of the Eastern North Pacific gray whale migration corridor. The National Park Service has said that “Gray whales have made a remarkable recovery from the brink of extinction. Yet, there are still many issues that may affect the future of the whales.” (Gray Whales at Point Reyes). According to the National Park Service, threats to gray whales include oil spills, ship strikes, noise pollution, and climate change. While the wind turbines themselves will provide clean energy, positively affecting climate change conditions, the ships that will tow them into place could strike a gray whale. Not only that, but The Marine Mammal Center has stated that the gray whale population has “dropped almost 40 percent along the California coast.” (How to see the Gray Whale Migration and help save a life, 2023)

According to The Marine Mammal Center, not only are whales starving as they struggle to find food in the Arctic, likely due to climate change, but they also say that “Amidst other negative human impacts they face like ship strikes and entanglements in ocean trash, conservation action is urgently needed.” (How to see the Gray Whale Migration and help save a life, 2023). Because of this, it is unconscionable to put gray whales at risk, and all preventive measures must be taken, from restricting vessel activity and speeds during the migration season to properly training vessel crews on vessel strike avoidance measures.

BIO-2.2: River Otters

The onshore site for the Humboldt Offshore Wind Energy Project, where the wind turbines are going to be assembled, is located in North Humboldt Bay, which the California Department of Fish and Wildlife Office of Spill Prevention and Response says is an area where “there are river otters and California sea lions nearby in the bay.” (Ewing, 2020). As a part of the construction of the onshore facilities where wind turbines will be assembled pile driving will take place, most likely to install monopile foundations. The Bureau of Ocean Energy Management says that “Impact pile driving produces high-intensity sound pulses at levels capable of producing acoustic injury to marine animals” (Assessment of Impacts to Marine Mammals, Sea Turtles, and ESA-Listed Fish Species Revolution Wind Offshore Wind Farm, 2023). As such, bubble curtains will be used during pile driving to protect marine mammals/animals such as river otters.

4.2.3 - Mitigation/Minimization Measures

Vessel speed restrictions shall be enforced, along with vessel strike avoidance measures and training for all vessel crew members involved in the project. This will be done in accordance with NOAA vessel strike avoidance measures, which say that “1. Vessel operators and crews shall maintain a vigilant watch for marine mammals and sea turtles to avoid striking sighted protected species. 2. When whales are sighted, maintain a distance of 100 yards or greater between the whale and the vessel.” (Vessel Strike Avoidance Measures and Reporting for Mariners NOAA Fisheries Service, Southeast Region, 2008). They also mention reducing vessel speed to 10 knots or less when mother/calf pairs, groups, or large assemblages of “cetaceans" are observed near

an underway vessel when safety permits. In addition, when working on the onshore site, bubble curtains shall be deployed to mitigate the impacts of pile driving. As stated in Appendix F of the Revolution Wind DEIS “The following measures will be implemented for impact and vibratory pile-driving activities. These measures will include seasonal restrictions, soft-start measures, shutdown procedures, . . . and noise attenuation systems such as bubble curtains, as appropriate.” (BOEM, 2022).

4.2.4 - Determination and Summary of Impacts and Mitigation Measures Table

Table 4.2.1

Determination and Summary of Impacts and Mitigation Measures for the Biological Resource Category of Marine Mammals.

Impact	**Criteria/Threshold**	**Mitigation Measures**	**Significance After Mitigation**
BIO-1: Gray Whales	Less than significant impact with mitigation	BIO-MM1: Enforcement of NOAA Vessel Strike Avoidance Measures and no vessel activity during migrations.	Less than significant impact with incorporation of mitigation.
BIO-2: River Otters	Less than significant impact with mitigation	BIO-MM2: Deploying bubble curtains to mitigate the acoustic effects of pile driving.	Less than significant impact with incorporation of mitigation.

4.3 - Resource Category: Socioeconomic Impacts to Commercial Fishermen - Lesina Burdick

4.3.1 - Environmental Setting:

There are two sites for the Humboldt Bay Offshore Wind Project; the wind farm, which will be located offshore, and the assembly site which will be along the shore in Humboldt Bay. Humboldt Bay is used by many different types of commercial fishermen harvesting fish off the Northern Coast of California (California Sea Grant, 2024). North Pacific Albacore Tuna is one of the most sought-after fish species caught in Humboldt County by commercial fishermen (California Department of Fish and Wildlife, 2020). The North Pacific Albacore Tuna fishing Industry in Humboldt Bay along with many other Tuna fisheries is currently struggling due to climate change and many years of overfishing (Vanderheiden, 2022). North Pacific Albacore Tuna and other Commercial Fishermen dock their fishing vessels and store fishing gear at Woodley Island Marina in Humboldt Bay (Humboldt Bay Harbor, Recreation, & Conservation District, 2024).

