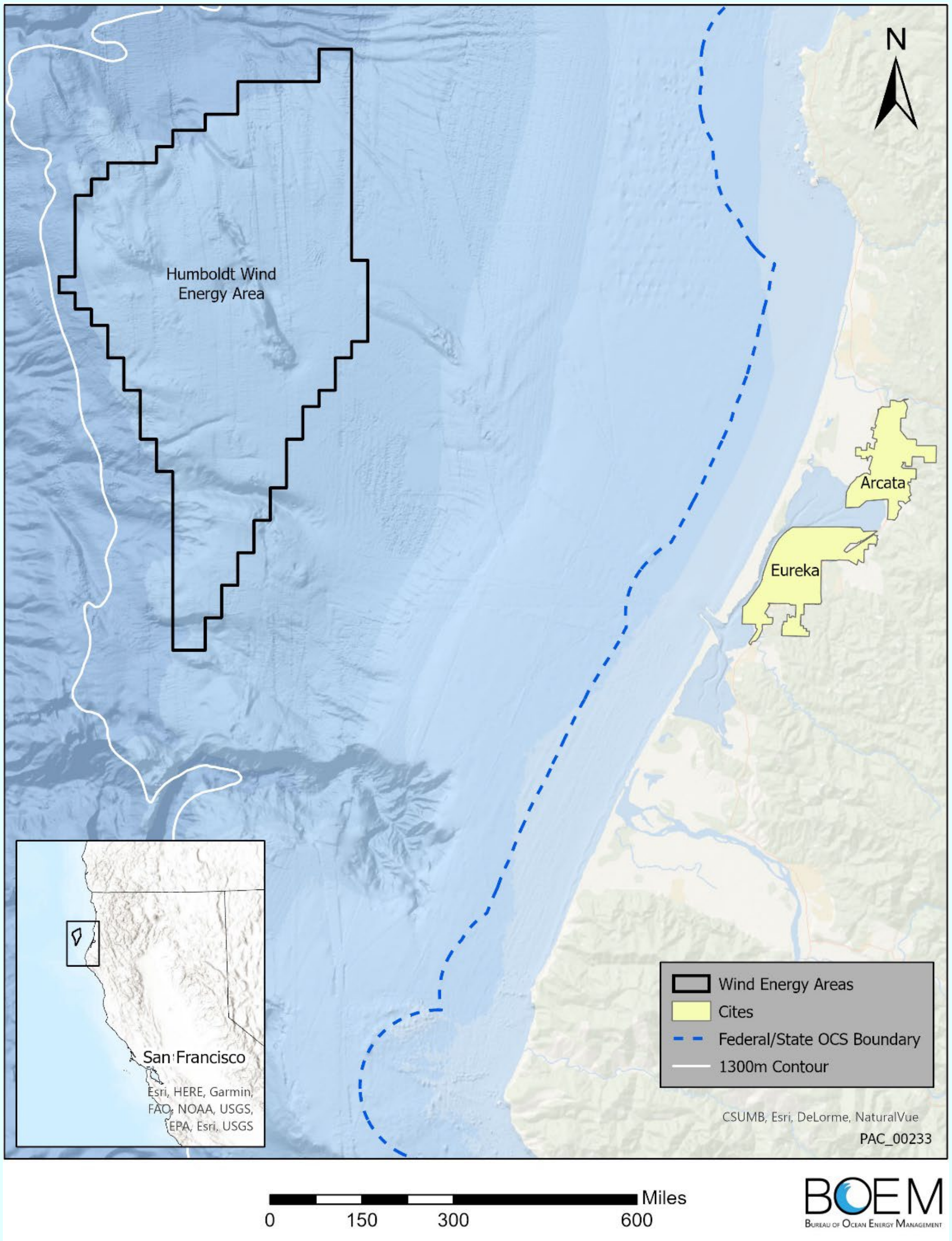
DRAFT ENVIRONMENTAL ASSESSMENT

Commercial Wind Lease and Grant Issuance and Site Assessment Activities on the Pacific Outer Continental Shelf, Humboldt Wind Energy Area, California

January, 2022



U.S. Department of the Interior
Bureau of Ocean Energy Management
Pacific Region

OCS EIS/EA
BOEM 2021-87

This Page Intentionally Left Blank

Commercial Wind Lease and Grant Issuance and Site Assessment Activities on the Pacific Outer Continental Shelf, Humboldt Wind Energy Area, California

Agency Name and Region	Bureau of Ocean Energy Management, Pacific OCS Region
Document Type	Environmental Assessment
BOEM Publication Number	OCS EIS/EA BOEM 2021-87
Activity Type	Leasing, Site Characterization and Site Assessment Activities
Document Date	January 11, 2022
Location	Humboldt Wind Energy Area
For more information	https://www.boem.gov/HumboldtEA

Table of Contents

List of Tables

List of Figures

Appendices

Abbreviations and Acronyms

ac	Acres
ADCP	Acoustic Doppler Current Profiler
AIS	Automatic Identification System
AUV	Autonomous Underwater Vehicle
BOEM	Bureau of Ocean Energy Management
CAAQS	California Ambient Air Quality Standards
CalEPA	California Environmental Protection Agency
Call	Call for Information and Nominations
CDFW	California Department of Fish and Wildlife
CDP	Census Designated Place
CEQ	Council on Environmental Quality
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CHIRP	Compressed High Intensity Radar Pulse
CO	carbon monoxide
COLOS	coastal oceanographic line-of-sight
COP	Construction and Operations Plan
cSEL	cumulative sound exposure level
CWA	Clean Water Act
DPS	Distinct Population Segment
EA	environmental assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPC	Eureka Port Complex
ESA	Endangered Species Act
FR	Federal Register
ft	foot/feet
FLiDAR	floating light detection and ranging
GDP	Gross Domestic Product
GHG	greenhouse gasses
HAPs	hazardous air pollutants
HRG	high-resolution geophysical
hrs	Hours
Hz	Hertz
IPF	Impact Producing Factor
ITA	incidental take authorization
kHz	Kilohertz
km	Kilometers

km^2	square kilometers
LiDAR	light detection and ranging
m	Meters
m^2	square meters
m/s	meters per second
mi	Miles
mi^2	square miles
MMPA	Marine Mammal Protection Act
MW	Megawatts
MWh	megawatt hour
NAAQS	National Ambient Air Quality Standards
NCAB	North Coast Air Basin
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
nmi	nautical miles
nmi^2	square nautical miles
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NOAA	National Oceanic and Atmospheric Administration
NOMAD	Naval Oceanographic and Meteorological Automated Devices
NRHP	National Register of Historic Places
OCA	Onshore Corresponding Area
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
PA	Programmatic Agreement
PCB	polychlorinated biphenyls
PFMC	Pacific Fishery Management Council
PM	particulate matter
$PM_{2.5}$	fine particulate matter
PNNL	Pacific Northwest National Laboratory
PSO	Protected Species Observer
PTS	permanent threshold shift
RMS	root mean square
ROV	Remotely Operated Vehicle
ROW	right-of-way
RUE	rights-of-use and easement
SAP	Site Assessment Plan
SO_2	sulfur dioxide
SOC	State of California, Standard Operating Conditions
TTS	temporary threshold shift
TSS	traffic separation scheme
USCG	U.S. Coast Guard

USFWS	U.S. Fish and Wildlife Service
VGP	Vessel General Permit
WEA	Wind Energy Area
yr	Year

1 Purpose and Need for the Proposed Action

The United States Department of the Interior's Bureau of Ocean Energy Management (BOEM) prepared this environmental assessment (EA) to determine whether the issuance of a lease within the Humboldt Wind Energy Area (WEA) would lead to reasonably foreseeable significant impacts on the environment and, thus, whether an environmental impact statement should be prepared prior to issuing a renewable energy lease.

The purpose of the Proposed Action is to issue up to 3 commercial renewable energy leases within the WEAs and grant rights-of-way (ROWs) and rights-of-use and easement (RUEs) in the region of the Outer Continental Shelf (OCS) of northern California. BOEM's issuance of these leases and granting of ROWs and RUEs is needed to: (a) confer the exclusive right to submit Site Assessment Plans (SAPs) to BOEM for potential development such that the lessees and grantees develop plans for BOEM's review and will commit to site assessment and site characterization activities necessary to determine the suitability of their leases, easements, and ROWs for commercial offshore wind production and/or transmission; and (b) ensure that site assessment and site characterization activities are conducted in a safe and environmentally responsible manner. The issuance of a lease by BOEM to the lessee conveys no right to proceed with development of a wind energy facility; the lessee acquires only the exclusive right to submit a plan to conduct this activity.

On July 16, 2021, BOEM released the Announcement of Area Identification Memorandum (BOEM, 2021 #1147); Appendix A). The Memorandum documents the analysis and rationale in support of the recommended designation of the Humboldt WEA, offshore Humboldt County, California for environmental analysis and consideration for leasing. The Humboldt WEA was created entirely from the Humboldt Call Area, as described in Table 1-1 and depicted in Figure 1-1. The Humboldt Call Area was identified in the Call for Information and Nominations (Call) published on October 19, 2018 (BOEM, 2018 #1148). The boundary of the Humboldt WEA begins 34 kilometers (km, 21 miles (mi)) offshore the city of Eureka, measures 45 km (28 mi) north to south and 23 km (14 mi) east to west, totaling approximately 132,368 acres (ac) (206 square miles (mi^2)). Water depths across the WEA range from approximately 500 to 1,100 meters ((m) 1,640–3,609 feet (ft)).

Table 1-1: Humboldt Wind Energy Area Descriptive Statistics

Acres	Installation Capacity[1]	Homes Powered[2]	Power Production (MWh/year): 40% Capacity Factor[3]	Power Production (MWh/year): 60% Capacity Factor[4]	Maximum Depth (meters)	Minimum Depth (meters)
132,369	1,605	561,750	5,632,920	8,435,880	1,100	500

Notes:

1 Megawatts (MW) based upon 3 MW/km^2 (square kilometers)

2 Homes powered based upon 350 homes per MW

3 A megawatt hour (MWh) equals 1,000 kilowatts of electricity generated per hour. Formula = Capacity (MW) x 8,760 (hrs/yr) x 0.4 (capacity factor)

4 Formula = Capacity (MW) x 8,760 (hrs/yr) x 0.6 (capacity factor)

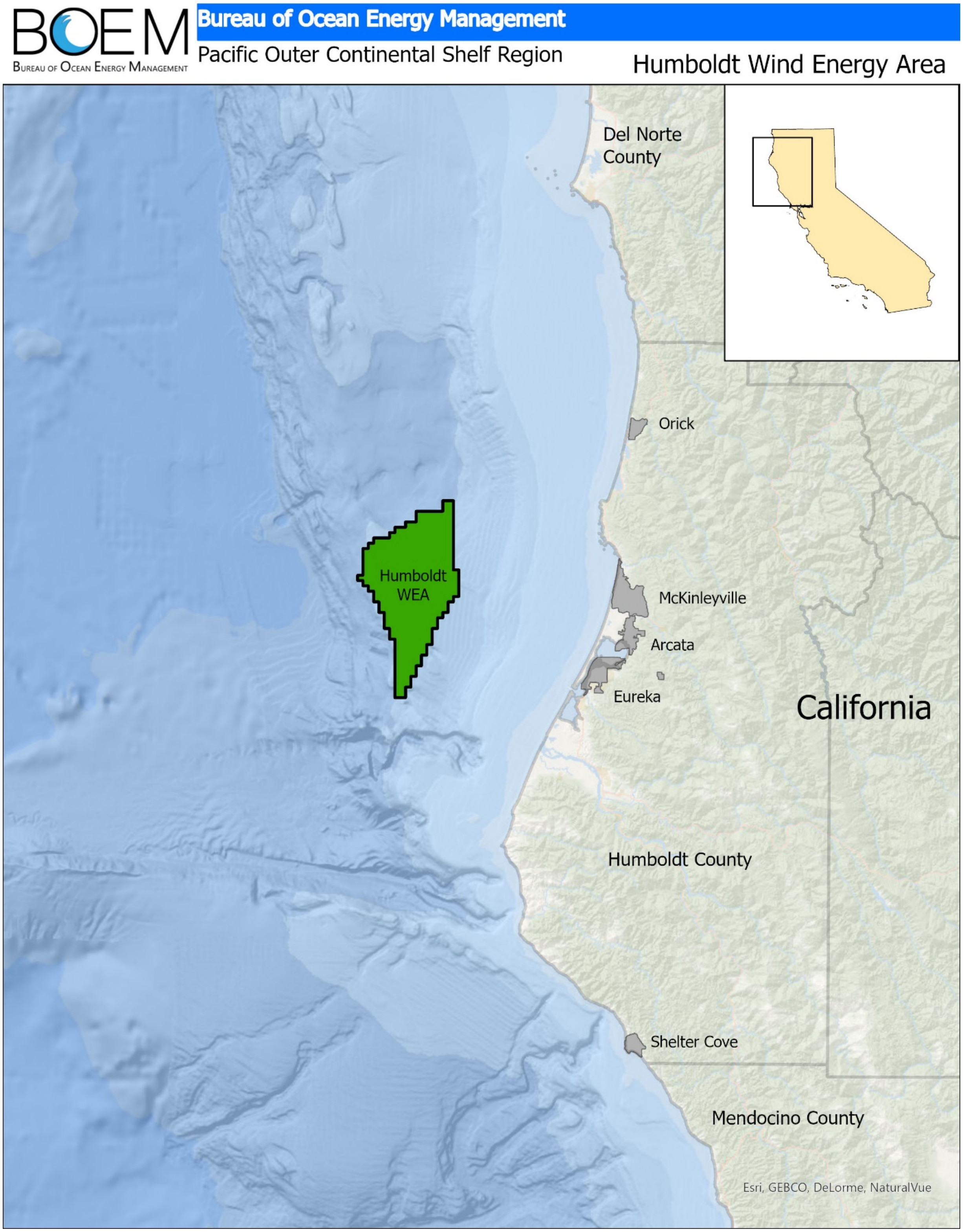


Figure 1-1: Map of Humboldt Wind Energy Area Offshore Northern California

2 Alternatives – Proposed Action and No Action

2.1 Proposed Action

The Proposed Action for this EA is the issuance of commercial wind energy leases and associated easements within the WEA that BOEM designated on the OCS in the vicinity of Humboldt County, California. This EA analyzes BOEM's issuance of up to 3 leases within the Humboldt WEA, as well as the issuance of easements and grants associated with each lease for subsea cable corridors and areas for associated offshore collector/ converter platforms. The ROWs and RUEs would all be located within the northern California OCS, extending from the WEA through to state waters and to the onshore energy grid. The Proposed Action may result in site assessment activities and site characterization activities focused within the leases and easements. A lessee would submit a SAP to describe these activities for BOEM's review (30 Code of Federal Regulations (CFR) 585.605-613). Site assessment activities would most likely include the temporary placement of meteorological buoys (i.e., metocean or met buoys) and scientific sampling equipment. Site characterization activities would most likely include geophysical, geotechnical, biological, archaeological, and ocean use surveys. While site characterization activities that extend into state waters and onshore to ports or existing substations are a reasonably foreseeable result of a wind energy lease issued in the Humboldt WEA, BOEM is not authorizing any activities in state waters and onshore areas and does not have regulatory authority to apply mitigation measures outside of the OCS.

This analysis does not consider construction and operation of any commercial wind power facilities, which would be evaluated if a lessee submits a Construction and Operations Plan (COP). BOEM conducts separate analyses for these two development phases based on several factors.

First, BOEM does not consider the issuance of a lease to constitute an irreversible and irretrievable commitment of agency resources. The issuance of a lease only grants the lessee the exclusive right to submit to BOEM a SAP and COP proposing characterization and development of the leasehold; the lease does not, by itself, authorize any activity within the lease area. After lease issuance, a lessee would conduct surveys and, if authorized to do so pursuant to an approved SAP, install meteorological measurement devices to characterize the site's weather conditions and to assess the wind resources in the proposed lease area. A lessee would collect this information to determine whether the site is suitable for commercial development and, if so, submit a COP with its project-specific design parameters for BOEM's review. Should a lessee submit a COP, BOEM would consider its merits; perform the necessary consultations with the appropriate federal, tribal, state, and local entities; solicit input from the public and the BOEM California Intergovernmental Renewable Energy Task Force; and prepare an independent, comprehensive, site- and project-specific Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA). This separate site- and project-specific EIS would provide additional opportunities for public involvement pursuant to NEPA and the Council on Environmental Quality (CEQ) regulations at 40 CFR Parts 1500–1508. BOEM would use this information to evaluate the potential environmental and socioeconomic consequences associated with the lessee-proposed project when considering whether to approve, approve with modification, or disapprove a lessee's COP pursuant to 30 CFR 585.628. After lease issuance but prior to COP approval, BOEM retains the authority to prevent the environmental impacts of a commercial wind power facility from occurring. BOEM would do this by disapproving a COP for failure to meet the statutory standards set forth in the Outer Continental Shelf Lands Act (OCSLA).

Second, BOEM does not consider the impacts resulting from the development of a commercial wind power facility within the WEA to be reasonably foreseeable at this time. Based on the experiences of the offshore wind industry in northern Europe, project design and the resulting environmental impacts are often geographically- and design-specific, and it would therefore be premature to analyze environmental impacts related to potential approval of any future COP (Michel et al. 2007; (Musial, 2010 #1149). A number of design parameters would be identified in a COP including turbine size, anchoring type, project layout, installation methods, and associated onshore facilities. However, the development of these parameters would be determined by information collected by the lessee during site assessment and site characterization activities, and potential advances in technology during the extensive time period between lease issuance and COP approval. Each design parameter, or combination of parameters, would have varying environmental effects. Therefore, additional analyses under NEPA would be required before any future decision is made regarding construction of wind energy facilities on the OCS.

The timing of lease issuance, as well as weather and sea conditions, would be the primary factors influencing timing of site assessment and site characterization survey activities. Under the reasonably foreseeable scenario, BOEM could issue leases in 2022. SAPs are expected to BOEM within one year of lease issuance (30 CFR 585.601) although lessees could begin survey activities as soon as possible after receiving a lease, preparing a SAP, and when sea states and weather conditions allow for site assessment and site characterization survey activities. For leases issued in late 2022, surveys would likely begin in spring of 2023. Lessees have up to 5 years to perform site characterization activities before they must submit a COP (30 CFR 585.235(a)(2)). For leases issued in late 2022, those lessees' surveys could continue through August 2027 prior to submitting COPs.

2.2 Information Considered in Developing this Environmental Assessment

This EA considers information collected through the ongoing outreach efforts and prior EA scoping process:

- Ongoing consultation and coordination since 2016 with the members of the BOEM California Intergovernmental Renewable Energy Task Force
- Comments received in response to the October 19, 2018 Call associated with wind energy planning in California
- CA Offshore Wind Energy Planning Outreach Summary Report and Addendum updated June 2021.
- Public response to the July 28, 2021 Notice to Stakeholders to prepare this EA from two online public scoping meetings held August 24, 2021 and public input via email sent to humboldtoffshorewind@boem.gov
- Information from https://caoffshorewind.databasin.org/
- Information collected through the Marine Renewable Energy Working Group (https://www.opc.ca.gov/2010/05/offshore-wave-energy-development)

2.2.1 Foreseeable Activities and Impact-Producing Factors

The analysis in this EA considers the effects of lease issuance and routine activities associated with lease and grant site assessment activities (i.e., meteorological buoy deployment, operation, and decommissioning) within the WEA and potential easements associated with transmission cable corridors, and site characterization activities (e.g., biological, geological, geophysical, geotechnical, and archaeological surveys focused in the WEA as shown in Table 2-2).

This analysis does not consider construction and operation of any commercial wind power facilities on a lease or grant in the identified WEA, which would be evaluated separately if a lessee submits a COP.

Impact-producing factors (IPFs) associated with the various activities in the Proposed Action that could affect resources include the following:

- noise
- bottom disturbance
- entanglements
- vessel traffic and routine discharges
- economic impacts
- changes in coastal viewsheds
- equipment, generator, and vessel air emissions
- lighting

BOEM does not receive a SAP until after a lease is issued, so the following sections describe assumptions about and scenarios of reasonably foreseeable site assessment and site characterization activities based on regulations, relevant experience on the Pacific OCS, and SAPs submitted to BOEM for the Atlantic OCS.

2.2.1.1 Surveying and Sampling Assumptions

- Lessees would likely survey the entire proposed lease area during the 5-year site assessment term to collect required information for the siting of up to three metocean buoys and potential commercial wind facilities.
- Site characterization surveys may be conducted before and after the installation of metocean buoys.
- Lessees would perform high-resolution geophysical (HRG) surveys, which do not include the use of air guns.
- Survey vessels would travel at a speed of 4.5 knots (MMS 2004).

2.2.1.2 Installation, Decommissioning, and Operations and Maintenance Assumptions

- Metocean buoy installation would take approximately one day (PNNL 2019).
- One buoy maintenance trip each year per buoy (PNNL 2019).
- Buoy decommissioning would take one day (PNNL 2019) and occur in Year 6 or Year 7 after lease execution.
- On-site inspections and preventative maintenance (e.g., marine fouling, wear, or lens cleaning) are expected to occur yearly.

2.2.1.3 Noise Generation Assumptions

The following activities can be expected to generate noise:

- HRG survey equipment (see Chapter 4).
- Coring and sediment sample collection as part of geotechnical sampling.
- Vessel engines during site characterization surveys and metocean buoy(s) installation, maintenance, and decommissioning.
- Diesel engines on metocean buoy(s) where solar/wind are not used for power.

2.2.1.4 Port Facilities Assumptions

BOEM assumes that during the site assessment and site characterization stages, a lessee will stage from the Port of Humboldt Bay, which is approximately 32.2 km (20 mi) east of the Humboldt WEA. The closest alternative harbors would be Crescent City (approximately 90 mi to the north), Coos Bay (approximately 349 km (217 mi) to the north), and San Francisco Bay (approximately 368.5 km (229 mi) to the south).

BOEM has identified the Port of Humboldt Bay (BOEM 2016b) as a deep-water port with the potential to be a Quick Reaction Port (a port that is within 2 hours by boat to the project site).

2.2.1.5 Vessel Traffic

Vessel trips are anticipated for both site assessment and site characterization activities (Table 2-3). This EA assumes vessel traffic from 2017 is a reasonable level of activity for analysis:

The Pacific Northwest National Laboratory (PNNL) deployed LiDAR (light detection and ranging) buoys off of California in the Humboldt and Morro Bay WEAs (PNNL 2019). A 65-foot tugboat was used to tow the LiDAR buoy, at 5 knots, from Humboldt Bay to the Humboldt WEA where they lowered the anchor, mooring line, and attached the buoy and then traveled back to Humboldt Bay in one day. PNNL planned for 3 vessel trips for a 12-month deployment (deployment, mid-year maintenance, recovery). Traffic patterns based on 2017 Automatic Identification System (AIS) data are more concentrated further to sea and closer to shore than in the Humboldt Call Area (Figure 2-1). Tug and tow vessels do traverse the Humboldt WEA; however, they are concentrated in the near shore tow lane and further offshore. Cargo ships also traverse the Humboldt WEA, but use is concentrated further offshore. Tankers did not traverse the Humboldt WEA in 2017.

Additional vessel traffic assumptions are shown in Table 2-3 in Section 2.2.1.7, and Table 2-4 in Section 2.2.1.8.

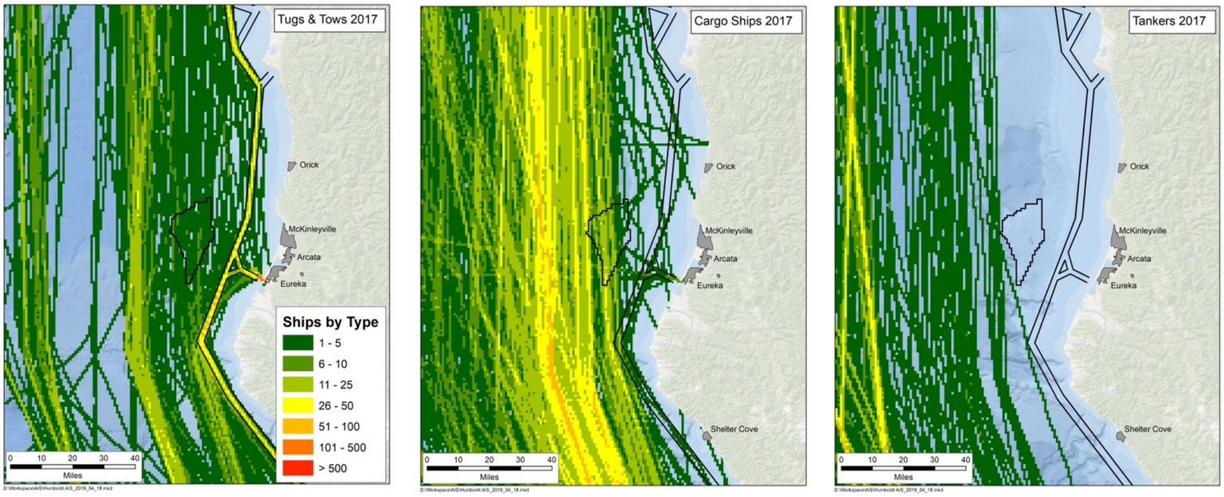


Figure 2-1: Vessel Traffic from 2017 in and near the Humboldt Wind Energy Area

2.2.1.6 Site Characterization Surveys

Site characterization activities involve geological, geotechnical, and geophysical surveys of the seafloor to ensure that mooring systems, turbines, and cables can be properly located, as well as look for shallow hazards. These survey methods can also be used for surveying archaeological (i.e., historic property) resources. Biological surveys are also part of site characterization surveys and collect data on potentially affected habitats, marine mammals, birds, sea turtles, and fishes.

BOEM regulations require that the lessee provide the results of several surveys with its SAP (30 CFR 585.610–611). Table 2-1 describes the types of site characterization surveys, types of equipment and/or methods used, and which resources the survey information would be used to inform. If applicable survey data is available, additional surveys may not be necessary.

Assumptions for analysis are based on BOEM guidelines that provide recommendations to lessees for acquiring the information required for a SAP under 30 CFR 585.610–611. BOEM has also published Guidelines for Information Requirements for a Renewable Energy SAP (BOEM, 2019 #1150), which are available at: http://www.boem.gov/Final-SAP-Guidelines/. BOEM national survey guidelines for some resources can be found at: http://www.boem.gov/Survey-Guidelines/. National guidelines are applicable for certain resource areas along the U.S. west coast. For the purpose of the Proposed Action scenario, BOEM assumes that the lessee would employ these methods to acquire the information required under 30 CFR 585.610–611 and that these activities would not be conducted concurrently with biological surveys for marine mammals and sea turtles.

Table 2-1: Proposed Site Characterization Survey Details for the Humboldt Wind Energy Area

Survey Type	Survey Equipment and/or Method	Resource Surveyed or Information Used to Inform
High-resolution geophysical surveys	Side-scan sonar, sub-bottom profiler, magnetometer, multi-beam echosounder	Shallow hazards[1], archaeological[2], bathymetric charting, benthic habitat
Geotechnical/sub-bottom sampling[3]	Vibra; piston; gravity cores; cone penetration tests	Geological[4]
Biological[5]	Grab sampling; benthic sled; underwater imagery/ sediment profile imaging; Remotely Operated Vehicle (ROV); Autonomous Underwater Vehicle (AUV)	Benthic habitats
	Aerial digital imaging; visual observation from boat or airplane; radar; thermal and acoustic monitoring	Avian
	Ultrasonic detectors installed on buoy and survey vessels used for other surveys, radar, thermal monitoring	Bats
	Aerial and/or vessel-based surveys and acoustic monitoring	Marine mammals and sea turtles
	Direct sampling using vessel-based surveys; underwater imagery; acoustic monitoring; environmental DNA	Fishes and some invertebrates

Notes:

[1] 30 CFR 585.610(b)(2)
[2] 30 CFR 585.610(b)(3)
[3] 30 CFR 585.610(b)(1)
[4] 30 CFR 585.610(b)(4)
[5] 30 CFR 585.610(b)(5)

2.2.1.7 Collection of Geophysical Information

HRG surveys would be performed to obtain geophysical hazards information, including information to determine siting for geotechnical sampling, whether hazards will impact seabed support of the turbines, information pertaining to the presence or absence of archaeological and habitat resources, and to conduct bathymetric charting.

Assuming the lessee follows BOEM's guidelines to meet the geophysical data requirements at 30 CFR 585.610–611, BOEM anticipates that the surveys would be undertaken using the equipment to collect the required data as described in Table 2-1 and Table 2-2. Vessel traffic assumptions for site characterization are shown in Table 2-3. Equivalent technologies to those shown in these tables may be used if their potential impacts are similar to those analyzed for the equipment described in the EA and are approved by BOEM prior to conducting surveys.

The line spacing for HRG surveys would vary depending on the data collection requirements of the different HRG survey types:

- For the collection of geophysical data for shallow hazards assessments (including magnetometer, side-scan sonar, and sub-bottom profiler systems), BOEM recommends surveying at a 150-m (492-ft) line spacing over the proposed lease area;
- for the collection of geophysical data for archaeological resources assessments, the lessee would likely use survey methods at a line spacing appropriate for the range of depths expected in the

survey area, as long as the sonar system is capable of resolving small, discrete targets 0.5 m (20 inches) in length at maximum range; and

- for bathymetric charting, the lessee would likely use a multi-beam echosounder at a line spacing appropriate to the range of depths expected in the survey area.

Table 2-2: High-Resolution Geophysical Survey Equipment and Methods

Equipment Type	Data Collection and/or Survey Types	Description of the Equipment
Bathymetry/depth sounder (multi-beam echosounder)	Collection of geophysical data for shallow hazards, archaeological resources, benthic habitats, and bathymetric charting	A depth sounder is a microprocessor-controlled, high-resolution survey-grade system that measures precise water depths in both digital and graphic formats. The system would be used in such a manner as to record with a sweep appropriate to the range of water depths expected in the survey area. This EA assumes the use of multi-beam bathymetry systems, which may be more appropriate than other tools for characterizing those lease areas containing complex bathymetric features or sensitive benthic habitats such as hardbottom areas.
Magnetometer	Collection of geophysical data for shallow hazards and archaeological resources assessments	Magnetometer surveys would be used to detect and aid in the identification of ferrous or other objects having a distinct magnetic signature. The magnetometer sensor is typically towed as near as possible to the seafloor and anticipated to be no more than approximately 6 m (20 ft) above the seafloor. This methodology will not be used in the WEA since depths are 500 m or greater, but will be used to survey potential cable routes that will occur in depths shallower than 500 m.
Side-scan sonar	Collection of geophysical data for shallow hazards and archaeological resource assessments	This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (MMS 2007). A typical side-scan sonar system consists of a top-side processor, tow cable, and towfish with transducers (or "pingers") located on the sides which generate and record the returning sound that travels through the water column at a known speed. BOEM assumes that the lessee would use a digital dual-frequency side-scan sonar system with 300–500 kHz frequency ranges or greater to record continuous planimetric images of the seafloor.
Shallow and medium (seismic) penetration sub-bottom profilers	Collection of geophysical data for shallow hazards and archaeological resource assessments and to characterize subsurface sediments	Typically, a high-resolution CHIRP System sub-bottom profiler is used to generate a profile view below the bottom of the seabed, which is interpreted to develop a geologic cross-section of subsurface sediment conditions under the track line surveyed. Another type of sub-bottom profiler that may be employed is a medium penetration system such as a boomer, bubble pulser or impulse-type system. Sub-bottom profilers are capable of penetrating sediment depth ranges of 3 m (10 ft) to greater than 100 m (328 ft), depending on frequency and bottom composition.

Notes:
CHIRP = Compressed High Intensity Radar Pulse kHz = kilohertz

Table 2-3: Projected Maximum Vessel Trips for Site Characterization

Survey Task	Number of Survey Days/Round Trips[1]	
	Based on 24-hour Days	Based on 10-hour Days
HRG surveys of all OCS blocks within lease area(s)	64	153
Geotechnical sampling	18	247
Avian surveys	24–48	24–48
Fish surveys	Once per day for the duration of the SAP	Once per day for the duration of the SAP
Marine mammal and sea turtle surveys	24–48	24–48
Total:	130–178	448–496

Notes:

[1] A range has been provided when data or information was available to determine an upper and lower number of round trips. Otherwise, only a maximum value was determined.

HRG = high-resolution geophysical

2.2.1.8 Instrumentation and Power Requirements

Metocean buoys would be anchored at fixed locations in potential commercial lease areas in order to conduct site assessment activities to monitor and evaluate the viability of wind as an energy source. The activities may include data gathering on wind velocity, barometric pressure, atmospheric and water temperatures, and current and wave measurements. To obtain these data, scientific measurement devices consisting of anemometers, vanes, barometers, and temperature transmitters would be mounted either directly on a buoy or on a buoy's instrument support arms. In addition to conventional anemometers, floating light detection and ranging (FLiDAR) and sonic detection and ranging equipment may be used to obtain meteorological data. To measure the speed and direction of ocean currents, Acoustic Doppler Current Profilers (ADCPs) would most likely be installed. Buoys could also accommodate environmental monitoring equipment, such as bird and bat monitoring equipment (e.g., radar units, thermal imaging cameras), visual or acoustic monitoring equipment for marine mammals and fishes, data logging computers, power supplies, visibility sensors, water measurement equipment (e.g., temperature, salinity), communications equipment, material hoist, and storage containers. Projected vessel traffic in support of metocean buoy placement is shown in Table 2-4.

Table 2-4: Example of Projected Maximum Vessel Trips for Metocean Buoy(s)

Buoy	Site Assessment Activity	Round Trips	Formula
Metocean buoys	Metocean buoy installation	3	1 round trip x 3 buoys
	Metocean buoy yearly maintenance trips	15	3 buoys x 5 years
	Metocean buoy decommissioning	3	1 round trip x 3 buoys
	Total buoy trips over 5-year period	21–30	Adds on additional maintenance/weather challenges

This instrumentation, along with associated telemetry systems, will require a reliable energy source with a capacity for long autonomy offshore deployments. To supply this energy, the buoys may be equipped with some combination of solar arrays, lithium or lead acid batteries, and diesel generators. If diesel generators are used, they will require an onboard fuel storage container with appropriate spill protection and an environmentally sound method to perform refueling activities.

2.2.1.9 Buoy Hull Types and Anchoring Systems

To accommodate the required onboard instrumentation and power systems, the buoys must be properly sized and anchored. The National Oceanic and Atmospheric Administration (NOAA) has successfully used boat-shaped hull buoys (known as Naval Oceanographic and Meteorological Automated Devices (NOMAD)) and the newer Coastal Buoy and Coastal Oceanographic Line-of-Sight (COLOS) buoys, for weather data collection for many years (Figure 2-2).

The choice of hull type used usually depends on its intended installation location and measurement requirements. To ensure optimum performance, a specific mooring design is produced based on hull type, location, and water depth (National Data Buoy Center 2012). For example, a smaller buoy in shallow coastal waters may be moored using an all-chain mooring. On the OCS, a larger discus-type or boat-shaped hull buoy may require a combination of a chain, nylon, and buoyant polypropylene materials designed for many years of ocean service (National Data Buoy Center 2008). Moorings will be designed to minimize or remove entanglement risk for protected species.

Discus-shaped, boat-shaped, and spar buoys (Figure 2-3, Figure 2-4, and Figure 2-5, respectively) are the buoy types that would most likely be adapted for offshore wind data collection. A large discus-shaped hull buoy has a circular hull ranging between 10 and 12 m (33 and 40 ft) in diameter and is designed for many years of service (National Data Buoy Center 2012). The boat-shaped hull buoy is an aluminum-hulled buoy that provides long-term survivability in severe seas (National Data Buoy Center 2012).

Some deep ocean moorings have operated without failure for more than 10 years (National Data Buoy Center 2012). The spar-type buoy can be stabilized through an on-board ballasting mechanism approximately 18 m (60 ft) below the sea surface. Approximately 9–12 m (30–40 ft) of the spar-type buoy would be above the ocean surface, where meteorological and other equipment would be located. Tension legs attached to a mooring by cables have been implemented for one spar-type buoy approximately 2 nautical miles (nmi) offshore of Oregon (Reeb 2020). In 2020, PNNL installed two LiDAR buoys off California that had a boat shaped hull and were moored with a solid cast iron anchor weighing approximately 4,990 kgs (11,000 lbs) with a 2.3 square meter (m^2) footprint. The mooring line was comprised of chain, jacketed wire, nylon rope, polypropylene rope and subsurface floats to keep the mooring line taut to semi-taut. The mooring line was approximately 1,200 m long in the Humboldt WEA (PNNL 2019).

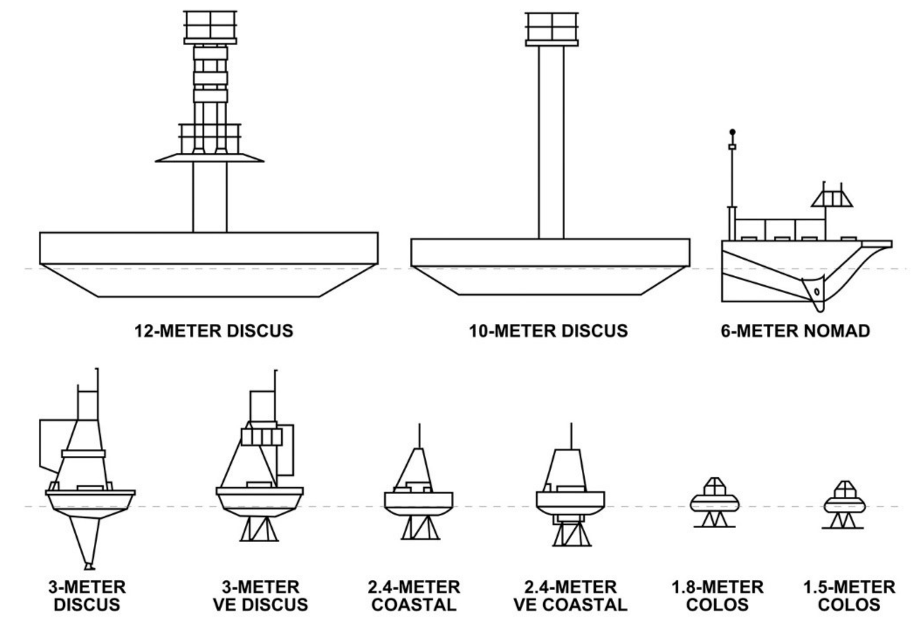


Figure 2-2: Buoy Schematic

Source: National Data Buoy Center 2008

Figure 2-3: 10-Meter Discus-Shaped Hull Buoy

Source: National Data Buoy Center 2012

Figure 2-4: 6-Meter Boat-Shaped Hull Buoy

Source: National Data Buoy Center 2012

Figure 2-5: Spar Buoy

Source: Australian Maritime Systems 2016

2.2.1.10 Buoy Installation and Operation

Buoys would typically take approximately one day to install.

Onshore activity (fabrication, staging, or launching of crew/cargo vessels) related to the installation of buoys is expected to use existing ports that can support this activity. Because buoy transport and deployment does not require the extensive large-scale infrastructure that would be required for construction of a full-scale offshore floating wind energy facility, there will be a much greater availability of port facilities for placing metocean buoys into service.

Boat-shaped and discus-shaped buoys are typically towed or carried aboard a vessel to the installation location. Once at the location site, the buoy would be either lowered to the surface from the deck of the transport vessel or placed over the final location, and then the mooring anchor dropped. After installation, the transport vessel would likely remain in the area for several hours while technicians configure proper operation of all systems. Transport and installation vessel anchoring for one day is anticipated for these types of buoys (PNNL 2019).

For the PacWave South Wave Energy Project, a spar-type buoy equipped with light detection and ranging (LiDAR) was towed approximately 37 km (2 nmi) offshore Oregon to the installation location by a transport vessel after assembly at a land-based facility. Oregon State University's 84-foot research vessel, along with a Zodiac rigid-hulled inflatable boat, were used to install the buoy (Reeb 2020). Approximately 12 m (40 ft) of the buoy was visible above the water line. The maximum area of disturbance to benthic sediments occurs during anchor deployment and removal (e.g., sediment resettlement or sediment extrusion) for this type of buoy.

Monitoring information transmitted to shore would include systems performance information such as battery levels and charging systems output, the operational status of navigation lighting, and buoy positions. Additionally, all data gathered via sensors would be fed to an on-board radio system that transmits the data string to a receiver onshore (Tetra Tech EC, Inc. 2010).

Because limited space on the buoy would restrict the amount of equipment requiring a power source, this equipment may be powered by small solar panels or wind turbines; however, diesel generators may be used, which would require periodic vessel trips for refueling.

2.2.1.11 Decommissioning

For the purpose of analysis, decommissioning is assumed to be essentially the reverse of the installation process. Equipment recovery would be performed with the support of a vessel(s) equivalent in size and capability to that used for installation (Installation section above). The mooring chain would be recovered to the deck using a winching system, leaving the anchor on the seafloor. The buoy would then be transported to shore by towing (PNNL 2019).

Buoy decommissioning is expected to be completed within one day. Buoys would be returned to shore and disassembled or reused in other applications. BOEM anticipates that the mooring devices and hardware would be re-used or recycled (PNNL 2019).

2.2.2 Non-Routine Events

Reasonably foreseeable non-routine and low-probability events and hazards that could occur during site characterization and site assessment related activities include the following: (1) allisions and collisions between the site assessment structures or associated vessels and other marine vessels or marine life; (2) spills from collisions or fuel spills resulting from generator refueling; and (3) recovery of lost survey equipment.

2.2.2.1 Allisions and Collisions

An allision occurs when a moving object (i.e., a vessel) strikes a stationary object (e.g., met buoy); a collision occurs when two moving objects strike each other. A met buoy in the WEA could pose a risk to vessel navigation. An allision between a ship and a met buoy could result in the damage or loss of the buoy and/or the vessel, as well as loss of life and spillage of petroleum product. Although considered unlikely, vessels associated with site assessment and site characterization activities could collide with other vessels, resulting in damages, petroleum product spills, or capsizing. Risk of allisions and collisions is reduced through routing measures such as Traffic Separation Schemes (TSS) and safety fairways, as well as U.S. Coast Guard (USCG) Navigation Rules and Regulations.

BOEM anticipates that aerial surveys (if necessary) would not be conducted during periods of reduced visibility conditions as flying at low elevations would pose a safety risk during storms and times of low visibility.

Collisions between vessels and allisions between vessels and met buoys are considered unlikely since vessel traffic is controlled by routing measures such as safety fairways, TSSs, and anchorages. Higher traffic areas were excluded from the WEA. Risk of allisions with met buoys would be further reduced by USCG-required marking and lighting.

2.2.2.2 Spills

A spill of petroleum product could occur as a result of hull damage from allisions with a met buoy, collisions between vessels, accidents during the maintenance or transfer of offshore equipment and/or crew, or due to natural events (i.e., strong waves or storms). From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88 gallons (USCG 2011); should a spill from a vessel associated with the Proposed Action occur, BOEM anticipates that the volume would be similar. Diesel fuel is lighter than water and may float on the water’s surface or be dispersed into the water column by waves. Diesel would be expected to dissipate very rapidly, evaporate, and biodegrade within a few days (MMS 2007a). The NOAA’s Automated Data Inquiry for Oil Spills (an oil weathering model) was used to predict dissipation of a maximum spill of 2,500 barrels, a spill far greater than what is assumed as a non-routine event during the Proposed Action. Results of the modelling analysis showed that dissipation of spilled diesel fuel is rapid. The amount of time it took to reach diesel fuel concentrations of less than 0.05 percent varied between 0.5 and 2.5 days, depending on ambient wind (Tetra Tech Inc. 2015), suggesting that 88 gallons would reach similar concentrations much faster and limit the environmental impact of such a spill.

Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills, and most equipment on the met and buoys would be powered by batteries charged by small wind turbines and solar panels. BOEM expects that each of the vessels involved with site assessment and site characterization activities would minimize the potential for a release of oils and/or chemicals in accordance with 33 CFR Parts 151, 154, and 155, which contain guidelines for implementation and enforcement of vessel response plans, facility response plans, and shipboard oil pollution emergency plans. Based on the size of the spill, it would be expected to dissipate very rapidly and would then evaporate and biodegrade within a day or two (at most), limiting the potential impacts to a localized area for a short duration.

2.2.2.3 Recovery of Lost Survey Equipment

Equipment used during site assessment and site characterization activities (e.g., towed HRG survey equipment, cone penetration test components, grab sampler, buoys, lines, cables) could be accidentally lost during survey operations. Additionally, it is possible (although unlikely) that a met buoy could disconnect from the clump anchor. In the event of lost equipment, recovery operations may be undertaken to retrieve the equipment. Recovery operations may be performed in a variety of ways, including ROVs and grapnel lines, depending on water depth and equipment lost. If grapnel lines (e.g., hooks, trawls) are used to retrieve lost equipment, extensive bottom disturbances could result from dragging the line along the bottom until it hooks the lost equipment. This may require multiple passes in a given area. In addition, after the line catches the lost equipment, components will be drug along the seafloor until recovery.

Where lost survey equipment is not able to be retrieved because it is either small or buoyant enough to be carried away by currents or is completely or partially embedded in the seafloor (for example, a broken vibracore rod), a potential hazard for bottom-tending fishing gear may occur, and additional bottom disturbance may occur. A broken vibracore rod that cannot be retrieved may need to be cut and capped 1 to 2 m (3–6.5 ft) below the seafloor. For the recovery of lost survey equipment, BOEM will work with the lessee/operator to develop an emergency response plan. Selection of a mitigation strategy would depend on the nature of the lost equipment, and further consultation may be necessary.

IPFs associated with recovery of lost survey equipment may include vessel traffic, noise and lighting, air emissions, and routine vessel discharges from a single vessel. Bottom disturbance and habitat degradation may also occur as a result of recovery operations

2.3 No Action Alternative

Under the No Action Alternative, no leases or grants would be issued in the Humboldt WEA at this time. Site characterization surveys and off-lease site assessment activities as described in the Proposed Action do not require BOEM approval and could still be conducted under the No Action Alternative, but these activities would not be likely to occur without a commercial wind energy lease or grant. The No Action Alternative will serve as the shifting baseline (changes over time) of current conditions (described in Chapter 3, Affected Environment) against which action alternatives are evaluated.

2.4 Alternatives Considered but Dismissed

Through the Area Identification (Area ID) process, the WEA underwent significant winnowing as a result of extensive coordination with the Task Force; relevant consultations with Federal, state, and local agencies; and extensive input from the public, potentially affected stakeholders, and potential developers, due to concerns related to visual resources, marine protected species, cable placement, recreational and commercial fishing, and vessel navigation. On July 16, 2021, BOEM released the Area ID Memorandum, which documents the analysis and rationale used to develop recommendations for the Humboldt WEA. Because of the winnowing that has already occurred and because the proposed action will not result in the approval of a wind energy facility and is expected to result only in site assessment and site characterization activities, BOEM has not identified any action alternatives that could result in meaningful differences in impacts to the various resources analyzed in this draft EA. In addition, scoping comments did not suggest alternatives that met the purpose and need and/or would have resulted in different impacts.

3 Description of Affected Environment and Environmental Impacts

3.1 GEOLOGY

3.1.1 Affected Environment

The Holocene marine geology of the Humboldt WEA reflects the multiple distinct tectonic and depositional stages along the North American plate margin throughout the Cenozoic. Local geologic features of interest within the WEA identified during recent United States Geological Survey marine geological and geophysical research cruises include active faulting, submarine landslides, steep seafloor slopes, seafloor pockmarks, and rock outcrops (Figure 3-1).

Within regulations outlined in 30 CFR 585, BOEM requires a lessee to execute a SAP as part of the development process of a renewable energy lease. Specifically, unless data is already available, the lessee is required to perform a marine site characterization survey and sampling program to ascertain local geologic and geotechnical conditions that may impact the design and installation of wind turbine systems. Within the Humboldt WEA, BOEM anticipates these site characterization surveys may include high-resolution multibeam bathymetry, side-scan sonar, magnetometer, subbottom profiler, minisparker, sediment grab samples, piston cores, and cone penetrometer tests.

3.1.2 Impacts of the Proposed Action

While the geology of the Humboldt WEA is complex, the anticipated impact to the local geologic resources by activities performed as part of an SAP would be negligible. No marine geophysical data acquisition would impact the seafloor or subseafloor geology, and any shallow geotechnical sampling within the WEA would result in minor, temporary disturbance of the upper 25 m (82 ft) of Quaternary sediment that underlie the seafloor.

3.1.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Humboldt WEA. The implementation of the No Action Alternative would mean that the minor, temporary disturbances to local geological resources associated with the Proposed Action would not occur. BOEM expects ongoing activities and planned actions to have continuing regional impacts on geological resources over the timeframe considered in this EA.

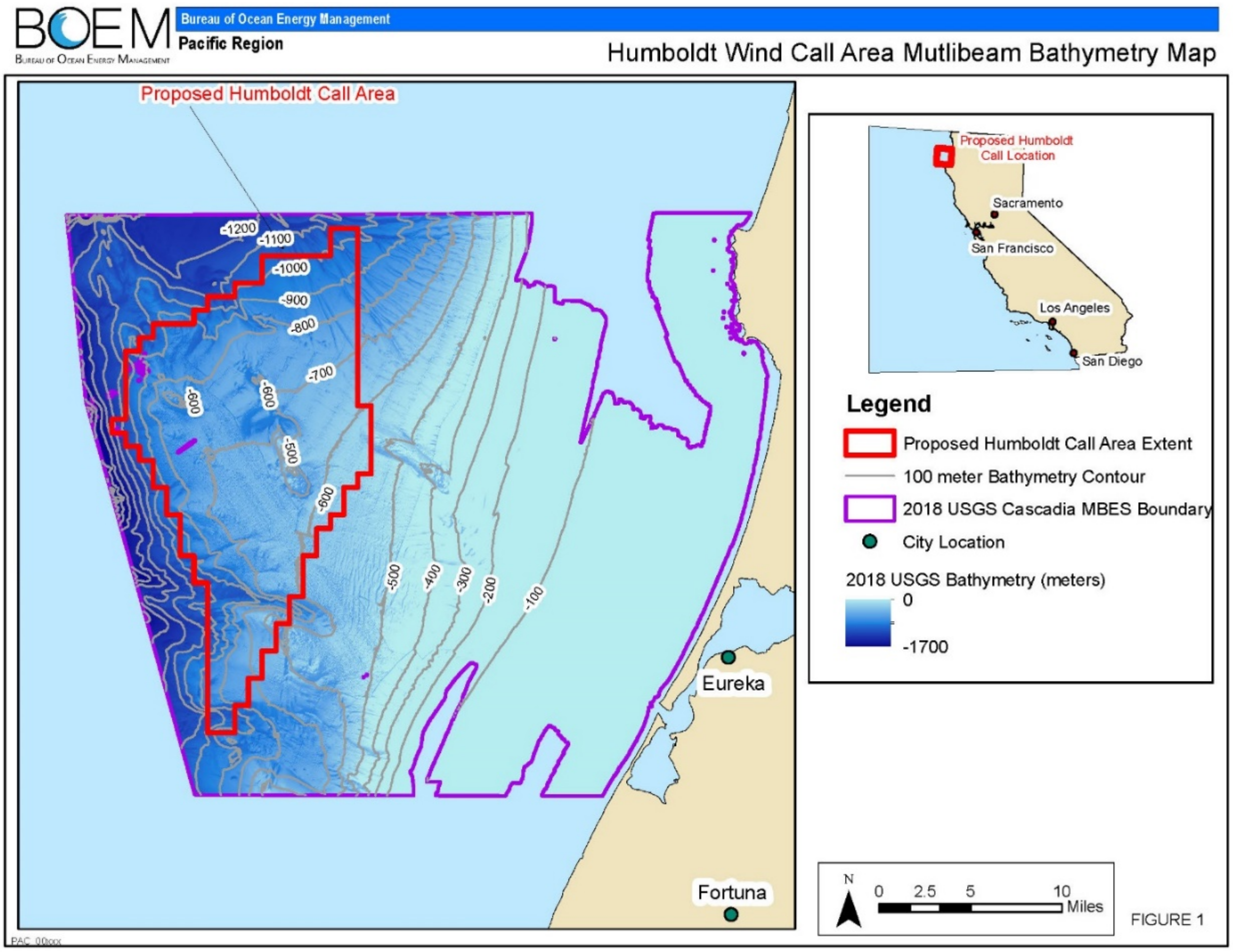


Figure 3-1: Humboldt Wind Energy Area Multibeam Bathymetry

3.2 AIR QUALITY

3.2.1 Affected Environment

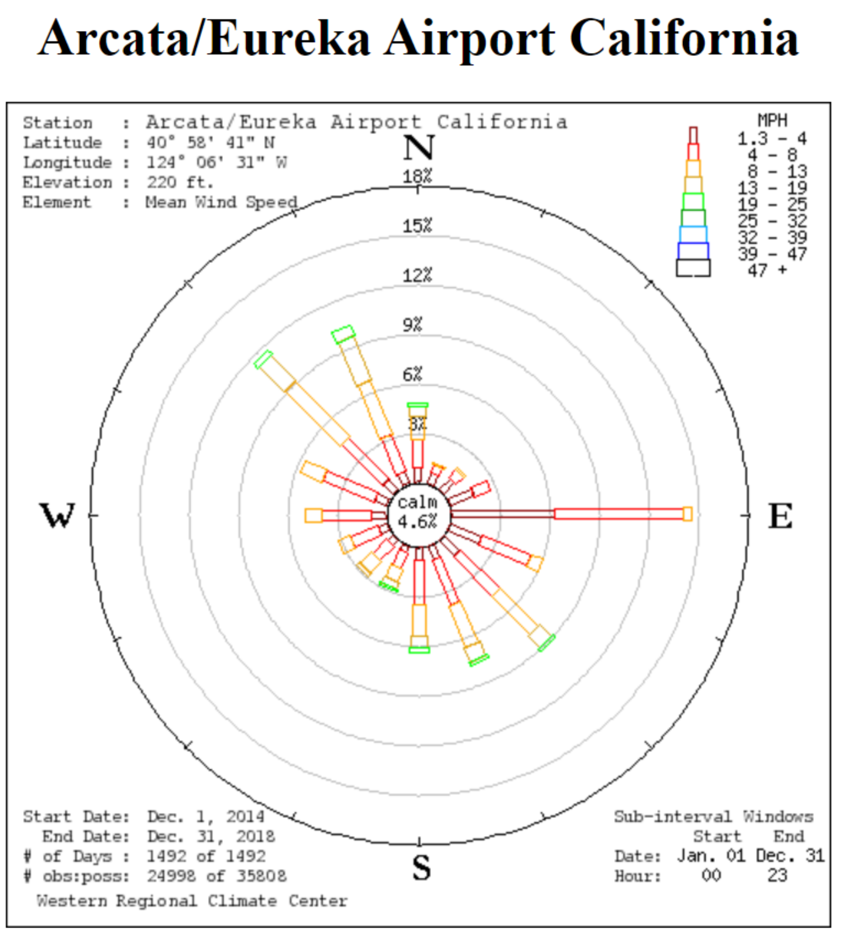
Air quality is defined by the concentration of pollutants, including greenhouse gasses (GHGs), in the ambient atmosphere. Pollutant concentrations are determined by a variety of factors including the quantity and timing of pollutants released by emitting sources, atmospheric conditions such as wind speed and direction, the presence of sunlight, and barriers to transport such as mountain ranges.

The North Coast Air Basin’s (NCAB) major features are the mountains of the California Northern Coast Ranges, which run north to south, parallel to the Pacific Ocean. These mountains act as a barrier to offshore winds and pollutant transport.

Air pollutants can be classified as criteria pollutants, hazardous air pollutants (HAPs), and GHGs. The criteria pollutants are carbon monoxide, lead, ground-level ozone, particulate matter (PM), nitrogen dioxide, and sulfur dioxide, and are regulated under the health-based National Ambient Air Quality Standards (NAAQS). HAPs are those pollutants that are known to cause cancer or other serious health effects. These pollutants are frequently associated with specific industries or equipment, for example, benzene from oil and gas operations. GHGs are gases that trap heat in the atmosphere. The primary GHGs are carbon dioxide, methane, and nitrous oxide. In contrast to the NAAQS and HAP contaminants, which have more local impacts, GHGs have a global impact.

Air pollutants are transported primarily by wind, so the wind speed and direction are significant factors to consider in determining adverse impacts. The land-based wind monitoring station closest to the Humboldt WEA is located at the California Redwood Coast – Humboldt County Airport (also known as the Arcata Airport). Wind data at the Arcata Airport Station measured an average wind speed over the 5-year period from January 1, 2014, through December 31, 2018, to be 7.2 miles per hour (WRCC 2021). Wind direction was generally from the east, northwest, and southeast (see Figure 3-2).

The federal and state attainment status of Humboldt County is found at 40 CFR 81.305. Humboldt County is in attainment for all NAAQS and California Ambient Air Quality Standards (CAAQS), with the exception of the state 24-hour PM_{10} standard (NCUAQMD 1995). Because Humboldt County has no stationary sources of air pollution on the corresponding OCS, it has not been designated as an Onshore Corresponding Area (OCA). Therefore, the U.S. Environmental Protection Agency (EPA) maintains jurisdiction over air quality management on the OCS offshore Humboldt County, in accordance with Section 328 of the Clean Air Act.



Source: (WRCC 2021).

Figure 3-2: Arcata Airport Windrose

3.2.2 Impacts of the Proposed Action

The factors associated with this project that can potentially produce adverse impacts on air quality are summarized in Table 3-1. The primary contaminants emitted are carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), fine particulate matter ($PM_{2.5}$), marine diesel, lube oils, and greenhouse gases.

Carbon monoxide, nitrogen dioxide, sulfur dioxide, and PM are criteria pollutants that are regulated under the NAAQS, which are health-based standards. Marine diesel and lube oils may contain HAPs, primarily benzene, and have adverse human health effects. They are also hydrocarbons, which, if volatilized, become precursors of photochemical smog (i.e., ozone, which is another NAAQS contaminant). Nitrogen dioxide, in the presence of sunlight, also becomes an ozone precursor. The primary GHG emitted is carbon dioxide. GHGs, in contrast to the other contaminants in Table 3-1, have a global, rather than local, impact. Carbon dioxide traps heat in the atmosphere and creates adverse impacts such as climate change, ocean acidification, and sea level rise.

Table 3-1: Factors that can Potentially Produce Adverse Impacts on Air Quality

Source	Impact-Producing Factors (IPFs)	Primary Contaminants
Marine vessels	• Stack emissions • Fugitive emissions[1] • Fuel and lubricant spills	CO, NO_2, $PM_{2.5}$, SO_2, marine diesel, lube oils, greenhouse gases
Auxiliary engines	• Stack emissions • Fugitive emissions • Fuel and lubricant spills	CO, NO_2, $PM_{2.5}$, SO_2, marine diesel, lube oils, greenhouse gases
Buoy back-up generators	• Stack emissions • Fugitive emissions • Fuel and lubricant spills	CO, NO_x, $PM_{2.5}$, SO_2, marine diesel, lube oils, greenhouse gases
Trucks and locomotives	• Engine exhaust	CO, NO_x, and $PM_{2.5}$, SO_2, greenhouse gases
Goods-movement equipment	• Engine exhaust	CO, NO_x, and $PM_{2.5}$, SO_2, greenhouse gases

Notes:

[1] Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening (40 CFR 70.2).

NO_x Oxides of nitrogen

3.2.2.1 Marine Vessels

Marine vessels are the source of stack emissions from the main exhaust stack of the engine that is used to propel the vessel. These emissions are primarily the products of combustions: CO, NO_2, $PM_{2.5}$, SO_2, and GHG. Fugitive hydrocarbon emissions may occur from the transfer and storage of fuel. Hydrocarbon emission may also result from fuel and lubricant spills.

3.2.2.2 Auxiliary Engines

Auxiliary engines are those internal combustion engines that are not used for the propulsion of the vessel and are used to power onboard equipment such as cranes, electrical generators, pumps, and compressors. Air emissions from auxiliary engines include CO, NO_2, and $PM_{2.5}$, and GHG, primarily carbon dioxide. Fugitive hydrocarbon emissions may occur from the transfer and storage of fuel. Hydrocarbon emission may also result from fuel and lubricant spills.

3.2.2.3 Back-up Generator for Buoy(s)

Buoys may be deployed with onboard back-up generators in case the buoy batteries or battery recharging system fail. Buoy back-up generators are generally powered by diesel fuel. Air emissions are primarily CO, NO_x, SO_2, and $PM_{2.5}$, and greenhouse gases. The possibility of a fuel spill also exists if the generator's fuel tank is ruptured, and also during filling operations.

3.2.2.4 Truck and Locomotive Traffic

Trucks and trains may be used to transport equipment to and from the onshore staging area(s). Associated air emissions would be CO, NO_2, $PM_{2.5}$, SO_2, and greenhouse gases.

3.2.2.5 Goods-Movement Equipment

Goods-movement equipment includes cranes, gantries, and winches, and are used to load and unload equipment and materials onto docks, boats, barges, or intermodally. Associated air emissions would be CO, NO_x, $PM_{2.5}$, SO_2, and greenhouse gases.

3.2.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Humboldt WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on air quality over the timeframe considered in this EA. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and will have commensurate negative impacts on air quality. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to air quality from existing and potential future actions.

3.3 WATER QUALITY

3.3.1 Affected Environment

The affected environment for water quality spans northern California coastal waters to 3 nmi, OCS marine waters within the WEA, and navigation routes between the lease area and the Port of Humboldt Bay. Navigation routes for survey and support vessels would likely stage from the Port of Humboldt Bay, approximately 32 km (20 mi) east of the Humboldt WEA.

3.3.1.1 Coastal Waters

Barnhart et al. (1992) describes three oceanographic conditions dictated by winds, (upwelling, low wind periods, and stormy periods) that influence water types found in the nearshore coastal environment of the Humboldt Bay region. Common during spring and early summer, upwelling periods are characterized by strong winds from the north and northwest that convey high nutrient, low oxygen, low temperature, and moderately high saline waters to the nearshore environment, including estuaries (Brown and Nelson 2015). During low wind periods, common in late summer and early fall, the southerly set California Current moves closer to shore bringing low nutrient concentrations, higher temperatures, and moderate salinities to the nearshore environment. Strong southerly winds common in late fall and winter coupled with the northerly set Davidson Current, convey waters to the nearshore environment with moderate nutrient concentrations, high sediment loads, low salinity, and oxygen saturation. Although these hydrographic conditions are associated with broad seasonal climatic shifts, these events have been observed to occur at any time of the year. Nearshore coastal waters generally have higher turbidities than offshore marine waters, particularly during spring runoff or storm events when resuspension of small sediment particles result from an increase of riverine input, waves, and currents (EPA 1995).

The Humboldt Bay region experiences a variety of land use and water-based activities that are contributing sources for point and non-point pollution to sediment, and fresh and marine water quality. Recreation, industrial enterprises, agriculture, mariculture, fishing, dredging, shipping, and urban development are common affairs in the Humboldt Region area. Pursuant to Clean Water Act (CWA) Sections 303(d) and 305(b) (33 USC §§ 1313(d) and 1315(b)), California is required to report to the EPA on the overall quality of the waters within its boundaries. The California EPA (CalEPA) 2018 Integrated Report CalEPA (2021) identified waterbodies in which specific conventional pollutants (bacteria, temperature, pH, dissolved oxygen), metals, pesticides and other organic chemicals, and trash do not meet current California water quality standards. Hydrologic units in the Humboldt region, including the Eel River, Eureka Plain, Trinidad, and Trinity River, are listed as impaired for one or more pollutants (CalEPA 2021).

3.3.1.2 Humboldt Bay Watershed

Humboldt Bay, a landmark feature of the region and one of California's largest coastal estuaries, is second only to San Francisco Bay in size. The drainage basin of the Humboldt Bay region includes freshwater and sediment input from the Elk River, Jacoby Creek, Eureka Slough, McDaniel Slough, Mad River Slough, and other smaller sloughs and creeks. Most of the oceanic sediment in this region is derived from riverine input with the Eel River supplying approximately 90 percent of the sediment to this region during winter storm events (Barnhart et al. 1992; HT Harvey & Associates 2020b). Tides and flushing characteristics vary within the bay with some areas sufficiently isolated from the nearshore resulting in distinct water quality characteristics. Only waters nearest the bay mouth at low tide more closely assume the characteristic of the nearshore environment. Barnhart et al. (1992) presents a descriptive estuarine profile of the Humboldt Bay waters and the geological, climatological, hydrological, and physicochemical aspects of the bay environment.

3.3.1.3 Marine Water

Water quality generally improves from coastal to marine locations, as onshore contaminants more commonly impact nearshore coastal waters than contaminants originating in marine waters. In the *National Coastal Condition Report IV* (USEPA 2012), EPA assessed the overall water quality of the west coast region based on an index derived from five water quality parameters: nutrient concentrations, (as indicated by nitrogen and phosphorus), dissolved oxygen, water clarity, and chlorophyll *a.* (USEPA 2012). The overall rating for the west coast coastal waters was *"Good"* including coastal waters in the Humboldt Region (USEPA 2012). Data in support of this rating were collected during the summer of 2003, including two continental shelf sampling locations approximately 11 and 16 km (7 and 10 mi), respectively, shoreward of the Proposed Action area (Nelson et al. 2008).