Humboldt Bay has one opening at the South end used by all vessels entering or exiting Humboldt Bay, which is the only major port in the area (Humboldt Bay Harbor, Recreation, & Conservation District, 2007). The offshore wind project would need to use this opening to tow fully assembled wind turbines out to the offshore site (Humboldt Bay Harbor, Recreation, & Conservation District, 2007). The wind turbines are large and would take up the majority of the channel making it impossible for other traffic to pass through the port. Due to the size of the wind turbines, while they are being towed out the entrance to the bay may be closed to all other traffic. To navigate through to open ocean to their fishing grounds fishermen use radar signals (Niiler, 2022). The wind turbine's size can interfere with these navigation signals and certain underwater structures or other vessels may not show up in their radar systems (Niiler, 2022).

The proposed area for the offshore wind farm site is currently fishing grounds for Albacore Tuna and Groundfish (California Department of Fish and Wildlife, 2024). This means that fishermen would lose access to these fishing grounds for the whole duration of the Offshore Wind Project. Many fishermen have vessel routes that go through the offshore wind farm site. During construction and for the duration of the Humboldt Bay

Wind Farm fishermen would need to be routed around the offshore wind site to get to their fishing grounds near the site (California Department of Fish and Wildlife, 2024).

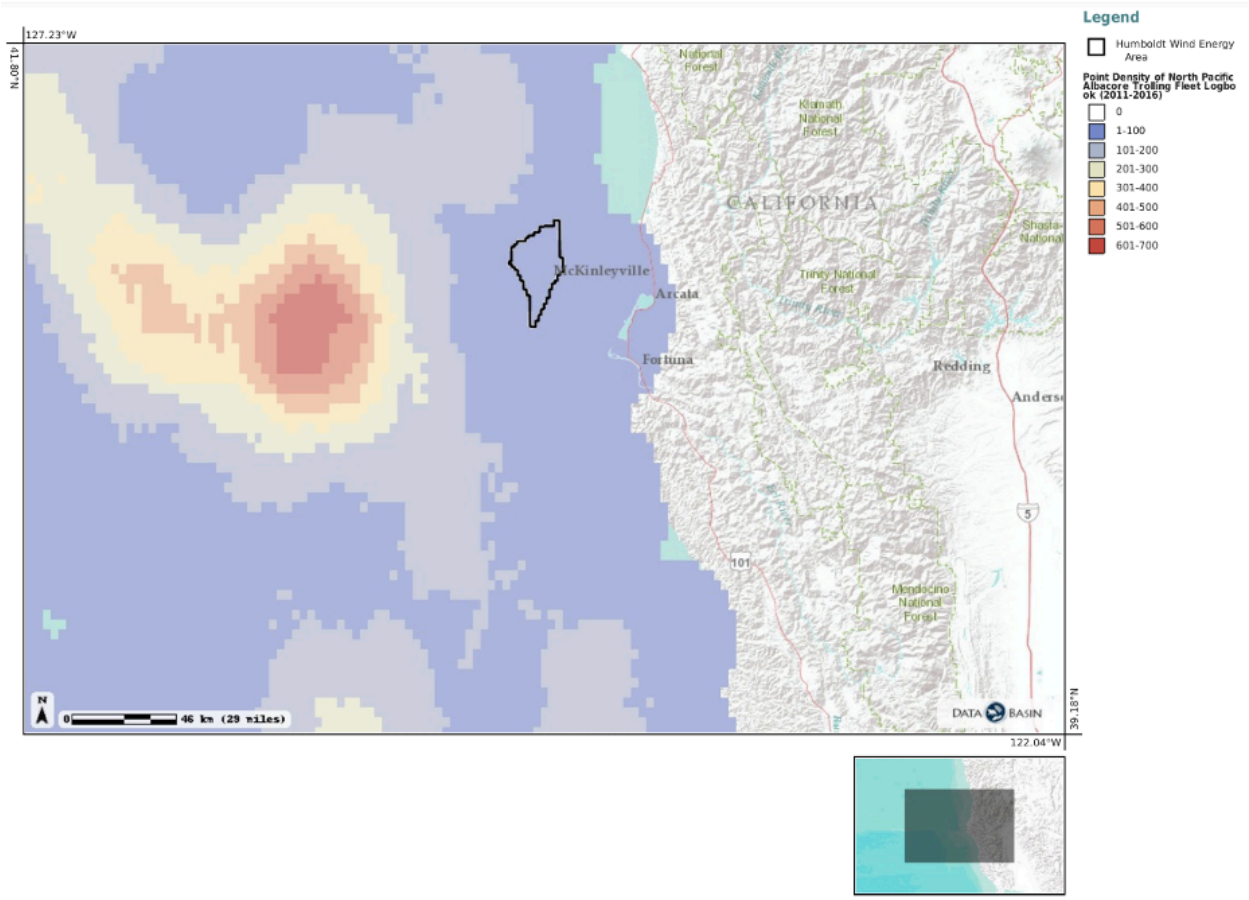

Figure 4.3.1

The point density of the North Pacific Albacore trolling fleet relative to the proposed Humboldt Bay Offshore Wind Farm site. The gradient of colors from blue to red represents the areas where North Pacific Albacore are historically caught and the black outline represents the location of the proposed Humboldt Bay Offshore Wind Site.