Included in EPA's *National Coastal Condition Report IV* (USEPA 2012) is an assessment and rating of west coast sediment quality. Based on three sediment quality indicators: sediment toxicity, sediment contaminants, and sediment total organic carbon, the marine sediment quality index was rated as *"Fair"* for the west coast region (USEPA 2012). However, the sediment quality index rating for coastal waters around the Humboldt Bay region was rated as *"Poor",* due to measurements of sediment toxicity (USEPA 2012). USEPA (2012) acknowledges that although the sediment toxicity results in support of the *National Coastal Condition Report IV* should be considered provisional for a variety of reasons and the interpretation of the results as *"Unclear,"* the sediment toxicity indicator for this period was virtually identical to previous periods. The other two sediment quality indicators, sediment contaminants, and sediment total organic carbon, were both rated *"Good"* for coastal waters in the Humboldt region (USEPA 2012).

3.3.2 Impacts of the Proposed Action

Routine activities associated with the Proposed Action that have the potential to impact coastal and marine waters and sediment quality include vessel discharges (including bilge and ballast water, and sanitary waste), geotechnical and benthic sampling, and installation and decommissioning of meteorological buoys. Oil and petroleum hydrocarbon spills are non-routine events that would impact water quality.

Under the CWA it is unlawful for any person to discharge any pollutant from a point-source into navigable waters without a permit under its provisions. The EPA regulates discharges incidental to the normal operation of all non-recreational, non-military vessels greater than 24 m (79 ft) in length into U.S. waters, under Section 402 of the CWA (EPA 2013 Vessel General Permit (VGP)). Small vessels and fishing vessels of any size must follow ballast water discharge requirements established in the EPA 2013 (VGP) and the USCG ballast water regulations at 33 CFR 151.10. Short-term and localized impacts to coastal and marine waters from vessel discharges by the introduction of total suspended solids, nutrients, organics, and oil and grease would be expected to diffuse rapidly in the water column without settling to the seafloor. Adherence to applicable permits and regulatory requirements for vessel discharges by local authorities, State of California (SOC), USCG, and EPA serves to minimize and mitigate discharges with no lasting impacts to water quality expected.

Vessel anchoring, coring, and collection of bottom samples associated with geotechnical surveys and benthic sampling would cause localized seafloor disturbance temporarily increasing turbidity and reducing water clarity by resuspension of sediments into the water column. Collection of bottom samples is estimated to impact up to 10 m^2 (108 ft^2) per sample, although the core or grab sample extraction area may be much smaller (BOEM 2014a). Short-term and localized resuspension of seafloor sediment into the water column is not expected to result in any lasting impact to water or sediment quality in either the WEA or along any projected transmission cable route. Upon cessation of the sampling, suspended sediment would immediately begin to settle to the seafloor with water quality promptly returning to ambient conditions.

Conclusion

Anchoring, installation, and decommission of meteorological buoys results in a greater disturbance to the seafloor than benthic sampling, consequently impacting water quality over a larger area. Anchors for boat- and discus-shaped buoys have a footprint of about 0.55 m^2 (6 ft^2) and an anchor sweep impact area of approximately 3.4 hectares (8.5 ac) (BOEM 2014a). A temporary resuspension of sediments into the water column would be expected during the one-day met buoy anchoring, installation, and decommissioning activities. This projected short-term duration would result in no lasting impact to water or sediment quality with ambient conditions likely throughout the operation and following decommissioning of the buoys. In the unlikely event of recovering lost equipment, seafloor disturbance and the resultant resuspension of sediments into the water column would be expected during the recovery operation. Transient and localized resuspension of sediment would temporarily impact water quality, but a return to ambient conditions would be expected immediately following the termination of the recovery operation.

Accidental releases of oil and petroleum products (e.g., diesel, lubricates) due to non-routine events are likely to result in small, short-term impacts on water quality over a localized area in the immediate vicinity of the release/spill.

3.3.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Humboldt WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on water quality over the timeframe considered in this EA. Local impacts from climate change are likely to be incremental and difficult to discern from effects of other actions such as urban development, mariculture, shipping and vessel discharges, and dredging. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to water quality from existing and potential future actions.

3.4 MARINE AND COASTAL HABITATS AND ASSOCIATED BIOTIC ASSEMBLAGES

3.4.1 Affected Environment

A variety of marine and coastal habitats exist within and nearby the WEA and species which reside in these habitats are characteristic of the Oregonian (cool-temperate) Biogeographic Province. Large-scale upwelling brings dissolved nutrients to the surface which in turn enhances biological productivity and supports significant biodiversity and biomass in the region. General references that describe the study region or the relevant ecological patterns within the California Current System include (Stephens, 2006) Allen et al. (2006), (Kaplan, 2010), and HTH (2020). These studies are incorpated by reference into this section. Key habitats and species which may be affected by the proposed project are sumarized below. The Pacific Fishery Management Council (PFMC) classifies all of these habitats as essential fish habitat for one or more federally managed fisheries (PFMC 2016, 2018, 2019, 2020).

3.4.1.1 Outer Shelf and Upper Slope Habitats

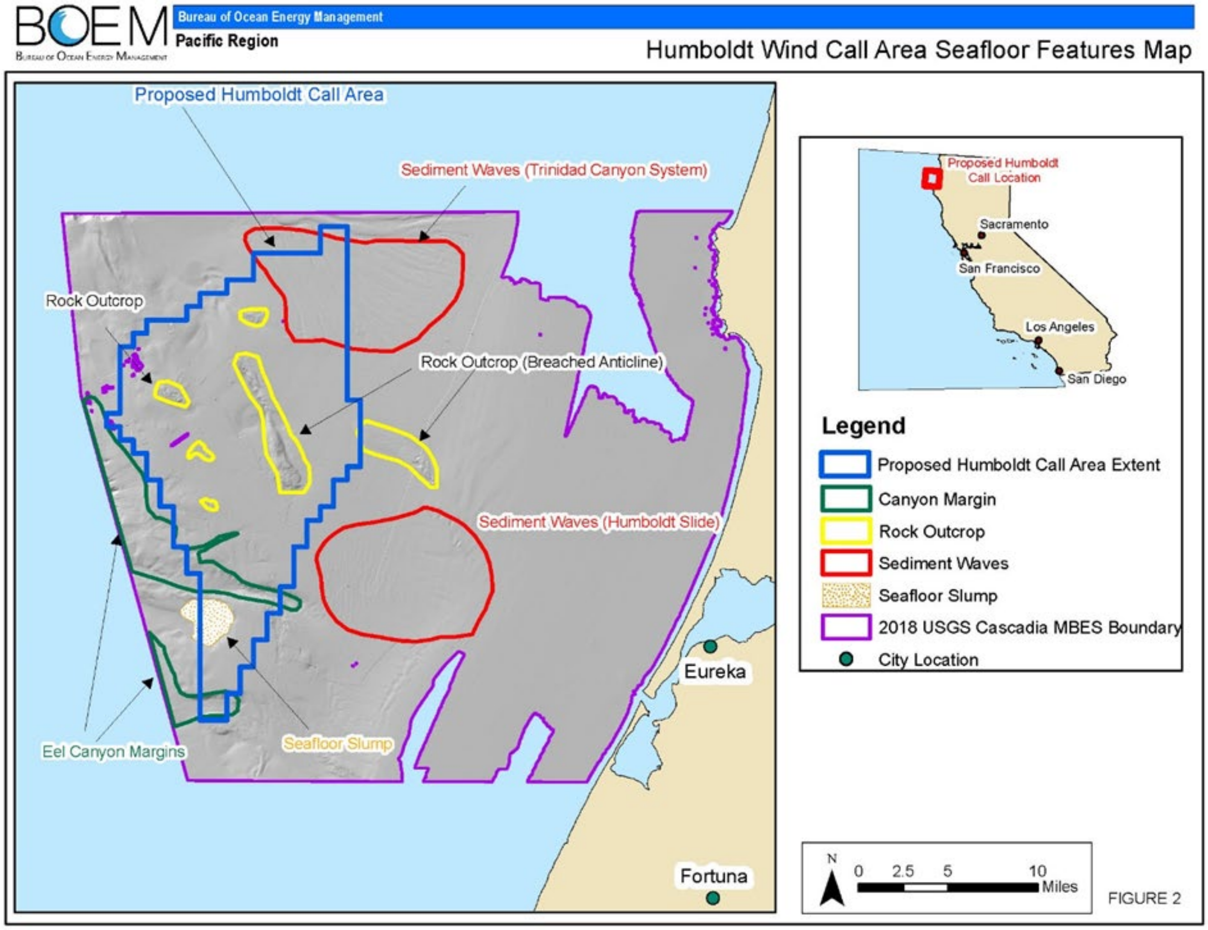


Figure 3-3: Humboldt Wind Energy Area Seafloor Features

Outer shelf and upper slope habitats. The ecosystem here is defined as the soft and hard substrates at depths between 400 m and 1,500 m (1,312 ft and 4,921 ft) and includes a few meters of the water column immediately above the seabed. The WEA benthos is entirely comprised of outer shelf and upper slope habitats. Within the larger study region, soft sediments cover most of the area with rock outcrops forming a minority of substrates (Goldfinger et al. 2014). Key structuring processes for invertebrate communities show cross-shelf patterns (BOEM report; Henkel and Gilbane 2020). For example, sediments on the continental shelf consist of sandy habitats nearshore and are dominated by filter-feeding organisms. Progressively deeper environments of silt and clay sediments follow, along with an increase in deposit feeders. At the shelf break, where the continental slope begins, the sediment becomes completely silt and clay (e.g. mud) and the community is dominated by deposit feeders (BLM 1980). Invertebrate prey serve as a forage base for larger piscine predators, some of which are commercially harvested, and include a variety of flatfishes (e.g., Dover and petrale soles), rays (e.g. longnose and California rays), thornyheads, sablefish, and hagfishes. As seen in Figure 3-3 above, the WEA seafloor features include a rock ridge toward the middle, and a seafloor slump and Eel Canyon margins in the southern portion of the WEA. Structure-forming invertebrates such as corals and sponges provide both habitat and food for other species. At all depths, fish assemblages at rock outcrops consist primarily of rockfishes (*Sebastes* spp.). Special habitats in the region include seeps and their associated chemosynthetic communities (Kennicutt, et al. 1989, USGS 2020) and submarine canyons (BLM 1980; MBARI 2020).

3.4.1.2 Pelagic Environments

This ecosystem is defined here as all open water habitat seaward of coastal habitats. Phytoplankton and zooplankton communities in the region are diverse and vary according to season and oceanographic conditions. These communities have been summarized by Kaplan et al. (2010). The pelagic environment also hosts a variety of larger animals including jellyfishes, krill, macro-invertebrate and fish larvae, forage fishes (e.g., myctophids, etc.), squid, tuna, and sharks (Kaplan et al. 2010).

3.4.1.3 Coastal Habitats

The coastal zone is defined here as benthic and water column habitats and species that reside seaward of intertidal habitats and out to the 100 m (328 ft) delineation point. Key references that summarize details concerning regional coastal habitats include Jenkinson et al. (2017), Lauermann (2017), Mulligan et al. (2017), and Shaughnessy et al. (2017). Special coastal features include kelp forests and estuaries. Of particular regional significance is Humboldt Bay, a natural, multi-basin, bar-built coastal lagoon that is the second largest enclosed bay in California. The Humboldt Bay National Wildlife Refuge is located within its boundaries. It is approximately 23 km (14 mi) long and the widest point is 6.9 km (4.3 mi). Extensive intertidal mudflats and eelgrass habitat are found within the bay. Further details about this special habitat are summarized in Scholsser and Eicher (2012).

3.4.1.4 Intertidal Habitats

Defined as the interface beween terrestrial and marine zones, two types of intertidal habitats exist: soft sediments (e.g., sandy and cobble beaches, mudflats, etc.), and hard substrate (e.g., rocky outcrops, human-made structures such as rock walls, etc.). The shoreline of Humboldt County consists of approximately 68 percent sandy beaches and 32 percent rocky shores (BLM 1980). Nielsen et al. (2017) and Craig et al. (2017) provide details about these habitats and are incorporated by reference.

3.4.1.5 Threatened and Endangered Species

Nine taxa that occur or potentially occur in the region’s coastal and marine habitats are listed as threatened and endangered under the Endangered Species Act (ESA) (Table 3-2).

Table 3-2: Taxa Listed as Threatened and Endangered under the ESA

Common Name	Scientific Name	Federal Status
Chinook salmon	*Oncorhynchus tshawytscha*	
Sacramento River winter-run ESU		Endangered
Central Valley spring-run ESU		Threatened
Coho Salmon	*Oncorhynchus kisutch*	
Southern Oregon/ Northern California Coast ESU		Threatened
Central California Coast ESU		Endangered
Steelhead	*Oncorhynchus mykiss irideus*	
Northern California DPS		Threatened
Central Valley DPS		Threatened

Common Name	Scientific Name	Federal Status
Green sturgeon, Southern DPS	*Acipenser medirostris*	Threatened
Eulachon, Southern DPS	*Thaleichthys pacificus*	Threatened
Tidewater goby	*Eucycloglobius newberryi*	Threatened

3.4.2 Impacts of the Proposed Action

A metocean buoy is estimated to disturb a maximum of 2.3 m^2 (25 ft^2) of sea floor from its solid cast iron anchor (PNNL 2019). Impacts to the outer shelf and upper slope habitats, including EFH, would be crushing or smothering of organisms by an anchor. Sediment suspension by anchor placement would cause temporary turbidity in the water column and could interfere with filter feeding invertebrates and the respiration and feeding of fishes. Physical sampling methods (grab samplers, benthic sleds, bottom cores, deep borings) may disturb, injure, or cause mortality to benthic resources and EFH in the immediate sampling area. Data collection buoys and associated mooring systems may act as small artificial reefs situated within an area that may exclude fishing (see discussion in Section 3.8), and this may provide a benefit to local benthic and fish assemblages associated with hard substrate. Decommissioning of the buoy may create short-term sediment suspension and will remove the artificial reef effect.

In the unlikely event of recovering lost equipment, seafloor disturbance would be expected during the recovery operation. Impacts to the outer shelf and upper slope habitats, including EFH, would be crushing or smothering of organisms by the dragging of grapnel lines to retrieve the lost item(s). If a vibracore rod cannot be retrieved, there would be additional bottom disturbance during the cutting and capping of the rod.

3.4.2.1 Pelagic Environments

Noise from HRG surveys and Project vessels may alter fish behavior within the WEA, but the effect will be temporary, and is not expected to affect viability of regional populations (Staaterman, unpublished data).

3.4.2.2 Coastal Habitats

Impacts to benthic resources in coastal habitats are not expected for site assessment and site characterization activities. Any impacts that could occur would be from accidental events, such as vessel grounding or collision. Impacts to fishes and EFH may occur from noise generated by Project vessels and potential introduction of invasive species from non-local Project vessels.

3.4.2.3 Intertidal Habitats

Impacts to benthic resources, EFH, and fishes in intertidal habitats are not expected for site assessment and site characterization activities. Any impacts that could occur would be from accidental events, such as vessel grounding or collision.

3.4.2.4 Threatened and Endangered Species

The regional population viability of species listed in Table 3-2 is not expected to be adversely affected by IPFs associated with the Project, and thus no additional conservation measures are proposed.

Conclusion

Impacts to benthic resources would be limited to the immediate footprint of the anchors or direct sampling. Sediment suspension would be temporary and short-term. Noise impacts from HRG surveys and Project vessels to EFH and fishes would be minimal and temporary in duration. The artificial reef effect may provide a local, short-term (less than 5 years) benefit to fish populations.

3.4.3 No Action Alternative

Under the No Action Alternative, commercial leases and grants would not be issued in the Humboldt WEA, however BOEM expects ongoing activities and planned actions to have continuing regional impacts on marine and coastal habitats and associated biotic assemblages over the timeframe considered in this EA. Local impacts from climate change are likely to be incremental and difficult to discern from effects of other actions such as urban development, mariculture, shipping and vessel discharges, and dredging. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to coastal habitats and associated biotic assemblages from existing and potential future actions.

3.5 MARINE MAMMALS AND SEA TURTLES

3.5.1 Affected Environment

There are approximately 39 species of marine mammal species known to occur in California waters including 8 baleen whale, 25 toothed whale and dolphin species, 6 species of seals and sea lions, and the northern and southern sea otter. Four listed species of sea turtles may occur in waters offshore California. Detailed species descriptions, including state, habitat ranges, population trends, predator/ prey interactions, and species-specific threats are described in H.T. Harvey & Associates (HT Harvey & Associates 2020b). These documents are incorporated by reference, and a summary of relevant information and conclusions for marine mammals and sea turtles is provided below.

Species that are unlikely to be present in the Proposed Action Area – due to its being outside of these species' current and expected range of normal occurrence – will not be considered further in this document. Table 3-3 lists the species (and applicable stocks) that are expected to occur in the Proposed Action Area. Although beaked whales are rarely sighted in the region, advances in acoustic monitoring have improved our ability to detect and identify some of these species, using echolocation pulse features (McDonald et al. 2009; Zimmer et al. 2008). Recent studies have detected some beaked whale species in and around the Proposed Action Area (Simonis et al. 2020) and they are listed in Table 3-3. The two sub-species of sea otters (Northern and Southern) fall under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). Northern and Southern sea otters are a near shore species that do not occur within the vicinity of the proposed activities and are therefore not considered further in this EA.

Table 3-3: Protected Marine Mammal Species Expected to Occur in the Project Area (DPS refers to Distinct Population Segment as defined under the ESA)

Common name	Scientific Name	Stock	ESA/MMPA Status	Occurrence
Baleen Whales				
Blue whale[1]	*Balaenoptera musculus*	Eastern North Pacific	Endangered/Depleted	Late summer and fall
Fin whale[1]	*Balaenoptera physalus*	California, Oregon, and Washington	Endangered/Depleted	Year round
Sei whale[1]	*Balaenoptera borealis*	Eastern North Pacific	Endangered/Depleted	Uncommon
Minke whale[1]	*Balaenoptera acutorostrata*	California, Oregon, and Washington	-	Occasional
Humpback whale[1]	*Megaptera novaeangliae*	California, Oregon, and Washington (Central American DPS and Mexico DPS)	Endangered/Threatened	Spring to fall
North Pacific Gray Whale[1]	*Eschrichtius robustus*	Eastern North Pacific	-	Oct-Jan and March-May
Toothed and Beaked Whales				
Sperm whale[1]	*Physeter macrocephalus*	California, Oregon, and Washington	Endangered/Depleted	Year round
Killer whale	*Orcinus orca*	Eastern North Pacific Transient/ West Coast Transient[2]	-	Sporadic
Killer whale – southern resident	*Orcinus orca*	Southern Resident	Endangered	Uncommon
Baird's beaked whale	*Berardius bairdii*	California, Oregon, and Washington	-	
Cuvier's beaked whale	*Ziphius cavirostris*	California, Oregon, and Washington	-	Uncommon
Stejneger's beaked whale	*Mesoplodon stejnegeri*	California, Oregon, and Washington	-	
Risso's dolphin	*Grampus griseus*	California, Oregon, and Washington	-	Year round
Rough-toothed dolphin	*Steno bredanensis*	N/A[3]	-	
Northern right whale dolphin	*Lissodelphis borealis*	California, Oregon, and Washington	-	Year round
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	California, Oregon, and Washington	-	Year round
Dall's porpoise	*Phocoenoides dalli*	California, Oregon, and Washington	-	Year round
Harbor porpoise	*Phocoena phocoena*	Morro Bay stock		Late Spring to early fall
Sea Lions and Seals				
Steller sea lion	*Eumetopias jubatus*	Eastern DPS	De-listed with critical habitat	Year round

Common name	Scientific Name	Stock	ESA/MMPA Status	Occurrence
California sea lion	*Zalophus californianus*	U.S. Stock	-	Year round
Northern elephant seal	*Mirounga angustirostris*	California	-	Year round
Harbor seal	*Phoca vitulina richardsi*	California	-	Year round
Guadalupe fur seal[1]	*Arctocephalus townsendi*	Throughout its range	Threatened	Spring/Summer, seasonal low numbers
Sea Turtles				
Leatherback sea turtle	*Dermochelys coriacea*	Throughout range	Endangered	Uncommon

Notes:

[1] Critical habitat has not been designated for these ESA-listed species.

[2] This stock is mentioned briefly in the Pacific Stock Assessment Report (Carretta et al. 2018; Carretta et al. 2016) and referred to as the "Eastern North Pacific Transient" stock, however, the Alaska Stock Assessment Report contains assessments of all transient killer whale stocks in the Pacific and the Alaska Stock Assessment Report refers to this same stock as the "West Coast Transient" stock (Muto et al. 2016; 2018).

[3] Rough-toothed dolphin has no recognized stock for the U.S West Coast.

ESA = Endangered Species Act MMPA = Marine Mammal Protection Act

3.5.2 Impacts of the Proposed Action

The potential IPFs for marine mammals and sea turtles associated with the Proposed Action noise from HRG and geotechnical surveys, includes the potential for collision with project-related vessels and potential entanglement in mooring systems associated with the installation of a metocean buoy.

BOEM assumes that measures developed through years of conventional energy operations and refined through BOEM's renewable energy program and consultations with NMFS, including vessel strike avoidance measures, visual monitoring, and shutdown and reporting, will be included as part of the Proposed Action to minimize or eliminate potential effects from site assessment and site characterization activities to protected marine mammal and sea turtle species (Appendix D). All survey plans and site assessment plans will be reviewed by BOEM to ensure inclusion of appropriate avoidance measures.

Impact: Project-related noise – HRG Surveys

In order for a sound to be potentially disturbing, it must be able to be heard by the animal. Effects on hearing ability or disturbance can result in disturbance of important biological behaviors such as migration, feeding, resting, communication, and breeding. Baleen whales hear lower frequencies; sperm whales, beaked whales and dolphins hear mid-frequencies; porpoise hear high frequencies (Table 3-4); seals from 50 hertz (Hz) to 86 kHz, and sea lions from 60 Hz to 39 kHz (Nmfs 2016; 2018). Sea turtles are low frequency hearing specialists with a range of maximum sensitivity between 100 to 800 Hz (Lenhardt, 2002; Bartol, 1999; Lenhardt, 1994) (Ridgway, 1969; Bartol and Ketten 2006) (Table 3-4).

The assessment of potential hearing effects in marine mammals is based on NMFS' technical guidance for assessing acoustic impacts, defined as Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) (Nmfs 2018); Table 3-4, below). The methodology developed by the U.S. Navy is currently thought to be the best available data to evaluate the effects of exposure to the survey noise by sea turtles that could result in physical effects (NMFS 2021); US Navy 2017; Table 3-4).

Table 3-4: Impulsive Acoustic Thresholds Identifying the Onset of PTS and TTS for Marine Mammals[1] and Sea Turtle[2] Species

Hearing Group	Generalized Hearing Range	Permanent Threshold Shift Onset	Temporary Threshold Shift Onset
Low frequency (e.g., Baleen Whales)	7 Hz to 35 kHz	219 dB Peak	213 dB Peak
		183 dB cSEL	179 cSEL
Mid-frequency (e.g., Dolphins and Sperm Whales)	150 Hz to 160 kHz	230 dB Peak	224 dB Peak
		185 dB cSEL	178 dB cSEL
High frequency (e.g., porpoise)	275 Hz to 160 kHz	202 dB Peak	148 dB Peak
		155 dB cSEL	153 dB cSEL
Phocid pinnipeds (true seals) (underwater)	50 Hz to 86 kHz	218 dB Peak	212 dB Peak
		185 dB cSEL	181 dB cSEL
Otariid pinnipeds (sea lions and fur seals) (underwater)	60 Hz to 39 kHz	232 dB Peak	226 dB Peak
		203 dB cSEL	199 dB cSEL
Sea Turtles	30 Hz to 2 kHz	230 dB Peak	226 dB Peak
		204 dB cSEL	189 dB cSEL

Notes:

[1] (Nmfs 2018).

[2] (Navy 2017).

cSEL = cumulative sound exposure level dB = decibels Hz = hertz kHz = kilohertz

Source levels and frequencies of HRG equipment were measured under controlled conditions and represent the best available information for HRG sources (Crocker and Fratantonio 2016). Using 19 HRG source levels (excluding side-scan sonars operating at frequencies greater than 180 kHz, and other equipment that is unlikely to be used for data collection/site characterization surveys associated with offshore renewable energy) with NOAA's sound exposure spreadsheet tool, injury (PTS) and disturbance ranges were calculated for listed species. To provide the maximum impact scenarios, the highest power levels and most sensitive frequency setting for each hearing group was used. A geometric spreading model, together with calculations of absorption of high frequency acoustic energy in sea water, when appropriate, was used to estimate injury and disturbance distances for listed marine mammals. The spreadsheet and geometric spreading models do not consider the tow depth and directionality of the sources; therefore, these are likely overestimates of actual injury and disturbance distances. All sources were analyzed at a tow speed of 2.315 meters per second (m/s) (4.5 knots).

Table 3-5: Summary of PTS Exposure Distances for Protected Marine Mammal Species from Mobile HRG Sources Towed at a Speed of 4.5 knots

HRG SOURCE	DISTURBANCE DISTANCE (m)						
	Highest Source Level (dB re 1 µPa)	Low Frequency (e.g., Baleen Whales)[1]	Mid-Frequency (e.g., Dolphins and Sperm Whales)[1]	High Frequency (e.g., Porpoise)	Phocids (true seals)	Otariids (sea lions and fur seals)	Sea Turtles
Mobile, Impulsive, Intermittent Sources							
Boomers, Bubble Guns (4.3 kHz)	176 dB SEL 207 dB RMS 216 peak	0.3	0	5.0	0.2	0	0
Sparkers (2.7 kHz)	188 dB SEL 214 dB RMS 225 peak	12.7	0.2	47.3	6.4	0.1	0
Chirp Sub-Bottom Profilers (5.7 kHz)	193 dB SEL 209 dB RMS 214 peak	1.2	0.3	35.2	0.9	0	NA
Mobile, Non-Impulsive, Intermittent Sources							
Multi-beam echosounder (100 kHz)	185 dB SEL 224 dB RMS 228 peak	0	0.5	251.4*	0	0	NA
Multi-beam echosounder (>200 kHz)	182 dB SEL 218 dB RMS 223 peak	NA	NA	NA	NA	NA	NA
Side-scan sonar (>200 kHz)	184 dB SEL 220 dB RMS 226 peak	NA	NA	NA	NA	NA	NA

Notes:

[1] PTS injury distances for listed marine mammals were calculated with NOAA's sound exposure spreadsheet tool using sound source characteristics for HRG sources in Crocker and Fratantonio (2016).

* This range is conservative as it assumes full power, an omnidirectional source, and does not consider absorption over distance.

NA = not applicable due to the sound source being out of the hearing range for the group.

RMS = root mean square SEL = sound exposure level

<u>Potential for injury</u>: For marine mammal species expected to occur in the Proposed Action Area, PTS distances are generally small ranging from 0–47 m (0-154 ft). The largest possible PTS distance is 251.4 m (825 ft) for porpoise species, only when the 100 MHz multi-beam echosounder is used. However, this range is likely an overestimate since it assumes the unit is operated in full power mode, that it is an omnidirectional source, and absorption of sound over distance is not taken into account. With the requirements for qualified Protected Species Observers (PSOs) to monitor a 1,000 m (3,280 ft) monitoring zone, for vessels to maintain 500 m (1,640 ft) from marine mammals, as well as the shutdown requirements when ESA-listed marine mammal species are sighted within 500 m, BOEM believes that the risk of PTS occurring in any protected marine mammal species from HRG surveys is discountable.

PTS exposure thresholds (calculated for 204 cSEL and 23 dB peak criteria (Navy 2017) are higher for sea turtles than for marine mammals, and based on the source characteristics, are not likely to result in PTS.

The predicted distances from these mobile sound sources indicate the sound sources are transitory and have no risk of exposure to levels of noise that could result in PTS for sea turtles (NMFS 2021).

Potential for disturbance: Using the same sound sources as for the PTS analysis, the disturbance distances to 160 dB re 1 µPa RMS for marine mammals and 175 dB re 1 µPa RMS for sea turtles were calculated using a spherical spreading model (20 LogR). These results describe maximum disturbance exposures for protected species to each potential sound source.

Table 3-6: Summary of Maximum Disturbance Distances for Protected Marine Mammal Species from Mobile HRG Sources Towed at a Speed of 4.5 knots

HRG SOURCE	DISTURBANCE DISTANCE (m)					
	Low Frequency (e.g., Baleen Whales)[1]	Mid-Frequency (e.g., Dolphins and Sperm Whales)[1]	High Frequency (e.g., Porpoise)	Phocids (true seals)	Otariids (sea lions and fur seals)	Sea Turtles
Mobile, Impulsive, Intermittent Sources						
Boomers, Bubble Guns (4.3 kHz)	224	224	224	224	224	40
Sparkers (2.7 kHz)	502	502	502	502	502	90
Chirp Sub-Bottom Profilers (5.7 kHz)	282	282	282	282	282	50
Mobile, Non-Impulsive, Intermittent Sources						
Multi-beam Echosounder (100 kHz)	NA	370	370	NA	NA	NA
Multi-beam Echosounder (>200 kHz)	NA	NA	NA	NA	NA	NA
Side-scan Sonar (>200 kHz)	NA	NA	NA	NA	NA	NA

Notes:

1 PTS injury distances for listed marine mammals were calculated with NOAA's sound exposure spreadsheet tool using sound source characteristics for HRG sources in (Crocker, 2016) (Crocker and Fratantonio (2016).

NA = not applicable due to the sound source being out of the hearing range for the group.

The disturbance distances depend on the equipment and the species present. The range of disturbance distances for all protected species expected to occur in the Proposed Action Area is from 40–502 m (131–1,647 ft), with sparkers producing the upper limit of this range. Visual monitoring requirements of a 500 m (1,640 ft) exclusion zone for ESA-listed large whales will ensure that any potential impacts to these species from noise generated by HRG survey equipment will be reduced to negligible to minor levels. Disturbance distances to protected species are conservative, as explained above, and any behavioral effects will be intermittent and short in duration and are expected to result in negligible effects.

<u>Impact</u>: Project-related noise – Geotechnical Surveys

Geotechnical surveys (vibracores, piston cores, gravity cores) related to offshore renewable energy activities are typically numerous, but very brief, sampling activities that introduce relatively low levels of sound into the environment. General vessel noise is produced from vessel engines and dynamic positioning to keep the vessel stationary while equipment is deployed, and sampling conducted. Recent analyses of the potential impacts to protected species exposed to noise generated during geotechnical survey activities determined that effects to protected species from exposure to this noise source are extremely unlikely to occur (NMFS 2021).

<u>Impact</u>: Project-related Vessel Traffic

The number of round trips for project-related vessels over a 3-year period will range from 188–274 for 24-hour operations or 566–598 for 10-hour daily operations (see Section 3.3). An additional 21–30 round trips will be conducted over a 5-year period for the deployment, maintenance, and decommissioning of 3 metocean buoys. Vessel speeds during site characterization surveys within the Proposed Action Area will be limited to less than 5 knots (2.57 m/s), but transit speeds will vary. Considering the current annual level of vessel traffic around the Proposed Action Area (see Section 3.7), including tug and tows, cargo ships and tankers, the project-related vessel traffic would increase the overall vessel traffic and risk of collision with marine mammals in the Proposed Action Area; however the required vessel strike avoidance measures, as well as reporting requirements (Appendix D), will minimize vessel interactions with protected species to negligible levels.

<u>Impact</u>: Entanglement

Most entanglements are never observed, but there are many cases of entangled whales with unidentified gear (International Whaling Commission, 2016). There are reports of large whales (including humpback, right, and fin whales) interacting with anchor moorings of yachts and other vessels, towing small yachts from their moorings or becoming entangled in anchor chains, sometimes with lethal consequences (Anonymous 2012; Richards 2012; Kerr 2013; Love 2013). Animals may swim into moorings accidentally or actively seek out anchor chains or boats as a surface to scratch against (Benjamins, 2014).

An extensive literature review of mooring systems proposed for marine renewable energy devices suggested that for these systems the risk is relatively modest, especially when compared to fisheries entanglements (Benjamins, 2014). Taut mooring configurations have the lowest relative risk of entanglement, while catenary moorings with slack or float lines or accessory buoys present the highest risk (Harnois, 2015). Even for lines under tension, moored devices pose an increasing risk of entanglement for animals with longer body length, rigidity of the animal, and mode of feeding with mouths open (Benjamins, 2014) – which are all characteristics of large whales. However, regardless of the mooring configuration, the absolute risk of entanglement is found to be low (Harnois, 2015).

The PNNL deployed two LiDAR metocean buoys – one in the Proposed Action Area and one in the Morro Bay WEA (PNNL, 2019). Including the multiple metocean buoys deployed along the NE Atlantic coast associated with site assessment activities, no incidents of entanglement have been reported to date. BOEM continues to work with lessees and requires the use of the best available mooring systems, using the shortest practicable line lengths, anchors, chain, cable, or coated rope systems, to prevent or reduce to discountable levels any potential entanglement or entrainment of marine mammals and sea turtles. BOEM will review each buoy design to ensure that reasonable low risk mooring designs are used.

Potential impacts on protected marine mammal species from entanglement related to buoy operations are thus expected to be discountable.

Impact to Critical Habitat

Effective May 21, 2021, NMFS issued an updated final rule to designate critical habitat for the endangered Central America Distinct Population Segment (DPS), and the threatened Mexico DPS of humpback whales (*Megaptera novaeangliae*) (86 CFR 21082). Critical habitat for these DPSs serve as feeding habitat and contain the essential biological feature of humpback whale prey. Critical habitat for the Central America DPS of humpback whales contains approximately 48,521 square nautical miles (nmi^2) of marine habitat in the North Pacific Ocean within the portions of the California Current Ecosystem off the coasts of Washington, Oregon, and California. Specific areas designated as critical habitat for the Mexico DPS of humpback whales contain approximately 116,098 nmi^2 of marine habitat in the North Pacific Ocean, including areas within portions of the eastern Bering Sea, Gulf of Alaska, and California Current Ecosystem. The Humboldt WEA consists of approximately 156 nmi^2 and overlaps with humpback whale critical habitat. Any displacement of prey species as a result of surveys conducted as part of the Proposed Action are anticipated to be short-term and temporary and are not anticipated to destroy or adversely modify critical habitat.

Conclusion

Due to the nature of the proposed activities, as well as the mitigative strategies employed as part of the Proposed Action (described in detail in Appendix D), the impacts to critical habitat and protected marine mammal and sea turtle species from site assessment and site characterization activities related to noise from HRG and geotechnical surveys, collisions with project-related vessels, and entanglement in metocean buoy moorings, are anticipated to range from negligible to minor.

3.5.3 No Action Alternative

Of the approximately 39 species of marine mammals known to occur in California waters, 22 marine mammals and a single sea turtle species (leatherback sea turtle) are likely to occur within the Project Area. Seven of these species (blue, fin, sei, humpback, gray, and sperm whales; and leatherback sea turtles) are listed as endangered under the ESA and the Guadalupe fur seal is listed as threatened. Detailed species descriptions, including status, habitat ranges, population trends, predator/prey interactions, and species-specific threats are described in HT Harvey & Associates (2020a); this document is incorporated by reference.

Marine mammals and sea turtles in the Project Area are subject to a variety of ongoing anthropogenic impacts that overlap with the Proposed Action including collisions with vessels (ship strikes), entanglement, fisheries bycatch, anthropogenic noise, disturbance of marine and coastal environments, effects on benthic habitat, and climate change (Carretta et al. 2021). Climate change has the potential to impact the distribution and abundance of marine mammal prey due to changing water temperatures, ocean currents, and increased acidity (Meyer-Gutbrod et al. 2021); (Sydeman et al. 2015). Additionally, bottom trawling and benthic disruption have the potential to result in impacts on prey availability and distribution.

Under this alternative, commercial leases and grants would not be issued in the Humboldt WEA and the negligible to minor impacts to marine mammals and sea turtles from the Proposed Action, will not occur. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on marine mammal and sea turtle species over the timeframe considered in this EA

3.6 COASTAL AND MARINE BIRDS

3.6.1 Affected Environment

The marine and coastal bird population off northern California is both diverse and complex, being composed of as many as 170 species (eBird, 2021). Of the many different types of birds that occur in this area, three groups are generally the most sensitive to the potential impacts of the Proposed Action: marine birds (e.g., loons, grebes, shearwaters, storm-petrels, cormorants, gulls, terns and alcids), waterfowl (geese and ducks), and shorebirds (e.g., plovers and sandpipers). While some of these species breed in the area, others may spend their non-breeding or "wintering" period there or may simply pass through during migration. This analysis considers Humboldt Bay and its shorelines, and the offshore cable routes and WEA.

Nearshore species generally occupy relatively shallow waters inshore of the continental slope waters. These species spend almost their entire time on the water surface. In the Proposed Action Area, the most common nearshore species are Red-throated, Pacific and Common Loons (*Gavia stellata, G. pacifica, and G. immer*); Western Grebes (*Aechmophorus occidentalis*); Surf, White-winged, and Black Scoters (*Melanitta perspicillata, M. deglandi, M. americana*); Brandt's and Pelagic Cormorants (*Phalacrocorax penicillatus and P. pelagicus*). Other species associated with nearshore waters include nearshore terns such as summering Caspian Terns (*Hydroprogne caspia*) and postbreeding Elegant Terns (*Thalasseus elegans*). Brown Pelicans (*Pelecanus occidentalis*) are another common postbreeding visitor in nearshore waters. Several species of gulls and Common Murres (*Uria aalge*) are abundant in nearshore waters, and Red-necked (*Phalaropus lobatus*) and Red (*Phalaropus fulicarius*) phalaropes occur during migration. The Marbled Murrelet (*Brachyramphus marmoratus*), listed as threatened under Federal Endangered Species Act and endangered under the California Endangered Species Act (CESA), breeds in coastal old growth forest and is typically found close to shore where it forages (Nelson, 1997). In winter, the Marbled Murrelet is joined by wintering Ancient Murrelets (*Synthliboramphus antiquus*) that breed in Canada and Alaska and winter offshore of northern California. In northern California, nearshore species occur in highest numbers during the winter months; relatively few remain during the summer except for those species that breed locally or disperse northward from southern breeding colonies in the summer.

Pelagic species generally occupy deeper waters over the continental shelf break (>200 m (656 ft)) and can occur in substantial densities far from shore (Ainley, 1996). These species spend much of their time on the water surface or diving for food. In the Proposed Action Area, common offshore species include Sooty, Pink-footed, and Buller's Shearwaters (*Ardenna griseus, A. creatopus, and A. bulleri*); Northern Fulmars (*Fulmarus glacialis*); and Pomarine, Parasitic, and Long-tailed Jaegers (*Stercorarius pomarinus, S. parasiticus, and S. longicaudus*). Shearwaters are found primarily in spring-fall, Northern Fulmars in winter, and jaegers during the spring and fall migrations. The Fork-tailed Storm-Petrel (*Hydrobates furcatus*) and Leach's Storm-Petrel (*Hydrobates leucorhous*) breed on offshore rocks and islands off Humboldt and Del Norte counties and traverse the waters around the Call Area while moving to foraging sites in the deepwater pelagic zone (Harris, 2006). Other species characteristic of this zone include several species of Albatross including the Black-footed Albatross (*Phoebastria nigripes*), the rarer Laysan Albatross (*Phoebastria immutabilis*), and the rare and federally endangered Short-tailed Albatross (*Phoebastria albatrus*). Several species of alcids breed on offshore islands and rocks and occur off northern California as foragers including the Common Murre (*Uria aalge*), Cassin's Auklet (*Ptychoramphus aleuticus*), Rhinoceros Auklet (*Cerorhinca monocerata*), and Tufted Puffin (*Fratercula cirrhata*). Nonbreeding South Polar Skuas (*Stercorarius maccormicki*) occur in the summer and fall. Offshore gulls and terns in this zone include Western Gulls (*Larus occidentalis*); migrating Sabine's Gulls (*Xema sabini*), Common Terns (*Sterna hirundo*) and Arctic Terns (*Sterna paradisaea*); and wintering Mew Gulls (*Larus canus*), California Gulls (*Larus californicus*), Herring Gulls (*Larus argentatus*), Glaucous-winged Gulls (*Larus glaucescens*), and Black-legged Kittiwakes (*Rissa tridactyla*). Gadfly petrels (*Pterodroma spp.*) are rare over deep pelagic waters beyond the continental shelf break and include the federally listed Hawaiian Petrel (*Pterodroma sandwichensis*), Cook's Petrel (*Pterodroma cookii*), and Murphy's Petrel (*Pterodroma ultima*). Although these species typically occur in deep water west of the Proposed Action area, Hawaiian Petrels have been observed over the continental shelf break on a number of occasions off California, and Murphy's Petrels have been reported fairly close to shore, including off the Mendocino County coast (eBird, 2019).

In addition to seabirds, there are a number of waterbirds and shorebirds that occupy coastal and estuarine habitats in the vicinity of the Proposed Action. Nearly the entire global population of Black Brant (*Branta bernicla nigricans*) stop in Humboldt Bay during migration (Chipley, 2003 #1002). Other waterfowl found from fall through spring include Cackling Goose (*Branta hutchinsii*), Canada Goose (*Branta canadensis*), Northern Shoveler (*Spatula clypeata*), Gadwall (*Mareca strepera*), American Wigeon (*Mareca americana*), Mallard (*Anas platyrhynchos*), Northern Pintail (*Anas acuta*), Green-winged Teal (*Anas crecca*), and Bufflehead (*Bucephala albeola*). Large numbers of shorebirds are present during much of the year with probably more than one million individuals occurring annually. Shorebirds wintering in large numbers include Marbled Godwits (*Limosa fedoa*), Western Sandpipers (*Calidris mauri*), and Dunlins (*Calidris alpina*). More than 30 shorebird species use a variety of habitats in the Humboldt Bay area. Many of the locally occurring shorebirds are migratory in this area with the majority occurring during the spring and fall migrations and during the winter; very few shorebirds breed in this area. Although the majority of shorebirds occupy coastal wetlands, including estuaries, lagoons, and salt and freshwater marshes, they also utilize other coastal habitats, including sandy beaches, rocky shores, and open ocean. Other common shorebird species in northern California and the Proposed Action Area include American Avocets (*Recurvirostra americana*), Black Oystercatchers (*Haematopus bachmani*), Black-bellied Plovers (*Pluvialis squatarola*), Whimbrels (*Numenius phaeopus*), Long-billed Curlews (*Numenius americanus*), Black Turnstones (*Arenaria melanocephala*), Surfbirds (*Calidris virgata*), Sanderlings (*Calidris alba*), Least Sandpipers (*C. minutilla*), Short-billed and Long-billed Dowitchers (*Limnodromus griseus and L. scolopaceus*), Greater Yellowlegs (*Tringa melanoleuca*), and Willets (*Tringa semipalmata*). The federally threatened Western Snowy Plover (*Charadrius nivosus nivosus*) nests and winters on sandy beaches in northern California.

Several bird species that have the potential to occur within the Proposed Action Area have been afforded protected status by the state and/or federal governments due to declining populations and/or habitats. In addition, all native birds within the area are protected by the Migratory Bird Treaty Act of 1918, which is enforced by the USFWS. Special-status marine bird species found within the vicinity of the proposed activities are listed in Table 3-7, below.