4.3.2 - Impact Analysis:

There are two main impacts that the Humboldt Bay Offshore Wind Project will have on North Pacific Albacore Tuna Commercial Fishermen. The offshore site being in the Albacore fishing grounds and the act of closing down the port to tow wind turbines to and from the offshore site will greatly impact Commercial Fishermen's vessel traffic and when they can harvest certain species.

Figure 4.3.2

The red-shaded area represents the projected path in Humboldt Bay that the wind turbines will follow to the offshore site.

To determine the significance of these impacts on commercial fishermen the following thresholds were used; There is a significant impact on Commercial fishing vessel traffic in and out of Humboldt Bay because routes to fishing grounds and radar navigation would be impacted for the entirety of the project (Humboldt Bay Harbor, Recreation, & Conservation District, 2023). There is a significant impact on North Pacific Albacore Tuna Commercial Fishermen of decreasing Albacore fishing availability around the offshore wind site. Wind turbine activity and construction can cause Albacore to leave the area or could decrease the available catch of North Pacific Albacore Tuna (Zhou et.al, 2020).

To access their fishing grounds commercial fishermen would need to navigate around the offshore wind site (California Coastal Commission, 2023). Navigation around the offshore site would cause more vessel traffic in other areas near the site, increase navigation time for fishermen, and increase the risk of boating accidents around the project area (California Coastal Commission, 2023). The wind turbines can also impact vessels' navigation systems by interfering with the radar signals they use (Niiler, 2022). This could also impact commercial fishermen's safety along with increasing the risk of boating accidents around the project area.

While turbines will be towed in and out of the bay for installation and repairs the entrance to Humboldt Bay may be closed for possibly days or weeks (Humboldt Bay Harbor, Recreation, & Conservation District, 2023). This will impact when Commercial Fishermen can leave and return to the port which will negatively impact their income by decreasing the days that they can harvest fish during fishing season (Vanderheiden, 2022).

Noise during the construction of the offshore site and from the wind turbines running underwater could attract or deter fish from the area (Parry, 2023). Mesoscale oceanographic structures such as those used in offshore wind structures were found to have a negative impact on the presence of Albacores causing them to move to deeper waters (Zhou et.al, 2020). This is directly related to impacts on commercial fisheries because it causes a decrease in their overall available catch of Albacore (Zhou et.al, 2020). During construction at the offshore site, the presence of construction vessels could decrease the availability of Albacore in the area and along the areas where cables will be put in place to secure the turbines to the ocean floor (Bureau of Ocean Energy Management & Office of Renewable Energy Programs, 2022). Since the offshore site would also be located in and near the current commercial fishing grounds fishermen could lose access to these grounds which could also result in lost income for these fisheries (Bureau of Ocean Energy Management & Office of Renewable Energy Programs, 2022).

4.3.3 - Mitigation/Minimization Measures:

The Humboldt Bay Offshore Wind Project can implement many different mitigation measures to reduce the Socioeconomic impacts of this project on North Pacific Albacore Tuna and other Commercial Fishermen operating out of Humboldt Bay.

Mitigation Measure 3.1

To reduce the impacts on the availability of North Pacific Albacore Tuna in the fisheries fishing grounds two bubble curtains can be used at the offshore site. Bubble curtains can be installed around underwater noise-producing structures and create a constant stream of bubbles that help absorb the noise that is being produced (Lewis, 2023). The bubbles are released by a perforated pipe that is placed on the sea floor creating bubble walls that continue to the surface (Lewis, 2023). A bubble curtain can be placed around each wind turbine with a second bubble curtain on the outside of the first bubble curtain to ensure that the most noise is absorbed (Lewis, 2023).

Mitigation Measure 3.2

To mitigate the impacts to commercial fisherman vessel navigation around the offshore site the wind turbines can be rearranged to allow for multiple passageways between them. Four Passageways can be constructed for vessel traffic inside of the offshore site to decrease the travel times for commercial fishing vessels to their fishing grounds. These navigation channels will not only decrease the travel time for commercial fishermen but will also decrease traffic in the surrounding areas around the offshore site which will help reduce the risk of accidents around the offshore wind site.

4.3.4 - Determination and Summary of Impacts and Mitigation Measures:

Table 4.3.1

Determination and Summary of Impacts and Mitigation Measures for Socioeconomic Impacts to Commercial Fishermen.

Impact	**Criteria/Threshold**	**Mitigation Measures**	**Significance After Mitigation**
Commercial fishing	Significant impact	**M II:** Rearrange the	less-than-significant

vessel traffic in and out of Humboldt Bay	will stop traffic and increase the potential for boating vessel accidents in and around the project area	wind turbines to allow for commercial fishing vessels to navigate safely through the Humboldt Bay Offshore Wind Offshore Site.	impact with mitigation
A decrease in albacore fishing availability around the offshore wind site	Significant impact because wind sites can cause Albacore to leave the area or decrease the amount of albacore available to catch. This would have economic impacts on the commercial fishermen fishing in this area.	**M I:** Place two bubble nets around each windmill to absorb the noises created during the construction and operation of each wind turbine.	Noise: less-than-significant impact with mitigation

4.4 - Biological Resource Category: Birds - Cole Crandall

4.4.1 - Environmental Setting/Affected Environment:

Humboldt Bay hosts diverse and ecologically significant biota, supporting over 400 plant species, 500 invertebrate species, 100 fish species, and 260 bird species. It is vital for hemispheric ecological patterns such as shorebird and waterfowl migration along the Pacific Flyway.

One species of concern that heavily uses the Humboldt Bay is the Northern Harrier (*Circus hudsonius*). The Northern Harrier is a raptor species known for its low-flying hunting behavior over open fields and grasslands. Northern Harriers are classified as a species of special concern in California so precautions and mitigations must be met in developments that can affect them. They primarily breed along the coast from Clam Beach to the Humboldt Bay lowlands. This species is known to breed and hunt across many habitats, such as freshwater marshes, brackish and saltwater marshes, river and stream borders with dense vegetation, wet meadows, and lightly grazed pastures. Preys primarily on rodents and other smaller Passerines. Commonly sited around Humboldt Bay and near the area of the turbine assembly site.

Another species of special concern for the offshore wind farm sites is the Tufted Puffin (*Fratercula cirrhata*). Tufted Puffins are seabirds known for their distinctive tufted head feathers, they rely on both terrestrial and marine habitats for nesting and hunting. Tufted Puffin is also classified as a species of special concern in California. They primarily nest and breed on land but use offshore, pelagic habitats heavily for hunting. Most of the year they live at sea as well, residing in regions around the proposed wind farm site is to be. Young birds also live on the ocean and only return to land once they reach sexual maturity (3 years).

4.4.2 - Impact Analysis:

Criteria:

Thresholds

Thresholds will be in accordance with CEQA biological impact thresholds. Would the project:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or US Fish and Wildlife Service?
- Interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory corridors, or impede use of native wildlife nursery sites?
- Conflict with local policies or ordinances protecting biological resources, such as tree preservation policy or ordinance?
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?

Impact of Proposed Project:

Northern Harrier

Site for turbine assembly poses a threat to their nesting sites, as the construction and assembly process can disrupt or deter nesting behavior. Nests are constructed either on the ground or above water on platforms made of vegetation, often hidden amidst tall, dense grasses, forbs, or low shrubs for camouflage and protection (Slater and Rock 2005). The Northern Harrier are highly sensitive to human disturbances in terms of breeding and nesting (Whitfield and Mathers 2006). Moreover, the

development can diminish available hunting grounds for these birds, as the construction of assembly the site may alter the landscape and disturb their prey species. The noise generated during turbine assembly can also negatively affect the habitat, potentially driving away Northern Harriers from the area.

Tufted Puffin

Tufted Puffins are the most pelagic of the auk family of birds, they spend the majority of winter and fall in the sea (Hanson et al. 2019). The California Current is a particular population that happens to be dwindling in population as it stands. With about 60 colonies and an estimated 6000 birds in this particular population, it is one of the lowest for the populations of the United States (USFWS 2020) the Installation of the turbine wind farms could heavily sway this population negatively. The North American range for the Tufted Puffin is shrinking as well as the total population is declining (Pearson et.al 2022).There is a high possibility of impact death from turbines, ruining habitat simply due to noise, diminishing the hunting sites that happen to overlap with this proposed site, and possibly diminish breeding populations local to Trinidad due to these factors.

4.4.3 - Mitigation/Minimization Measures:

Northern Harrier

Pre-construction detecting surveys should occur to detect any resident birds, since their territory size is averaged at 260-hectares surveys should account for at least 260-hectare radius around the building site (MacWirther and Bildstein 1996). Surveying this size radius will ensure no Harriers are actively using this area as their home range. Building should not occur during breeding and nesting months (mid-March- early June), especially if individuals use this area for their home range (Slater and Rock 2005).

Tufted Puffin

Surveys from boats should be conducted near the site of off-shore wind farms in which standardized protocol should be implemented (Hanson and Pearson 2019).. If high populations are detected, turbines should be turned during the day to mitigate

impact death and disturbance to the Tufted Puffin or perhaps have the turbines only run during nocturnal hours. Although according to USFWS wind turbines should have little to no effect on populations of Tufted Puffin when offshore (USFWS 2020). If mitigation efforts to time operation efforts to reduce potential effects are put in place there should not be any significant effect on the birds.