Table 3-7: Special-Status Marine and Coastal Birds Within or Near the Project Area

Common Name	Scientific Name	Federal Status	State Status
Brant	*Branta bernicla*		SSC
Harlequin Duck	*Histrionicus histrionicus*		SSC
Black Oystercatcher	*Haematopus bachmani*	BCC	
Western Snowy Plover	*Charadrius nivosus nivosus*	T, BCC	SSC
Marbled Godwit	*Limosa fedoa*	BCC	
Red Knot	*Calidris canutus*	BCC	
Short-billed Dowitcher	*Limnodromus griseus*	BCC	
Lesser Yellowlegs	*Tringa flavipes*	BCC	
Willet	*Tringa semipalmata*	BCC	
Marbled Murrelet	*Brachyramphus marmoratus*	T	E
Scripps's Murrelet	*Synthliboramphus scrippsi*		T
Guadalupe Murrelet	*Synthliboramphus hypoleucus*	BCC, BMC	
Craveri's Murrelet	*Synthliboramphus craveri*	BCC	
Ancient Murrelet	*Synthliboramphus antiquus*	BCC	
Cassin's Auklet	*Ptychoramphus aleuticus*		SSC
Rhinoceros Auklet	*Cerorhinca monocerata*		WL
Tufted Puffin	*Fratercula cirrhata*		SSC
Western Gull	*Larus occidentalis*	BCC	
California Gull	*Larus californicus*		WL
Caspian Tern	*Hydroprogne caspia*	BCC	
Laysan Albatross	*Phoebastria immutabilis*	BCC	
Black-footed Albatross	*Phoebastria nigripes*	BCC	
Short-tailed Albatross	*Phoebastria albatrus*	E	SSC
Fork-tailed Storm-Petrel	*Hydrobates furcatus*		SSC
Ashy Storm-Petrel	*Hydrobates homochroa*	BCC	SSC
Black Storm-Petrel	*Hydrobates melania*	BCC	SSC
Murphy's Petrel	*Pterodroma ultima*	BCC	
Hawaiian Petrel	*Pterodroma sandwichensis*	E	
Cook's Petrel	*Pterodroma cookii*	BCC	
Buller's Shearwater	*Ardenna bulleri*	BCC	
Pink-footed Shearwater	*Ardenna creatopus*	BCC	
Black-vented Shearwater	*Puffinus opisthomelas*	BCC	
Brandt's Cormorant	*Urile penicillatus*	BCC	
Double-crested Cormorant	*Phalacrocorax auritus*		WL
Brown Pelican	*Pelecanus occidentalis*	DE	DE, FP

Status: E = Endangered T -= Threatened DE = Delisted (formerly Endangered) C = Candidate
BCC = Bird of Conservation Concern SSC = Species of Special Concern WL = Watch List
FP = Fully Protected

3.6.1.1 Threatened and Endangered Birds that could Occur in the Vicinity of the Proposed Project

Short-tailed Albatross. The Short-tailed Albatross (*Phoebastria albatrus*) was federally listed as endangered on June 2, 1970 (35 FR 8491). It is also a California species of special concern. This species is a large pelagic bird with long narrow wings adapted for soaring just above the water surface. As of 2020, 84 percent of the known breeding population uses a single colony, Tsubamezaki, on Torishima Island off Japan. The remaining population nests on other islands surrounding Japan, primarily the Senkaku Islands, and a single pair nested on Midway Atoll from 2008–2015. During the non-breeding season, the Short-tailed Albatross regularly ranges along the Pacific Rim from southern Japan to the Gulf of Alaska, primarily along continental shelf margins. It is rare to casual but increasing offshore from British Columbia to southern California (Howell, 2012). All recent records along the west coast have been Stage 1 immatures (Howell, 2012), which travel more broadly throughout the north Pacific than adults (USFWS, 2014). Most individuals found off California in recent years have been during the fall and early winter with a few records in late winter and early spring (California Bird Records Committee, 2007). The diet of this species is not well studied; however, research suggests at sea during the non-breeding season that squid, crustaceans, and fish are important prey (USFWS, 2008).

The global population is currently estimated to be 7,365 birds (USFWS, 2020). There have been 42 records of the species off California since 1977 with 38 records between 1998 and 2020; only two of these are off the Humboldt County coast (California Bird Records Committee, 2021). Based on satellite tracking of 99 individuals between 2002 and 2012, juveniles generally range in shallower, nearer-to-shore waters than adults (e.g., less than 200 m (656 ft) depth) and are more likely than adults to occur off the west coast of the U.S. and Canada (Suryan, 2006; Suryan, 2007; Suryan, 2008; Suryan, 2010; Deguchi, 2012; USFWS, 2014). The extreme rarity of this species off the California coast indicates that the Short-tailed Albatross is highly unlikely to be in the offshore portions of the action area; its presence is anticipated to be limited to occasional occurrences even as the population continues to grow (HT Harvey & Associates, 2020).

Hawaiian Petrel. The Hawaiian Petrel (*Pterodroma sandwichensis*) was federally listed as endangered on March 11, 1967 (32 FR 4001). The species breeds on larger islands in the Hawaiian chain where they nest in burrows on vegetated cliffs, volcanic slopes, and lava flows. The global population is comprised of approximately 52,186 individuals (95 percent Confidence Interval 39,823–67,379), including juveniles and subadults (USFWS, 2017; Joyce, 2013). The species is absent from Hawaiian waters from November to April when it disperses to the eastern tropical Pacific. Individuals have been recorded off Oregon and California from May to September with most records occurring during July and August (Howell, 2014). The first of California's 66 accepted records occurred in May 1992. Records of Hawaiian Petrels have increased such that they are no longer a review species for the California Bird Records Committee. Records were reviewed through 2013; four accepted records were off the Humboldt County coast (California Bird Records Committee, 2021). This species is typically encountered offshore in deep water, but occasionally individuals are observed over the continental shelf break. In addition to the rarity of the Hawaiian Petrel off the California coast, the presence of this species in the offshore portions of the action area would likely be limited to rare occurrences (HT Harvey & Associates, 2020).

Western Snowy Plover. The Pacific Coast population of the western snowy plover was listed as threatened on March 5, 1993 (58 FR 12864). The primary reasons for listing this population were loss and degradation of habitat, and human disturbance. A final recovery plan was signed August 13, 2007. Critical habitat for the species was originally designated in 1999 (64 FR 68507), revised in 2005 (70 FR 56970), and revised again in 2012 (77 FR 36728).

The Pacific Coast population of the Western Snowy Plover (*Charadrius nivosus nivosus*) breeds on the Pacific Coast from southern Washington to southern Baja California, Mexico. The bird is found on beaches, open mudflats, salt pans and alkaline flats, and sandy margins of rivers, lakes, and ponds. It nests in depressions in the sand above the drift zone on coastal beaches, sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at creeks and river mouths, and salt pans at lagoons and estuaries. The breeding season extends from early March to late September, with birds at more southerly locations beginning to nest earlier in the season than birds at more northerly locations (64 FR 68507). In most years, the earliest nests on the California coast generally occur during the first to third week of March. Peak nesting in California occurs from mid-April to mid-June, while hatching lasts from early April through mid-August.

In winter, the taxa is found on many of the beaches used for nesting as well as on beaches where they do not nest, in man-made salt ponds, and on estuarine sand and mud flats. The winter range is somewhat broader and may extend to Central America (Page, 1995). The majority of birds along the coast winter south of Bodega Bay, California (Page, 1986). This taxa may be found wintering at any beach with suitable habitat along the California coast, including the cable landfall locations in the action area (HT Harvey 2020). Western Snowy Plovers were reported during winter surveys of beaches in Humboldt County between 2011 and 2018, including on the South Spit (USFWS, 2018). The South Spit contains designated critical habitat for the Western Snowy Plover (77 FR 36728), and nesting has been observed on the North and South Spits of Humboldt Bay (USFWS, 2007).

Marbled Murrelet. The Marbled Murrelet (*Brachyramphus marmoratus marmoratus*) was federally listed as threatened on October 1, 1992 within the states of Washington, Oregon, and California (57 FR 45328). Populations of the species in Alaska and British Columbia were not listed under the ESA. The Marbled Murrelet is a small seabird that spends most of its life in the nearshore marine environment, but nests and roosts inland in low-elevation old growth forests, or other forests with remnant large trees. Critical Habitat for the species was designated on May 24, 1996 (61 FR 26256) and was later revised in a final rule published on October 5, 2011 (76 FR 61599). A final determination published on August 4, 2016 (81 FR 51348) determined that the critical habitat for the Marbled Murrelet, as designated in 1996 and revised in 2011, meets the statutory definition of critical habitat under the ESA. No marine areas were designated as critical habitat. The Proposed Action Area is in Recovery Conservation Zone 4 (from Shelter Cove, California north to Coos Bay, Oregon) for marbled murrelets (Falxa, 2016), and 2017 population estimates for this zone were approximately 8,574 murrelets (CI=6,358–11,155) (McIver, 2019).

(HT Harvey & Associates, 2020) summarized the status of the Marbled Murrelet near the Humboldt WEA as follows. At-sea abundance has been strongly correlated with proximity to inland areas containing contiguous old-growth forest with suitable nesting habitat (Raphael, 2016 #1041). In California, the at-sea density of Marbled Murrelets during the breeding season is highest (5 to more than 10 murrelets per 1 km^2 (0.39 mi^2)) in the nearshore waters between Trinidad, California and Brookings, Oregon (Falxa, 2016), which is directly offshore from large tracts of inland nesting habitat. At sea, Marbled Murrelets forage on small schooling fishes and large pelagic crustaceans (euphausiids, mysids, amphipods) and occur primarily in very nearshore waters (less than 1.5 km (0.9 mi) from shore) (Sealy, 1974; Strachan, 1995; Hébert, 2008; Strong, 2009; Raphael, 2015; Falxa, 2016). Peak densities of Marbled Murrelets in northern California occur within 1.6 km (1 mi) of shore, and they are rare but consistently present beyond 4 km (2.5 mi) from shore (Hébert, 2008; Falxa, 2016). There is some evidence that they occur farther offshore over the continental shelf during the non-breeding season (Hébert, 2008), thus it is possible that they are more likely to occur in the action area from fall through spring.

Scripps's Murrelet. The Scripps's Murrelet (*Synthliboramphus scrippsi*) was listed as threatened under CESA on December 22, 2004. At the time of listing, the Scripps's Murrelet was known as Xantus's Murrelet and considered conspecific with the Guadalupe Murrelet (now *Synthliboramphus hypoleucus*);

therefore, most of the existing literature on Scripps's Murrelet is associated with its former name (HT Harvey & Associates, 2020). The breeding range of this small black and white alcid is restricted to 12 nesting islands or groups of islands over a distance of 500 miles in southern California and Baja Mexico (Pacific Seabird Group, 2002). The estimated remaining global population of 5,000–20,000 birds is concentrated during the breeding season near the breeding colonies on the Channel Islands and off the coast of northern Baja California. The species typically nests in crevices, caves, under large rocks, on steep cliffs and canyons of offshore islands. The species disperses from breeding area in late summer and autumn, when they move primarily northward (Whitworth, 2000). At this time of year, they are found from southern Baja California to Vancouver Island, British Columbia, with the bulk between central Oregon and central Baja California. The highest numbers of the Scripps's Murrelet have been reported from Point Conception to Monterey Bay and Point Año Nuevo, typically 20–100 km (12–62 mi) offshore, although it is occasionally seen from shore (Briggs, 1987). Scripps's Murrelet is considered casual to rare in the offshore portions of the Proposed Action area, and only 93 birds were reported from central Mendocino County to the Oregon border in 2005 (HT Harvey & Associates, 2020; Harris, 2006). These records were from the continental shelf, shelf break, and beyond the shelf break; most of the records were from beyond the shelf break and during the early to mid-fall postbreeding dispersal period. The Scripps's Murrelet may occur in the offshore portions of the Proposed Action area but based on the species' known distribution it should only rarely occur during the postbreeding dispersal period, with a higher probability of potential occurrences during warm water years (e.g., El Niño years) (HT Harvey & Associates, 2020).

Guadalupe Murrelet. The Guadalupe Murrelet was listed as threatened under CESA on December 22, 2004. The Guadalupe Murrelet was known as Xantus's Murrelet at the time of listing and regarded as conspecific with the Scripps's Murrelet. Of the three species in this genus, the Guadalupe Murrelet is the rarest and most geographically restricted, breeding only on Guadalupe and San Benito Islands off Baja California. Postbreeding dispersal north occurs primarily to waters off southern California, but birds rarely occur north to the pelagic zone off central California, especially during warm water events. This species is quite rare north of central California and there are no documented records off Humboldt County, although it undoubtedly occurs there as there are scattered records north to British Columbia (HT Harvey & Associates, 2020). Four Guadalupe Murrelets were documented offshore of Mendocino County north of Fort Bragg on September 16, 2018 (eBird 2020).

3.6.2 Impacts of the Proposed Action

BOEM has recently conducted several NEPA reviews (e.g., BOEM, 2012; BOEM, 2014; BOEM, 2015; BOEM, 2016; BOEM, 2020) for geophysical and geological surveys and offshore wind site assessment activities offshore the Atlantic coast that evaluate impacts to birds that could occur as a result of those activities. This analysis incorporates some of the elements of those analyses while building upon them with specifics for the Humboldt WEA. The impacts to bird species considered in this EA would be similar to those considered in these recent reviews due to the similarity of impact-causing factors and of bird species composition. This section discusses the potential impacts of routine events associated with the preferred alternative on marine and coastal birds. IPFs for marine and coastal birds include (1) active acoustic sound sources, (2) vessel and equipment noise and vessel traffic, (3) aircraft traffic and noise, (4) metocean buoys, (5) trash and debris, and (6) accidental fuel spills. Since all site assessment activities are performed using vessels, all activities have the potential to impact marine and coastal birds.

3.6.2.1 Active Acoustic Sound Sources

The primary potential for impact to marine and coastal birds from active acoustic sound sources is to marine birds and waterfowl that dive below the water surface and are exposed to underwater noise (Turnpenny, 1994 #1) including the Marbled Murrelet as well as other alcids, loons, cormorants, storm-petrels, shearwaters, petrels, grebes, and sea ducks. Among the threatened and endangered species, Western Snowy Plovers are shorebirds that are unlikely to come into contact with HRG surveys. Marbled, Scripps's, and Guadalupe Murrelets are more likely to come into contact with HRG surveys, as they forage offshore and feed by diving. The Short-tailed Albatross and Hawaiian Petrel may occur in the area but generally feed by snatching prey from the sea surface. Only those species that dive are at risk of exposure to active acoustic sound sources since pulses are directed downward and are highly attenuated near the surface. In addition, active acoustic sound sources such as side-scan sonar and sub-bottom profilers are highly directive (e.g., downward, towards the seafloor), with beam widths as narrow as a few degrees; this directivity and narrow beam width also diminishes the risk to bird species other than diving species. Because of these factors, other species of seabirds, waterfowl, and shorebirds would not be affected by active acoustic sound sources and are not discussed further for this IPF.

Birds have a relatively restricted hearing range for airborne noise, from a few hundred hertz to about 10 kHz (Dooling, 2000). Data regarding bird hearing range for underwater noise is limited; however, a recent study using psychophysics found that Great Cormorants (*Phalacrocorax carbo*) learned to detect the presence or absence of a tone while submerged (Hansen, 2017). The greatest sensitivity was found at 2 kHz, with an underwater hearing threshold of 71 dB re 1 µPa RMS. The hearing thresholds are comparable to seals and toothed whales in the frequency band 1–4 kHz, which suggests that cormorants and other aquatic birds make special adaptations for underwater hearing and make use of underwater acoustic cues (Hansen, 2017).

Active acoustic sound sources usually have one or two (sometimes three) main operating frequencies. The frequency ranges for representative sources are 100 and 400 kHz for the side-scan sonar; 3.5, 12, and 200 kHz for the chirp sub-bottom profiler; and 240 kHz for the multibeam depth sounder. The low-frequency underwater noise generated by several types of survey equipment (e.g., sub-bottom profilers) would fall within the airborne hearing range of birds, whereas noise generated by other types of survey equipment (e.g., side-scan sonar, depth sounders) is outside of their airborne hearing range, which may be more limited underwater, and should be inaudible to birds.

Some marine birds and waterfowl, including gulls, terns, pelicans, and sea ducks, either rest on the water surface or shallow-dive for only short durations. Most of these birds would be resting on the water surface in the area surrounding survey vessels or would be dispersed; therefore, they would not come into contact with the active acoustic sounds. However, those birds that shallow-dive could come into contact with active acoustic sounds, with the majority of the sound energy directed towards the seafloor. Therefore, the energy level that these diving birds could be exposed to would be for such a short time and have a lower sound energy that it would result in a negligible impact.

Diving marine birds and waterfowl such as alcids, loons, cormorants, storm-petrels, shearwaters, petrels, grebes, and sea ducks could be susceptible to active acoustic sounds generated from survey equipment, especially those species that would likely dive, rather than fly away from a vessel (e.g., grebes, loons, alcids, and some diving ducks). However, seismic pulses are directed downward and highly attenuated near the surface; therefore, there is only limited potential for direct impact from the low-frequency noise associated with active acoustic sound sources to affect diving birds. In addition, active acoustic sound sources such as side-scan sonar and sub-bottom profilers are highly directive, with beam widths as narrow as a few degrees or narrower; the ramifications of this directionality include a lower risk of high-level exposure to diving birds that may forage close to (but lateral to) a survey vessel.

Investigations into the effects of acoustic sound sources on seabirds are extremely limited, however studies performed by (Stemp, 1985) and (Lacroix, 2003) did not observe any mortality to the several species of seabirds studied when exposed to seismic survey noise; further, they did not observe any differences in distribution or abundance of those same species as a result of seismic survey activity. Based on the directionality of the sound and the low frequency equipment used for HRG surveys, it is expected that there would be no mortality or life-threatening injury and little disruption of behavioral patterns or other non-injurious effects of any diving marine birds or waterfowl from this direct impact, resulting in a negligible impact.

Vessel and Equipment Noise and Vessel Traffic

The primary potential impacts to marine and coastal birds from vessel traffic and noise are from underwater vessel and equipment noise, attraction to vessels and subsequent collision or entanglement, disturbance to nesting or roosting, and disturbance to feeding or modified prey abundance (Schwemmer, 2011). Since all survey activities are performed from vessels, with the exception of those conducted via aircraft, most survey activities have the potential to impact marine and coastal birds from vessel traffic and the associated vessel and equipment noise.

Underwater Noise

The sound generated from individual vessels can contribute to overall ambient noise levels in the marine environment on variable spatial scales. As stated above, birds have a relatively restricted hearing range, from a few hundred hertz to about 10 kHz (Dooling, 2000) for airborne noise, with few data available regarding bird hearing range for underwater noise. The survey vessels would contribute to the overall noise environment by transmitting noise through both air and water. Underwater noise produced by vessels is a combination of narrow-band (tonal) and broadband sound. Tones typically dominate up to about 50 Hz, whereas broadband sounds may extend to 100 kHz. According to (Southall, 2005) and (Richardson, 2013), vessel noise typically falls within the range of 100–200 Hz. Noise levels dissipate quickly with distance from the vessel. The underwater noise generated from the survey vessels would dissipate prior to reaching the coastline and the shore/beach habitats of shorebirds, including the threatened Western Snowy Plover. Because of the dissipation of underwater noise from survey vessels prior to reaching the shore/beach habitat, it is expected that underwater noise would produce negligible impacts to shorebird species, including the Western Snowy Plover.

Some marine birds, including gulls, terns, pelicans, albatrosses, shearwaters, and petrels, as well as the endangered Short-tailed Albatross and Hawaiian Petrel, either rest on the water surface, skim the water surface, or shallow-dive for only short durations. Because of these behaviors, members of these families would not come in contact with underwater vessel and equipment noise generated from HRG survey vessels, or the contact would be for such a short time that it would result in little disruption of behavioral patterns or other non-injurious effects. Therefore, impacts to these marine birds (including the Short-tailed Albatross and Hawaiian Petrel) from vessel and equipment noise would be negligible.

Diving marine birds and waterfowl including the Marbled, Scripps's, and Guadalupe Murrelets as well as alcids, loons, grebes, cormorants, storm-petrels, shearwaters, petrels, and sea ducks could be susceptible to underwater noise generated from HRG survey vessels and equipment. Site assessment-related surveys typically use a single vessel. This level of vessel activity per survey event is not a significant increase in the existing vessel and equipment noise, the vessels are typically moving at slow speeds, and noise levels dissipate quickly with distance from the vessel. Machinery noise can be continuous or transient, and variable in intensity. Because of this noise dissipation, only a very small area would experience vessel and equipment noise and potential associated disruption. Therefore, impacts of underwater noise from survey vessels to the Marbled, Scripps's, and Guadalupe Murrelets and other diving marine birds and waterfowl are expected to be negligible.

Vessel Attraction

A single vessel is typically involved in a site assessment-related survey. This level of vessel traffic is not a significant increase when compared to existing vessel traffic in nearshore or offshore waters. In addition, vessels performing surveys are relatively slow moving (approximately 7.4–11.1 km/hr (4–6 kn)), which allows for marine and coastal birds to easily move out of the way of survey vessels.

The potential for bird strikes on a vessel is not expected to be significant to individual birds or their populations. However, a number of marine bird species, including members of the gulls, terns, albatrosses, storm-petrels, shearwaters, petrels, pelicans, and alcids are generally attracted to offshore rigs and vessels. The attraction of some of these bird species is due to light attraction at night (Montevecchi, 1999; Wiese, 2001; Black, 2005; Montevecchi, 2006). However, some birds engage in ship following as a foraging strategy, especially with commercial or recreational fishing vessels. In addition, in an open environment like the ocean objects are easy to detect and birds locate vessels easily from long distances and approach to investigate. Bird mortality has been documented as a result of light-induced attraction and subsequent collision with vessels. Birds exhibiting this behavior are typically alcids and petrels, with bird strikes typically occurring at night and occasionally resulting in mortality (Black, 2005). In addition, alcids may also dive to escape disturbance, increasing their potential for collision with a vessel or gear in the water. Vessels are also required to have down-shielded lighting to minimize the potential attraction of birds. However, even if Marbled, Scripps's, and Guadalupe Murrelets or other birds were attracted to the survey vessels or dove near a survey vessel, there is a very low potential for either vessel collision or entanglement since the vessels are moving relatively slowly (7.4–11.1 km/hr (4–6 kn)) and the gear is towed from 1 to 3.5 m (3.3 to 11.5 ft) below the surface. There is no empirical evidence indicating that these types of marine and coastal birds could become entangled in HRG survey gear in spite of the potential for attraction to this gear. Given the low potential for collision or gear entanglement, the impacts are not expected to result in mortality or serious injury to individual birds, resulting in a negligible impact to these types of seabirds from vessel attraction.

Shorebirds including the Western Snowy Plover that reside along the shorelines are not known to be attracted to vessels. Therefore, there would not be impacts to shorebirds from vessel attraction. The Short-tailed Albatross and Hawaiian Petrel are members of Family *Procellariidae*, which are highly pelagic, and could be attracted to survey vessels offshore. However, as discussed above for other pelagic bird families, there is a low potential of impact from vessel collision or gear entanglement; therefore, the impacts are expected to be negligible to individual birds and their populations, as the Short-tailed Albatross and Hawaiian Petrel are rarely present in the vicinity of the Humboldt WEA.