4.4.4 - Determination and Summary of Impacts and Mitigation Measures:

Table 4.4.1

Determination and Summary of Impacts and Mitigation Measures for Biological Impacts to Birds.

Impact	**Criteria/Threshold**	**Mitigation Measures**	**Significance After Mitigation**
BIO-1: Tufted Puffin	Less-than-significant impact if mitigation is incorporated	BIO-MM1: Running turbines nocturnally	Less-than-significant impact if mitigation is incorporated
BIO-2: Northern Harrier	Less-than-significant impact if mitigation is incorporated	BIO-MM2: Survey for home range residing species, and no construction during breeding and nesting season.	Less-than-significant impact if mitigation is incorporated

4.5 - Hydrology and Water Quality- Lexi Taylor

4.5.1 - Environmental Setting/Affected Environment:

Humboldt Bay, spanning over 17,000 acres of water, mud flats, and marshes, stands as one of California's largest natural bays. Five main watersheds flow into the bay, in addition to the three sub-bays that make up the bay including a North Bay, Arcata Bay, and South Bay (Cavanagh, et.al 2007). The approved sites for the construction of the Offshore Wind Energy Project (including both onshore and offshore sites) lie along or within bodies of water including Humboldt Bay and the Pacific Ocean. The onshore site- which will be focused on in this analysis- is located in close proximity to the town of Samoa, and will be specifically located at the Redwood Marine Terminal (RMT1), owned by Humboldt Bay Harbor, Recreation, and Conservation District. At this site, facilities for staging, assembly operations, storage, and fabrication are planned to be developed. The project first plans on clearing the current structures that exist in this area and reconstructing the dock that it lies along. Additional facilities including ones for turbine installation and a base for maintenance for Windfloat- a floating offshore wind turbine- will be developed. The offshore site is within federal waters and spans about two hundred square miles within the Pacific Ocean, 21-29 nautical miles off the coast of Humboldt County. Given that the location of this project is near/along two large and important bodies of water, it is crucial to consider the impacts the onshore wind construction and operations site may have on hydrology and water quality standards.

4.5.2 - Impact Analysis:

Criteria

The significance of the impacts are based on the North Coast Basin Plan and the State of California Sea-Level Rise Guidance thresholds.

The North Coast Basin Plan consists of water quality standards related to color, taste/odor, grease, pH, etc. Following the water quality objectives of the North Coast Basin Plan, the criteria/threshold for the Humboldt Offshore Wind Energy Project will be determined on levels following their thresholds on pH and turbidity, as both of these are projected to be good indicators on if this project has compromised nearby bodies of water. Their standards state that pH levels must remain within 6.5-8.5 pH units (Water

Quality Objectives North Coast Basin Plan, 2011). Their standards for turbidity state that the level of turbidity shall not exceed a 20 percent increase from its naturally existing background levels (Water Quality Objectives North Coast Basin Plan, 2011).

The State of California Sea-Level Rise Guidance predicts the sea-level rise (in feet) for San Francisco, a geographically comparable location to the Humboldt Bay and surrounding areas. The guidance threshold recommends first evaluating the project's lifespan, then analyzing how this corresponds with sea-level rise projections. The Humboldt Offshore Wind Energy Project is expected to have a 'useful' lifetime of about 25 years (Joint Committee on Fisheries and Aquaculture, 2023), so it is important to look at the probabilistic projections for the year 2050 and so on in both the likely and unlikely projections, and plan for sea-level rise accordingly. The following table will be used in correspondence.

Table 4.5.1

The table above demonstrates the projected sea-level rise (in feet) for San Francisco. (*Table accessed from the State of California Sea-Level Rise Guidance, 2018).*

		Probabilistic Projections (in feet) (based on Kopp et al. 2014)					H++ scenario (Sweet et al. 2017) *Single scenario
		MEDIAN	LIKELY RANGE		1-IN-20 CHANCE	1-IN-200 CHANCE	
		50% probability sea-level rise meets or exceeds...	66% probability sea-level rise is between...		5% probability sea-level rise meets or exceeds...	0.5% probability sea-level rise meets or exceeds...	
				Low Risk Aversion		Medium - High Risk Aversion	Extreme Risk Aversion
High emissions	2030	0.4	0.3 -	0.5	0.6	0.8	1.0
	2040	0.6	0.5 -	0.8	1.0	1.3	1.8
	2050	0.9	0.6 -	1.1	1.4	1.9	2.7
Low emissions	2060	1.0	0.6 -	1.3	1.6	2.4	
High emissions	2060	1.1	0.8 -	1.5	1.8	2.6	3.9
Low emissions	2070	1.1	0.8 -	1.5	1.9	3.1	
High emissions	2070	1.4	1.0 -	1.9	2.4	3.5	5.2
Low emissions	2080	1.3	0.9 -	1.8	2.3	3.9	
High emissions	2080	1.7	1.2 -	2.4	3.0	4.5	6.6
Low emissions	2090	1.4	1.0 -	2.1	2.8	4.7	
High emissions	2090	2.1	1.4 -	2.9	3.6	5.6	8.3
Low emissions	2100	1.6	1.0 -	2.4	3.2	5.7	
High emissions	2100	2.5	1.6 -	3.4	4.4	6.9	10.2
Low emissions	2110*	1.7	1.2 -	2.5	3.4	6.3	
High emissions	2110*	2.6	1.9 -	3.5	4.5	7.3	11.9
Low emissions	2120	1.9	1.2 -	2.8	3.9	7.4	
High emissions	2120	3	2.2 -	4.1	5.2	8.6	14.2
Low emissions	2130	2.1	1.3 -	3.1	4.4	8.5	
High emissions	2130	3.3	2.4 -	4.6	6.0	10.0	16.6
Low emissions	2140	2.2	1.3 -	3.4	4.9	9.7	
High emissions	2140	3.7	2.6 -	5.2	6.8	11.4	19.1
Low emissions	2150	2.4	1.3 -	3.8	5.5	11.0	
High emissions	2150	4.1	2.8 -	5.8	5.7	13.0	21.9

Impact of Proposed Project

The two main impacts that the Humboldt Offshore Wind Energy Project may have in concerns of the surrounding location's hydrology and water quality are: (WQH-1) Stormwater pollution during construction, focusing on potential polluted runoff that can affect water quality standards and (WQH-2) Possibility of inundation due to sea level rise as the site location is in a risk zone.

Given that the Humboldt Bay area averages 38 inches of rain per year (Redwood Coast Climate 2024), polluted runoff from the construction site into the Humboldt Bay is probable. One issue that can arise during construction is that sediment can be disturbed and suspended into neighboring waters. If this sediment is not properly managed, it can travel by stormwater runoff into nearby water bodies leading to increased turbidity and sedimentation (PennState Extension, 2022). Additionally, certain toxic chemicals may be used during construction activities that can potentially spill or leak into the surrounding environment, later being transported from stormwater runoff into bodies of water. This can affect water quality standards and can be toxic to aquatic life. Lastly, various debris and waste can be leftover as a result of construction activities which can be washed into water bodies by stormwater runoff. This can affect water quality standards and pollute the neighboring water environments. Levels of pH and turbidity are to be focused on as they indicate the cleanliness and clarity of the water and are vital parameters for assessing water quality.

The site location is subject to inundation due to sea level rise, as it is located in a risk zone. As the neighboring town of Samoa has an elevation of only 23 feet (DBpedia 2014), and the site location is along the Humboldt Bay, the vulnerability of the site location to inundation due to sea level rise is extremely important to consider. This is an issue as the site location is located in areas of low elevation, and may be susceptible to inundation. Rising sea levels can increase the likelihood of inundation and flooding, which can damage the project's construction equipment, disrupt the ability to operate, and increase the frequency of maintenance and repairs.

Additionally, sea-level rise is associated with sea water intrusion, also known as salt water intrusion, which refers to the intrusion of saline water into areas of freshwater

within coastal aquifers (Werner, et.al, 2009). Climate change caused sea-level rise is crucial in sea water intrusion as there are changes in atmospheric pressure and an increase in ocean area as ice sheets and glaciers melt. This occurs because rising sea levels elevate saline water levels at the coastal boundary, resulting in intensified and more frequent saltwater intrusion. Saltwater is highly corrosive, which can lead to an accelerated degradation of infrastructure and construction equipment. Equipment such as turbines, transmission lines, and other support structures are highly vulnerable to corrosion, which can decrease their lifespan and increase maintenance costs (Environmental Finance Center Network 2023).