Disturbance to Nesting or Roosting

There is the potential for impact to marine and coastal birds from the potential disturbance of breeding colonies by airborne noise from vessels and equipment (Turnpenny, 1994). Most marine and coastal bird species nest and roost along the shore and on coastal islands. Survey vessels for renewable energy projects are expected to make daily round trips to their shore base in Humboldt Bay.

Vessels could cause a disturbance to breeding birds, with the potential to adversely affect egg and nestling mortality, if a vessel approached too close to a breeding colony. Surveys would not occur close enough to land to affect marine and coastal bird breeding colonies during survey activities. However, survey vessels are anticipated to transit from a shore base to offshore and return daily. The expectation is that this daily vessel transit would occur at one of the shore bases identified or at other established ports, which have established transiting routes for ingress and egress in the coastal areas and existing vessel traffic. Because of this existing vessel traffic, it is not anticipated that marine and coastal birds would roost in adjacent areas, or if they did already roost nearby, the addition of survey vessels would not significantly increase the existing vessel traffic. In addition, noise generated from the survey vessels and equipment would typically dissipate prior to reaching the coastline and the nesting habitats of coastal birds. Impacts of airborne vessel and equipment noise to nesting or roosting marine and coastal birds would be negligible.

The Western Snowy Plover is a ground nester along the shoreline. As discussed above, this taxa is not expected to nest in areas that would be disturbed by survey vessels transiting from port to offshore or coastal locations; therefore, there would be no impact to the nesting of this taxa. The Marbled Murrelet nests and roosts inland in low-elevation old growth forests, or other forests with large remnant trees; therefore, there would be no impact to the nesting of this species. Scripps's Murrelets nest on islands between central Baja California and southern California, and Guadalupe Murrelets nest on islands off central Baja California; therefore, these species will not experience nesting impacts from survey activities. The Short-tailed Albatross nests only on islands offshore Japan and Hawaiian Petrels breed only on the main Hawaiian Islands islets; therefore, these species would not experience nesting impacts from survey activities.

Disturbance to Feeding or Modified Prey Abundance

Marine and coastal birds require specialized habitat requirements for feeding (Kushlan, 2002). Survey vessel and equipment noise could cause pelagic bird species, including gulls, terns, jaegers, alcids, pelicans, storm-petrels, albatrosses, shearwaters, and petrels, to be disturbed by the survey vessel and equipment noise and relocate to alternative areas, which could result in a localized, temporary displacement and disruption of feeding. These alternative areas may not provide food sources (prey) or habitat requirements similar to that of the original (preferred) habitat and could result in additional energetic requirements expended by the birds and diminished foraging opportunity. However, it is expected that if these species temporarily moved out of the area it would be limited to a very small portion of a bird's foraging range, and it would be unlikely that this temporary relocation would affect foraging success. Impacts to pelagic birds from disturbance associated with vessel and equipment noise would be negligible.

Humboldt Bay and the Humboldt County coastline are extremely important for transient shorebirds during both northbound and southbound migrations. Possible indirect impacts to marine and coastal birds from vessel and equipment noise may include relocation of some prey species, which is primarily linked to seasonality. During their annual migrations, a number of marine and coastal birds have very specific stopover locations for species-specific foraging to accumulate fat reserves. Because of the noise produced from survey vessels, there is the potential for an indirect impact of modified prey abundance and distribution that migrating birds rely on for the accumulation of fat reserves to fuel their migration, which could result in additional energetic requirements for the migrating birds. However, it is unlikely that bird prey species would be affected by survey vessels to a level that would affect foraging success. As noted previously, surveys would not take place within coastal nearshore areas or within bays (e.g., Humboldt Bay). If prey species exhibit avoidance of the area in which a survey is performed, it is expected to be limited to a very small portion of a bird's foraging range and for a limited duration. Therefore, there is the potential for minor, temporary displacement of species from a portion of preferred feeding grounds during migration and minor, short-term displacement of marine and coastal bird species from non-critical activities during non-migration seasons resulting in minor impacts.

Western Snowy Plovers feed along the shoreline and would not be impacted by vessel and equipment noise. Marbled Murrelets forage in nearshore waters, generally within 4 km (2.5 mi) of shore and could be temporarily displaced from preferred foraging areas by transiting vessels. Short-tailed Albatrosses and Hawaiian Petrels are only present while on long-distance foraging trips or during the non-breeding season and would experience temporary displacement. This would be limited to a very small portion of a bird's foraging range. It is unlikely that this temporary relocation resulting from survey vessel noise would affect foraging success of Short-tailed Albatrosses and Hawaiian Petrels.

Aircraft Traffic and Noise

Potential impacts to marine and coastal birds from aircraft traffic include noise disturbance and collision. Noises generated by project-related survey aircraft that are directly relevant to birds include airborne sounds from passing aircraft for both individual birds on the sea surface and birds in flight above the sea surface. Both helicopters and fixed-wing aircraft generate noise from their engines, airframe, and propellers. The dominant tones for both types of aircraft are generally below 500 Hz (Richardson, 2013) and are within the airborne auditory range of birds. Aircraft noise entering the water depends on aircraft altitude, the aspect (direction and angle) of the aircraft relative to the receiver, and sea surface conditions. The level and frequency of sounds propagating through the water column are affected by water depth and seafloor type (Richardson, 2013). Because of the expected airspeed (250 km/hr (135 kn)), noise generated by survey aircraft is expected to be brief in duration, and birds may return to relaxed behavior within 5 minutes of the overflight (Komenda-Zehnder, 2003); however, birds can be disturbed up to 1 km (0.6 mi) away from an aircraft (Efroymson, 2000).

The physical presence of low-flying aircraft can disturb marine and coastal birds, including those on the sea surface as well as in flight. Behavioral responses to flying aircraft include flushing the sea surface into flight or rapid changes in flight speed or direction. These behavioral responses can cause collision with the survey aircraft. However, (Efroymson, 2000) reported that the potential for bird collision decreases for aircrafts flying at speed greater than 150 km/h.

Considering the relatively low numbers of aerial surveys, along with the short duration of potential exposure to aircraft-related noise, physical disturbance, and potential collision to marine and coastal birds, it is expected that potential impacts from this activity would range from negligible to minor.

Metocean Buoys

Potential impacts to marine and coastal birds from metocean buoys include noise disturbance/lighting, collisions, loss of habitat, and decommissioning. Noise and other disturbance generated by the installation or decommissioning of metocean buoys are expected to be short-term and localized, resulting in negligible impacts to birds. Because buoy height is anticipated to be up to approximately 12 m (40 ft) above the ocean surface, collisions with buoys are unlikely. Although seabirds, including terns, gulls, and cormorants may roost on buoys, roosting on buoys does not pose a threat to these birds. Thus, overall impacts to birds from metocean buoys are expected to be negligible. Although it is possible that Peregrine Falcons could use a tower as a perch to opportunistically prey on seabirds, this predation would be expected to have a negligible impact on birds overall.

Due to their excellent vision, birds flying during daytime hours are unlikely to collide with metocean buoys. However, night-flying or flying under other conditions that would impair their vision, birds could potentially collide with metocean buoys, leading to injury or death. Managing the type of lighting present on the buoys can minimize collisions.

Because the metocean buoys would be more than 34 km (21 mi) from the shoreline, the chances of birds colliding with the buoys would be rare, resulting in minor impacts on marine and coastal bird populations. Because the metocean buoys would be removed after the site assessment activities are concluded or at the end of the lease, any impacts on birds from the buoys would be temporary.

Trash and Debris

Plastic is found in the surface waters of all of the world's oceans and poses a potential hazard to marine birds through entanglement or ingestion (Laist, 1987). The ingestion of plastic by marine and coastal birds can cause obstruction of the gastrointestinal tract, which can result in mortality. Plastic ingestion can also include blockage of the intestines and ulceration of the stomach. In addition, plastic accumulation in seabirds has also been shown to be correlated with the body burden of polychlorinated biphenyls (PCBs), which can cause lowered steroid hormone levels and result in delayed ovulation and other reproductive problems (Pierce, 2004).

Site characterization activities may generate trash comprising paper, plastic, wood, glass, and metal. Most trash is associated with galley and offshore food service operations. However, over the last several years, companies operating offshore have developed and implemented trash and debris reduction and improved handling practices to reduce the amount of offshore trash that could potentially be lost into the marine environment. These trash management practices include substituting paper and ceramic cups and dishes for those made of styrofoam, recycling offshore trash, and transporting and storing supplies and materials in bulk containers when feasible and have resulted in a reduction of accidental loss of trash and debris. In addition, all authorizations for shipboard surveys would include guidance for marine debris awareness. The guidance would be similar to BSEE's NTL No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination") or any NTL that supersedes this NTL. Therefore, the amount of trash and debris dumped offshore would be expected to be minimal, as only accidental loss of trash and debris is anticipated, some of which could float on the water surface. Therefore, impacts from trash and debris on marine and coastal birds, as generated by site characterization vessels or sampling and other site characterization related activities, would be negligible.

Impacts of Accidental Fuel Spills

An accidental event could result in release of fuel or diesel by a survey vessel. Spills occurring at the ocean surface would disperse and weather. Volatile components of the fuel would evaporate. Fuel and diesel used for operation of survey vessels is light and would float on the water surface. There is the potential for a small proportion of the heavier fuel components to adhere to PM in the upper portion of the water column and sink. This accidental spill could occur either offshore or nearshore, and the marine and coastal bird species affected, and the type of effect, would differ depending on the location of the spill (Wiese, 2001; Castege, 2007). If the accident occurred in nearshore waters, shorebirds including

Western Snowy Plovers; Marbled Murrelets; waterfowl; and coastal seabirds such as gulls, terns, loons, pelicans, cormorants, and grebes, could be impacted either directly or indirectly. Direct impacts would include physical oiling of individuals. The effects of oil spills on coastal and marine birds include the potential of tissue and organ damage from oil ingested during feeding and grooming from inhaled oil, and stress that could result in interference with food detection, predator avoidance, homing of migratory species, and respiration issues.

Indirect effects could include oiling of nesting and foraging habitats and displacement to secondary locations. The potential of a vessel collision occurring is quite low, with the potential for a resultant spill even lower. An accidental event could result in release of fuel or diesel by a survey vessel, but such an event has a remote probability of occurring. Therefore, an accidental fuel spill within nearshore waters would not be expected to result in significant impacts to these types of coastal and marine birds. Impacts to birds from accidents are unlikely; however, if they occur, there could be possible impacts on their food supply. However, impacts to shorebirds, waterfowl, and marine bird species would range from negligible to minor depending on timing and location. Since the populations of the Western Snowy Plover and Marbled Murrelet are already in peril, if an accidental fuel spill occurred that affected any of these species or their food supply, there would be a moderate impact to these species since birds are very susceptible to oiling impacts.

If the accidental event occurred in offshore waters, fuel and diesel would float on the water surface. There is potential for oceanic and pelagic seabirds such as alcids, storm-petrels, albatrosses, shearwaters, and petrels to be directly and indirectly affected by spilled diesel fuel. Impacts would include oiling of plumage and ingestion (resulting from preening). Indirect impacts could include oiling of foraging habitats and displacement to secondary locations. The potential of a vessel collision occurring is quite low, with the potential for a resultant spill even lower. Dispersal, weathering, and evaporation would reduce the amount of fuel remaining on the sea surface. Impacts to oceanic and pelagic birds from a spill incident involving survey vessels within offshore waters would range from negligible to minor. However, since populations of Short-tailed Albatross and Hawaiian Petrel are already imperiled, if an accidental fuel spill occurred that affected them, there would be a moderate impact to that species since birds are very susceptible to oiling impacts.

Measures to Minimize Potential Adverse Impacts to Birds

1. To minimize the potential for adverse impacts on birds, BOEM has developed measures to reduce or eliminate the potential risks to or conflicts with specific environmental resources. If leases or grants are issued, BOEM will require the lessee to comply with these measures through lease stipulations and/or as conditions of SAP approval. The following measures are intended to ensure that the potential for adverse impacts on birds is minimized, if not eliminated. The lessee will use only red flashing strobe-like lights for aviation obstruction lights and must ensure that these aviation obstruction lights emit infrared energy within 675–900 nanometers wavelength to be compatible with Department of Defense night vision goggle equipment.
2. Any lights used to aid marine navigation by the Lessee during construction, operations and decommissioning of a meteorological tower or buoys must meet USCG requirements for private aids to navigation (https://www.uscg.mil/forms/cg/CG_2554.pdf).
3. For any additional lighting not described in (1) or (2) above, the lessee must use such lighting only when necessary, and the lighting must be hooded downward and directed when possible, to reduce upward illumination and illumination of adjacent waters.

4. An annual report shall be provided to BOEM documenting any dead birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the U.S. Geological Survey's Bird Band Laboratory, available at https://www.pwrc.usgs.gov/bbl/.
5. Anti-perching devices must be installed on the metocean buoys in order to minimize the attraction of birds.

Conclusion

Overall, impacts to birds would be minor. The construction, presence, and decommissioning of metocean buoys would pose minimal threats to birds. Loss of water column habitat, benthic habitat, and associated prey abundance are expected to have negligible impacts because of the small area affected by buoys. Impacts to birds in coastal waters from vessel traffic are expected to be negligible due to the amount of existing vessel traffic. Impacts on birds from site characterization surveys are expected to be negligible. Impacts to birds from trash or debris releases and from accidental fuel spills are expected to be negligible. Potential noise impacts from metocean buoy deployment could have localized, short-term minor impacts on birds foraging near or migrating through the construction site, and noise impacts from decommissioning are expected to be negligible. The risk of collision with the metocean buoy would be minor because of the buoy's height and its distance from shore. Additionally, the Proposed Action includes SOCs for birds to reduce the potential for the Proposed Action to adversely impact birds.

3.6.3 Bats

3.6.3.1 Affected Environment and Impacts of the Proposed Action

While bats are expected to be rare in the Humboldt WEA, bats could have avoidance or attraction responses to vessels and buoys due to noise, lighting, and the possible presence of insects. Bats have been recorded as using offshore ships as opportunistic stopover sites (Pelletier, 2013); thus, while it is undocumented, it is possible that vessels could unintentionally transport bats into the offshore environment.

HT Harvey & Associates, (2020) summarized the status of bats near the Humboldt WEA as follows. The bat species that could occur offshore over federal waters are the hoary bat (*Lasiurus cinereus*) and western red bat (*Lasiurus blossevillii*). Hoary bats are known to migrate south in autumn offshore and along the coast of central California, and western red bats are also known to migrate offshore of central California (Cryan, 2007). Some species of bats hunt for insects in offshore areas where they normally migrate across open ocean areas, such as the Baltic Sea, and have been found to forage for flying insects around, and rest on, offshore wind turbines (Ahlén, 2007). No other species of bats are expected to occur in the marine portion of the Proposed Action area based on the lack of museum records and literature.

Site Characterization Activities

Impacts to bats from site characterization activities would be limited to avoidance or attraction responses to the vessels (or aircraft) conducting surveys. Lights and noise from vessels associated with site characterization activities could potentially disturb migrating or feeding bats and affect a bat's ability to forage, navigate, and communicate easily (Schaub, 2008) However, site characterization activities would not be concentrated and the noise and light from vessels are not likely to be intense. Few bats are expected to migrate or forage in the WEA, and activity, if any, is most likely to occur during a short period during migration in the late summer/early fall. Therefore, any impacts on bats from site characterization activities would be negligible.

Site Assessment Activities

Lights and noise from the vessels associated with construction, operation, and decommissioning of the metocean buoy(s) could affect a bat's ability to forage, navigate, and communicate easily and influence the behavior of migrating or feeding bats (Schaub, 2008; Stone, 2009).

No studies of the effects of intense light have focused on the bat species that may be found in the WEA. From light tolerance studies, Myotis species appear to be the species most intolerant of intensely lighted areas (Stone, 2009 #1058;Lacoeuilhe, 2014 #1025) and most likely to have foraging and migratory behavior affected. Few Myotis, if any, are expected to occur in the WEA.

Red aviation lighting does not attract invertebrate prey (Bennett, 2014 #996). A study of the effects on bats from red aviation lighting on wind turbines found that hoary bats are neither attracted nor repelled from such lighting, and the eastern red bat is not attracted to aviation lights (Bennett, 2014 #996). No evidence suggests that the hoary bat or western red bat is repelled by light.

Some species of bats, particularly passive listening bats such as Myotis, can be repelled from areas with constant broadband noise (Schaub, 2008 #1046). Species using passive listening (using prey generated sound to detect prey) continue to emit echolocation calls while approaching prey (Russo, 2007 #1044), which suggests that, although foraging success in Myotis species could be affected by noise, there is no reason that navigation and communication will be affected. A study by (Bunkley, 2015 #1000) concluded that Myotis species were not affected by compressor noise, which is broadband in nature and may be assumed to be similar to generator noise. Acoustic deterrent research has inferred through collision mortality comparisons that broadband ultrasonic broadcasts can reduce bat activity, with silver-haired bats and hoary bats avoiding areas with such broadcasts (Arnett, 2013 #995). Broadband ultrasonic noise is dissimilar from any noise anticipated from vessels associated with construction, operation, and decommissioning of a metocean buoy.

Not all bat species are equally affected by either light or noise, or by the same types of light and noise, and data show some species of bat continuing to forage in both lighted and noisy suburban habitats, while foraging efficiency of other species has been adversely affected (Rydell, 1991 #1045;Threlfall, 2012 #1065;Arnett, 2013 #995;Bunkley, 2015 #999;Bunkley, 2015 #1000). No studies specifically address the effect of audible acoustic noise on the bat species expected to be found most often in the offshore environment—western red bat and hoary bat—so it is unknown if these species could be repelled or unaffected by noise or light. However, because bats do not depend on food or resting opportunities in the WEA, and because site assessment activities will be largely during daylight hours and of short duration, impacts to bats in the WEA are expected to be negligible.

The metocean buoy(s) could potentially provide a roosting opportunity not only for bats, but also birds that prey on bats such as gulls and Peregrine Falcons (Speakman, 1991 #1056). If bats were active during daylight and early dusk hours near the tower or buoys, there would be an opportunity for predation on bats while they forage or migrate offshore. Given the scarcity and distribution of both bats and predatory birds in the WEA, predation on bats is remote and unlikely, and impacts are expected to be negligible.

It is rare but possible that migrating bats may be driven into offshore OCS waters by a storm or high winds and subsequently into a buoy. Bat collisions with stationary structures, including meteorological towers, have been reported and are most likely to occur during stormy weather (Crawford, 1981 #1005). However, the land-based roosting, breeding, and foraging behavior of bats, as well as their limited home ranges and echolocation sensory systems, suggest that there is little risk of a bat being blown that far out of its habitat range. In the unlikely event that a bat blown off course returns from the open ocean in the vicinity of the buoy in the WEA, the chances of the bat striking the tower or buoy are very small and would therefore be negligible.

The impacts from accidental fuel spills should not interfere with any aspect of bat behavior offshore, and impacts would therefore be negligible.

Conclusion

To the extent that there would be any impacts on individual bats, the overall impact on bats would be negligible. There is evidence to suggest that two species of migratory tree bats, none of which are state or federally listed, could migrate through the WEA in very low abundance, and mostly during the late summer and early fall. Myotis species could potentially occur in the WEA, although occurrence is anticipated to be rare. During periods of high boat activity, particularly nocturnal activities, there is a small chance that bats might avoid any areas associated with the Proposed Action. The metocean buoy could serve as a roosting structure for bats and birds. The presence of a predatory bird at the tower or buoys could increase the possibility of predation if bird presence coincides with bat migration or foraging before darkness. The likelihood of collision between bats and boats or the buoy would be remote. Instances of bat collisions with towers are reported infrequently at terrestrial sites, and distribution and scarcity of bats in the offshore environment further reduce the potential for a collision with a comparatively small and isolated buoy offshore. The SOCs for birds, including lighting restrictions and installation of anti-perching devices, may also reduce potential impacts on bats.

3.6.4 No Action Alternative

Coastal and marine birds in the geographic analysis area are subject to a variety of ongoing human-caused impacts that overlap with the Proposed Action, including fisheries bycatch in gill-net and other fisheries, oil spills, various contaminants, plastics pollution, anthropogenic noise, habitat destruction, introduced predators, disturbance of marine and coastal environments, and climate change. Many coastal and marine bird migrations cover long distances, and these factors can have impacts on individuals over broad geographical scales. Climate change has the potential to impact the distribution and abundance of coastal and marine bird prey due to changing water temperatures, ocean currents, and increased acidity.

Under this alternative, commercial leases and grants would not be issued in the Humboldt WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on coastal and marine birds over the timeframe considered in this EA. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and will have commensurate negative impacts on coastal and marine birds. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to coastal and marine birds from existing and potential future actions. The largest ongoing contributors to impacts on coastal and marine birds stem from habitat destruction, disturbance of marine and coastal environments, and commercial and recreational fishing activities, primarily through bycatch.

3.7 COMMERCIAL FISHING

3.7.1 Affected Environment

The waters offshore California support numerous types of fishing, and stakeholders place high cultural and economic significance on these activities. Pomeroy et al. (2011), Industrial Economics, Inc. (2012), Hackett et al. (2017), and LWC and HSU (2019) describe the characteristics of commercial fishing in the Eureka region and these citations are incorporated by reference for this assessment. During 2009–2018 the ex-vessel value of all marine commercial fisheries landings within California averaged approximately $216 million per year (CDFW 2021). Within this same period, the Eureka Port Complex (EPC) contributed about 18 percent to this total and is second only to the Santa Barbara Channel Port Complex in significance to the SOC. Within the EPC, commercial fishers primarily land their catch at three places (Eureka, Trinidad, and Crescent City) and use several smaller locations with less consistency. Dungeness crab dominates the value of landings at all ports and 11 other taxa recorded at least 1 percent of value landed at one or more of the local harbors. Gear and methods fishers use to ply the waters offshore California include trawls, pots/traps, nets, longlines, and other hook-and-line gear (jigs, bait, or trolling). The marine and coastal habitats and associated biotic assemblages that support regional fisheries are described in Section 3.4.