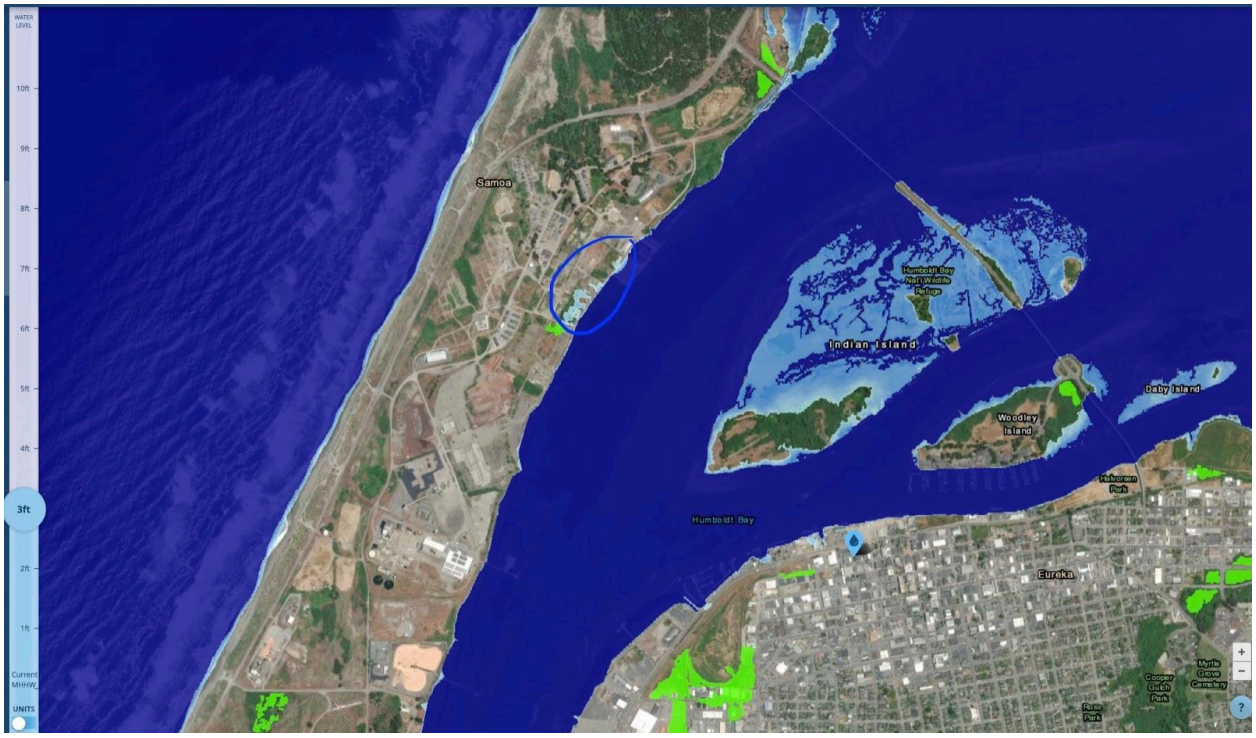

Figure 4.5.1

The above figure shows (in light blue) where in the Humboldt Bay area would be impacted by 3 feet of sea-level rise (as shown on the left scale bar). The blue circled region is where the onshore site location is, which is impacted by 3 feet of sea-level rise. 3 feet was chosen for this analysis in reference to Table 1 as 3 feet of sea-level rise can 'likely' occur between the years of 2090-2100, or even as soon as 2050, which has a lower likelihood, but still is crucial to consider. (*Figure accessed from NOAA Logo Sea-Level Rise Viewer).*

Availability:

Figure 4.5.2

The figure above similarly shows the risk and vulnerable areas from sea-level rise (in red) with two meters of sea-level rise in reference to the site area circled in black. (*Figure accessed from Laird 2018).*

4.5.3 - Mitigation/Minimization Measures:

HWQ-1-MM1

To mitigate the possible polluted runoff by stormwater during construction, a Construction Stormwater Pollution Prevention Plan (SWPPP) must be implemented prior to the beginning of site construction to prevent pollution. This plan, as used in the Old Arcata Road Rehabilitation Plan, will outline erosion sediment control Best Management Practices (BMPs) to manage pollutants in stormwater runoff during

construction activities (DEIR Old Arcata Road Rehabilitation, 2021). It will specifically address water erosion control, sediment control, and debris and waste management. Additionally, integrating a sampling and monitoring program into the Construction SWPPP would be beneficial in ensuring the effectiveness of the BMPs. This mitigation measure approach helps in complying with regulatory requirements.

HWQ-2-MM1

To mitigate the risk of sea inundation caused by sea level rise, a proposed course of action for this project, due to its close proximity to the Humboldt Bay and the Humboldt coast, would be to incorporate a coastal resilience/adaptation plan. Within this plan, there would be assessments of where there are vulnerabilities that can be affected by flooding and sea level rise. With an assessment of the location's vulnerabilities, it can be identified where exactly needs to be prioritized in how to gain and improve coastal resilience. In addition to this, specifically elevating critical structures if possible in all phases of the development of this project can mitigate possible effects, given there be sea-level rise. This may also include flood resistant construction and management techniques. It is crucial to invest in flood resistant infrastructures in order to prevent risks to the safety and operation ability of the project ("Canada: Residents of Western Newfoundland to Benefit from Flood-Resistant Highways, Bridges and Improved Infrastructure" 2019).

4.5.4 - Determination and Summary of Impacts and Mitigation Measures:

Both environmental impacts, stormwater pollution during construction (WQH-1) and possibility of inundation due to sea level rise (WQH-2), are deemed significant. Without adequate mitigation measures, these impacts could compromise water quality standards, aquatic habitats, in addition to the project's long term viability. By implementing HWQ-1-MM1 and HWQ-2-MM1 mitigation measures, impacts on hydrology and water quality will be minimized, and will have less than significant impacts.

Table 4.5.2

Determination and Summary of Impacts & Mitigation Measures for Impacts to Hydrology & Water Quality.

Impact	**Criteria/Threshold**	**Mitigation Measures**	**Significance After Mitigation**
HWQ-1: Stormwater pollution during construction/polluted runoff	Following the water quality objectives of the North Coast Basin Plan, the criteria/threshold will be determined on levels following their thresholds on pH and turbidity.	HWQ-1-MM1: Construction Stormwater Pollution Prevention Plan (SWPPP) for prior to construction; Sampling and monitoring during and after construction	Less than significant impact
HWQ-2 Risk of inundation due to sea level rise	Following the State of California Sea-Level Rise Guidance, the criteria/threshold will be determined on sea-level rise projections in relation to the project's lifespan.	HWQ-2-MM1: Coastal resilience/adaptation plan; Elevation of critical infrastructures	Less than significant impact

Alternatives

5.1 - Proposed Action and Alternatives

Alternative Name:	Brief Description:
Alternative 1 (Proposed Project)	This Alternative includes rearranging the layout of the wind turbines and changing the turbine design to vertical axis wind turbines. These changes will mitigate some of the impacts described above on commercial fishermen and birds such as Tufted Puffins.
Alternative 2 (No Project)	Dock facilities will not be revamped, lease area will not be utilized, bio/socioeconomic/hydro impacts will not experience impaction from the project. However, impacts caused by climate change will continue to degrade natural resources and marine environments.
Alternative 3	Alternative turbine rotor designs will be used. This will reduce bird mortality, and the configuration of turbine placements will be redesigned to better allow fishermen access their fishing grounds through the offshore site and reduce bird mortality.

Proposed Action

The proposed action will have a significant socioeconomic impact on commercial fishermen. The offshore site will stop vessel traffic within the area of the offshore site and increase the potential for boating vessel accidents in and around the project area due to an increase in vessels navigating around the offshore project site. It will also have a significant impact on North Pacific Albacore Tuna available catch because wind sites can cause Albacore to leave the area or reside in deeper waters (Zhou et.al, 2020). This would have negative economic impacts on the commercial fishermen fishing in this area by decreasing their revenue.

The proposed action has the potential to have a significant impact on biological resources such as birds and marine mammals. The onshore site has the potential to disturb populations of nesting birds like the Northern Harrier. The offshore site could also have a significant impact on hunting populations of Tufted Puffin. Without mitigation measures, these populations of species of concern could be put into a worse situation biologically. In addition, both the onshore and offshore sites could negatively impact marine mammals. For instance, construction of the onshore site includes the use of pile driving which could disturb or otherwise injure marine animals such as the river otter. On the other hand, the proposed offshore site where the turbines are to be towed into place by ships is in the middle of the Eastern North Pacific gray whale migration corridor. Seeing as how gray whales are susceptible to vessel strikes this could have major impacts on the Eastern North Pacific gray whale population. These issues need to be mitigated so as not to put the river otter or gray whale populations at risk.

No Action Alternative

The no-action alternative could also cause significant impacts to the resource categories previously described. Our energy systems are currently dependent on fossil fuels which are known to produce greenhouse gasses that contribute to ocean acidification and climate change. This will negatively impact commercial fishermen since it could cause a decrease in the available catch of North Pacific Albacore Tuna (Cheung et al, 2020). Climate change will also have an effect on habitat ranges and resources for birds, such as shifting the range to different areas or ruining resources in the existing range. Climate change can also have an effect on migration patterns for birds like migratory timing cues which can ultimately lead to death if migration occurs too late or too early.

Alternative 1

This Alternative includes rearranging the layout of the wind turbines and changing the turbine design to vertical axis wind turbines. These changes will mitigate some of the impacts described above on commercial fishermen and birds such as Tufted Puffins. Commercial fishermen will no longer have to navigate around the offshore site since the new wind turbine layout will allow vessels to travel through the offshore site. These navigation channels will not only decrease the travel time for commercial fishermen but will also decrease traffic in the surrounding areas around the offshore site which will help reduce the risk of accidents around the offshore wind site. Using a vertical axis wind turbine will reduce the risk of fatal impact for pelagic bird species due to the design which is smaller and slower than horizontal axis wind turbines.

5.2 - Alternatives Analysis/Environmentally Preferred Alternative

Environmentally superior alternative: Alternative 1

Out of the Alternatives considered for the proposed project the environmentally preferred alternative is Alternative 1. Switching our energy systems from being reliant on fossil fuels to being reliant on renewable energy would help combat the impacts from

climate change that our world is currently experiencing. This design will also prevent impacts from climate change by generating renewable energy. The vertical axis turbines will decrease the chance of bird fatality in and around the project area.

Preferred/Recommended Alternative: Alternative 1

Based on the analysis of alternatives we recommend alternative 1. This alternative would help mitigate the most impacts while aligning with the global, state, and federal goals to decarbonize our current energy systems by investing in renewable energy sources. Alternative 1 is also the environmentally superior alternative which means that it would mitigate the most impacts while generating wind power off of Humboldt Bay.

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