Vessel monitoring system data describe the relative offshore distribution of commercial fishing activity for many important fisheries, and California Department of Fish and Wildlife (CDFW) landing receipts (also known as “fish tickets”) provide spatially explicit information (Miller et al. 2017). Fishing effort and economic productivity reflect biological productivity and is highest in shallower waters near the coast, generally declining as depth increases (Miller et al. 2017). Within the WEA, bottom trawling for Pacific Coast groundfishes shows the greatest activity. Within the likely transit zone between ports and offshore areas, fishing activity occurs for most of the other targeted species (Frawley et al. 2021).

3.7.2 Impacts of the Proposed Action

Data collection buoys and vessel traffic associated with the Proposed Action may generate space-use conflicts and interfere with fishing operations by (1) creating de facto exclusion zones from fishing grounds, (2) reducing fishing efficiency, and/or (3) causing economic losses associated with gear entanglement. Data collection buoys emplaced within leases may inadvertently exclude nearby fishing operations, particularly for bottom trawling, due to the general incompatibility of fixed structures and mobile fishing gear. Fishers may suffer decreased efficiency when trying to avoid buoys during their operations. If fishers fail to avoid buoys, subsequent entanglement may result in damage to or loss of fishing gear. If damage to a data collection buoy or its scientific instrumentation occurs because of fishing operations, the fishing vessel captain could be held financially responsible. The spatial extent of de facto exclusion from fishing grounds may be estimated using, as an analog, USCG safety zone considerations for OCS facilities (33 CFR §147.1), where 500 m (1,640 ft) safety zones were established to promote the safety of life and property (e.g., 33 CFR §147.1109). This approach estimates a 0.785 km^2 (0.303 mi^2) circular exclusion zone per buoy – a fraction of the total fishing grounds available for the Pacific Coast Groundfish Fishery (PFMC 2020), including those areas already off limits from marine shipping or other marine protected areas. Other fisheries operating within the WEA may also be affected by buoy emplacement, but the impact is expected to be minimal because the relative effort for these non-trawl fisheries has historically been low, and the deployment and retrieval of other gears may have more maneuverability compared to trawls. Given that harvest strategies vary among individuals, some fishers may be disproportionately impacted by the Proposed Action compared to others.

Site characterization and assessment activities and Proposed Action marine vessels mobilizing and transiting from ports to the WEA may reduce efficiency of fishing operations due to time delays associated with congestion. Marine vessels associated with the Proposed Action may accidentally damage fishing gear (e.g., by cutting trap floats) or release marine debris which could cause entanglement or interfere with other fishing operations. The EPC and its nearshore waters host a variety of marine operations and hundreds of fishers, so the expected increase in activity from Proposed Action vessels will be small compared to the overall level of work.

Mitigation measures to reduce space-use conflicts center on avoidance and procedures to increase navigation safety. Many of the region's important fishing grounds are in depths less than 500 m (1,640 ft), so a buoy within the WEA (500 m to 1,100 m (1,640 ft to 3,609 ft) depth) decreases conflict with the fishing industry due to its offshore location. At the end of the 5-year term data collection instrumentation will be decommissioned, and large marine debris objects removed so any existing de facto exclusion zones will be eliminated. Vessel operators are required to comply with pollution regulations outlined in 33 CFR 151.51-77 so only accidental loss of trash and debris is anticipated. To enhance navigational safety, lessees will develop a SAP that will include site-specific measures to mitigate navigational concerns, which could become terms and conditions of SAP approval. Such measures may include a Local Notice to Mariners, vessel traffic corridors, lighting specifications, incident contingency plans, or other appropriate measures.

Conclusion

The impact analysis for ascertaining space-use conflicts with commercial fishing considered marine shipping, marine protected areas, and the IPCs associated with the Proposed Action. Potential effects to commercial fishing from the Proposed Action are expected to be temporary in duration (5 years or less), and primarily associated with the data collection buoy(s). Lessees will develop a SAP that will aim to minimize adverse effects from their site assessment and site characterization activities.

3.7.3 No Action Alternative

Under the No Action Alternative, commercial leases and grants would not be issued in the Humboldt WEA, however BOEM expects ongoing activities and planned actions to have continuing regional impacts on commercial fishing over the timeframe considered in this EA. Local impacts from climate change are likely to be small, incremental, and difficult to discern from effects of other actions such as urban development, mariculture, shipping and vessel traffic and discharges, and dredging. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to commercial fishing from existing and potential future actions.

3.8 RECREATION AND TOURISM

3.8.1 Affected Environment

Marine-based tourism and recreation contribute significantly to the Humboldt County economy. Popular tourist destinations include Humboldt Bay National Wildlife refuge, Trinidad State Beach, Humboldt Lagoons State Park, and Samoa Dunes Recreation Area. Both coastal land and ocean activities and attractions are utilized by locals and tourists. Coastal land activities include visiting historic towns and landmarks, golfing, biking, horseback riding, off-roading, bird watching, and beach going. Ocean activities include swimming, diving, surfing, kayaking, boating, sailing, and fishing.

3.8.1.1 Economic Importance of Ocean Recreation and Tourism

For California's Humboldt County, the total ocean economy is a significant component of the county's total economy. The total ocean economy is a measure of all ocean economic activities within a geography. For Humboldt County, the Total Ocean Economy in 2018 was 4.2 percent of the total economy when measured by Gross Domestic Product (GDP), bringing in $222.8 million, with an average of $46,800 GDP per employee. Of the total ocean economy for Humboldt County as measured by GDP, tourism and recreation made up 76.6 percent, or $170.5 million, with an average of $40,100 GDP per employee. Tourism and recreation are defined as eating and drinking establishments, hotels, marinas, campsites and RV parks, scenic water tours, boat dealers and charters, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums.

Employment based on the ocean economy made up 10 percent of Humboldt County's total economy in 2018. A total of 5,134 people were employed in the total ocean economy with 371 people being self-employed. Tourism and recreation accounted for 89.2 percent of the total ocean economy when measured by employment with 4,377 people employed, 128 being self-employed.

Business establishments based on the total ocean economy account for 7 percent of the county's total economy in 2018, centered around 381 establishments with an average number of 13 employees per establishment. Of that 7 percent of the total Humboldt economy when measured by establishments, 79.5 percent of that was focused on tourism and recreation. This amounted to 303 establishments with an average of 14 employees per establishment.

Wages based on the total ocean economy accounted for 5.3 percent of the county's total economy in 2018, with $107.9 million in wages paid with an average of $22,700 per employee. Of the 5.3 percent of Humboldt County's total ocean economy wages, tourism and recreation took 77.1 percent with a total of $83.2 million in wages with an average of $19,600 per employee.

3.8.2 Impacts of the Proposed Action

3.8.2.1 Routine Activities

Previous studies have shown that the main IPF associated with site characterization surveys would be the generation of trash and debris. Compliance with federal regulations and the relative amount of added vessel traffic compared to existing vessel traffic would reduce accidental generation of trash and debris to a minimum. Site assessment activities would add vessel traffic. However, the total vessel traffic associated with site assessment activities and site characterization surveys should remain small.

3.8.2.2 Non-Routine Events

Previous projects have studied the effect of accidental fuel spills on recreation and tourism. Diesel spills were expected to disperse rapidly and the impacts on recreation and tourism were expected to be negligible to minor, depending on the location of the spill.

Conclusion

The impact to recreation and tourism should be negligible to minor, by minimizing total vessel traffic associated with site assessment activities, site characterization surveys, and potential impacts from accidental fuel spills. Designing WEAs in a way that minimize effects on the viewshed and primary recreational resources helps sustain healthy recreation and tourism.

3.8.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Humboldt WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on tourism and recreational activity over the timeframe considered in this EA. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and will have commensurate negative impacts on recreation and tourism. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to tourism and recreational activities from existing and potential future actions.

3.9 SOCIOECONOMICS

3.9.1 Affected Environment

3.9.1.1 Population and Demographics

This section presents an overview of major socioeconomic characteristics and trends to provide the context from which to assess impacts of the Proposed Action. The counties chosen for analysis are those with ports which may be used by a lessee. Ports that Lessees may use include Newport, Humboldt, and the Port of San Francisco. Demographic and economic characteristics and trends are presented at the county level for Del Norte, Humboldt, and Mendocino counties, since Humboldt is the port closest to the leases. These counties are most likely to experience economic impacts associated with the development of offshore leases.

The northernmost coastal county in California, Del Norte is bordered on the west by 59.5 km (37 mi) of Pacific Ocean coastline. Surrounding counties include Humboldt to the south, and Siskiyou to the east. Oregon borders the north side of the county. Del Norte’s Redwood National Park and other state parks are home to some of the world’s tallest trees, making tourism a natural industry in the county. Vacationers come from around the world to visit the giant redwoods of Del Norte County (EDD 2021a).

Humboldt County is the largest and most populous of the north coast counties. The county is bordered by Del Norte County to the north, Siskiyou County to the north and east, Trinity County to the east, Mendocino County to the south, and the Pacific Ocean to the west (EDD 2021b). Economic activity is likely to be based out of Humboldt Bay due to proximity to the lease area. Approximately one-half of the population is concentrated in the cities of Eureka (the county seat), Arcata, Fortuna, and McKinleyville. These cities and the Census Designated Place (CDP) all lie within 10 miles of Humboldt Bay, with Eureka and Arcata bordering Humboldt Bay.

Mendocino County is located along California’s northern coast. Sonoma, Lake, Glenn, Tehama, Trinity, and Humboldt counties all border on the inland side. Tourism is the primary industry on the Mendocino coast. Coastal Highway 1 and Highway 101, which run through the central county, are important transportation routes. Smaller country roads connect Mendocino’s five distinct regions: Anderson Valley to the south, South Mendocino coast, North Mendocino coast, Northern Mendocino county, and the Russian River Valley to the east (EDD 2021c).

The Port of San Francisco is located approximately 434 km (270 mi) to the south of the Humboldt WEA. This port complex in 2020 was the 10th largest port in the US. A substantial number of ocean economy-based industries are located within the Port. The surrounding counties contain a large and diverse set of economic activities spanning the spectrum from basic to advanced. Within the greater bay area, the population exceeds 7 million people in 9 counties. Impacts from economic development of the Humboldt leases would be insufficient to have a perceptible impact on local employment and population.

Newport, located in Lincoln County, Oregon, is located approximately 531 km (330 mi) to the north of the Humboldt WEA. The county has a strong oceanography research center and is known as the "whale watching capital of the world." Newport's primary economic activities are based on tourism, government, services/retail, forest products, and fishing. Lincoln County has a very temperate climate and a short, but productive, growing season. Impacts from economic development of the Humboldt leases would be insufficient to have a perceptible impact on local employment and population.

Population and labor force statistics for the three counties located closest to the leases and the SOC are presented in Table 3-8 below. The three counties have lower unemployment rates than statewide, smaller populations, and lower per capita income when compared to statewide data.

Table 3-8: Population, Labor Force and Employment Statistics

Area	Population	Labor Force	Employed	Unemployed	Unemployment Rate	Per Capita Income
Del Norte	27,419	9,250	8,560	690	7.4%	$37,268
Humboldt	135,765	59,800	56,300	3,500	5.8%	$48,739
Mendocino	88,875	36,360	34,310	2,150	5.9%	$50,510
California*	39,817,785	18,895,200	17,378,500	1,516,700	7.9%	$63,557
Data Year	2018	2021	2021	2021	2021	2018

Notes:

* Population and Per Capita Income data are from 2019 for the State of California data row only.

The National Ocean Economics Program publishes datasets on employment and establishments compiled from the Bureau of Labor Statistics on economic activity that typically takes place in the ocean or supports the activity. The industrial sectors for which the data are compiled include living resources, tourism and recreation, and transportation within the three counties. Data classified as "other" contains information that is aggregated.

As of 2018, ocean-related jobs within Del Norte, Humboldt, and Mendocino counties make up 7–13 percent of employment at the county level (Table 3-9). A significant number of these jobs are centered on the tourism and recreation sector (88.0–89.2 percent), with living resources, transportation, and other jobs comprising the remainder. On a relative basis the ocean economy provides a relatively high number of jobs at the county level when compared to the total employment within California. In California, 3 percent of the total labor force is employed by ocean-based sectors, compared to 7–13 percent at the county level.

Table 3-9: Ocean Economy Employment

			Ocean Economy Subsectors			
Area	% of Total Economy	Employment	Living Resources	Tourism & Recreation	Transportation	Other

			Ocean Economy Subsectors			
Del Norte	13%	1,235	9.0%	88.0%	0.0%	3.0%
Humboldt	10%	5,134	6.0%	89.2%	0.6%	4.2%
Mendocino	7%	2,566	4.9%	88.9%	3.2%	3.1%
California	3%	602,454	1.5%	75.3%	19.3%	3.9%

As of 2018, ocean-related wages within Del Norte, Humboldt, and Mendocino counties make up 5–9 percent of the total economy (Table 3-10). On a relative basis the ocean economy provides a relatively high portion of wages at the county level, when compared to the total coastal wages within California. However, wages per employee on a relative basis are below the coastal statewide average. In California, 2 percent of wages come from ocean-based sectors, compared to 5–9 percent at the county level.

Table 3-10: Ocean Economy Wages

Area	% of Total Economy	Wages ($ millions)	Wages per Employee
Del Norte	9%	$28.10	$26,600
Humboldt	5%	$107.90	$22,700
Mendocino	5%	$58.50	$25,300
California	2%	$24.80	$42,400

As of 2018, ocean-related GDP within Del Norte, Humboldt, and Mendocino counties makes up 4–7 percent of the total economy (Table 3-11). On a relative basis the ocean economy provides a relatively high portion of GDP at the county level, when compared to the total coastal GDP within California. However, GDP per employee on a relative basis is below the coastal statewide average. In California, 2 percent of the GDP comes from ocean-based sectors, compared to 4–7 percent at the county level.

Table 3-11: Ocean Economy GDP

Area	% of Total Economy	GDP ($ millions)	GDP per Employee
Del Norte	7%	$55.90	$53,000
Humboldt	4%	$222.80	$46,800
Mendocino	4%	$119.20	$51,600
California	2%	$49,100.00	$83,800

3.9.2 Impacts of the Proposed Action

Temporary increases in employment from Proposed Action activities such as surveying, tower and buoy fabrication, and construction, would occur in various local economies associated with onshore- and offshore-related industry in the coastal counties of California. An analysis of a similar project on the East Coast (G&G Final PEIS ((BOEM 2014b)) found that the small number of workers directly employed in site characterization surveys consisting of 10 to 20 people, would be insufficient to have a perceptible impact on local employment and population.

BOEM expects any beneficial impacts on employment, population, and the local economies in and around Del Norte, Humboldt, and Mendocino counties to be short-term and imperceptible. When taking into consideration the distribution of activities, and timeframe they would occur in, the impacts would be negligible. Although the approximate number of workers directly employed would be measurable, benefits to the local economy would be difficult to measure; and the overall impact to local economy, and therefore to demographics and employment, would be negligible.

Conclusion

BOEM anticipates that the Proposed Action would have beneficial, short-term impacts to demographics and employment in Humboldt County and adjacent areas, but impacts would be imperceptible and are expected to be negligible. Impacts to the Port of San Francisco and Newport would be imperceptible and are also expected to be negligible.

3.9.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Humboldt WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on economic activity over the timeframe considered in this EA. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and will have commensurate negative impacts on the region's economy. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to economic activities from existing and potential future actions.

3.10 HISTORIC PROPERTIES

Historic properties are defined as any pre-contact period or historic period district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP) (54 USC § 300308). This can also include properties of traditional religious and cultural importance to a Tribe that meet criteria for inclusion in the NRHP (54 USC § 302706). Both site assessment activities (i.e., installation of meteorological buoys) and site characterization (i.e., HRG survey and geotechnical exploration) have the potential to affect historic properties. Construction activities associated with the placement of site assessment structures that disturb the ocean bottom have the potential to affect historic properties on or under the seabed. Vessel traffic associated with surveys and construction, although indistinguishable from existing ocean vessel traffic could, at times, be visible from coastal areas, potentially impacting historic properties onshore. Similarly, although indistinguishable from other lighted structures on the OCS, some meteorological buoys might be visible from historic properties onshore.

3.10.1 Affected Environment

Historic properties within and nearby the WEA include potential submerged pre-contact sites dating back at least 15,000 years and shipwrecks dating from at least the 16^{th} through mid-20^{th} centuries. Based on the current understanding of sea level rise and the earliest date of human occupation in the western hemisphere, any submerged pre-contact site on the Pacific OCS would be located shoreward of the 130 m (427 ft) bathymetric contour line (Clark et al. 2014; ICF International 2013). Additionally, pre-contact period sites would most likely be found in the vicinity of paleochannels or river terraces that offer the highest potential of site preservation; however, preservation conditions are variable and depend on local geomorphological conditions and the speed of sea level rise. Water depths across the WEA range from approximately 500–1,100 m (1,640–3,609 ft); much deeper than the depth limit of possible pre-contact sites. Therefore, the potential for submerged pre-contact period sites is non-existent within the WEA. There is, however, the potential for submerged pre-contact sites to exist within a yet to be determined transmission cable corridor extending from the WEA toward shore.

In addition to submerged pre-contact period site potential, there are 72 known and reported historic shipwreck losses near the WEA. With the exception of 4 reported shipwrecks with unknown loss dates, the dates of loss for the remaining 68 shipwrecks range from 1850 to 1950.

The information presented in this section is based on existing and available information and is not intended to be a complete inventory of historic properties within the affected environment. The WEA has not been extensively surveyed and that, in part, is the reason that BOEM requires the results of historic property identification surveys to be submitted with a SAP and COP. Additional background information on potential historic properties near the WEA and an overview of the types of cultural resources that might be expected on the Pacific OCS may be found in the BOEM-funded report Inventory and Analysis of Coastal and Submerged Archaeological Site Occurrence on the Pacific Outer Continental Shelf (ICF International 2013).

3.10.2 Impacts of the Proposed Action

3.10.2.1 Site Characterization

As described in Section 2.1, site characterization activities include shallow hazards assessments, and geological, geotechnical, archaeological, and biological surveys, and may include installation, operation, and decommissioning of data collection buoys. HRG surveys do not impact the seafloor and therefore have no ability to impact cultural resources. Geotechnical testing and sediment sampling does impact the bottom and, therefore, does have the ability to impact cultural resources. However, if the Lessee conducts HRG surveys prior to conducting geotechnical/sediment sampling, the Lessee may avoid impacts on historic properties by relocating the sampling activities away from potential cultural resources. Therefore, BOEM would require the Lessee to conduct HRG surveys prior to conducting geotechnical/sediment sampling, and, when a potential historic property is identified, the Lessee will be required to avoid it. Inclusion of the following elements in the lease(s) will ensure avoidance of historic properties:

> The Lessee may only conduct geotechnical exploration activities, including geotechnical sampling or other direct sampling or investigation techniques, in areas of the leasehold in which an analysis of the results of geophysical surveys have been completed for that area. The geophysical surveys must meet BOEM’s minimum standards (see BOEM Archaeological Survey Guidelines), and the analysis must be completed by a qualified marine archaeologist who meets both the Secretary of the Interior’s Professional Qualifications Standards (48 Federal Register (FR) 44738–44739) and has experience analyzing marine geophysical data. This analysis must include a determination whether any potential archaeological resources are present in the area and the geotechnical (sub-bottom) sampling activities must avoid potential archaeological resources by a minimum of 50 m (164 ft). The avoidance distance must be calculated from the maximum discernible extent of the archaeological resource. In no case may the Lessee’s actions impact a potential archaeological resource without BOEM’s prior approval.

Additionally, during all ground-disturbing activities, including geotechnical exploration, BOEM requires that the Lessee observe the unanticipated finds requirements stipulated in 30 CFR 585.802. If the Lessee, while conducting activities, discovers a potential archaeological resource while conducting construction activities or other activities, the Lessee must immediately halt all seafloor-disturbing activities within the area of discovery, notify BOEM within 72 hours of the discovery, and keep the location of the discovery confidential and not take any action that may adversely affect the resource until BOEM has made an evaluation and instructed the Lessee on how to proceed.

Finally, vessel traffic associated with survey activities, although indistinguishable from existing ocean vessel traffic, could at times be within the viewshed of onshore historic properties. These effects would be limited and temporary.

3.10.2.2 Site Assessment

As described in Section 2.1 above, site assessment activities consist of construction, operation, and decommissioning of one to two meteorological buoys on a lease. To assist BOEM in complying with the National Historic Preservation Act (NHPA) and other relevant laws (30 CFR 585.611(a), and (b)(6)), the SAP must contain a description of the archaeological resources that could be affected by the activities proposed in the plan. Under its Programmatic Agreement (PA) (Appendix C), BOEM will then consult to ensure potential effects to historic properties are avoided, minimized, or mitigated under Section 106 of the NHPA.

BOEM anticipates that bottom disturbance associated with the installation of meteorological buoys would disturb the seafloor in a maximum radius of 239 m (784 ft) around each buoy anchor location. This includes all anchorages and appurtenances of the support vessels. Impacts on archaeological resources within 239 m (784 ft) of each meteorological buoy would result from direct destruction or removal of archaeological resources from their primary context. Although this would be extremely unlikely given that site characterization surveys described above would be conducted prior to the installation of any structure (see e.g., 30 CFR 585.610-611), should contact between the activities associated with site assessment and a historic property occur, there may be damage or loss to archaeological resources.

Should the surveys reveal the possible presence of an archaeological resource in an area that may be affected by its planned activities, the applicant would have the option to demonstrate through additional investigations that an archaeological resource either does not exist or would not be adversely affected by the seafloor/bottom-disturbing activities (see 30 CFR 585.802(b) and the PA in Appendix C). Although site assessment activities have the potential to affect cultural resources either on or below the seabed or on land, existing regulatory measures, coupled with the information generated for a Lessee's initial site characterization activities and presented in the Lessee's SAP, make the potential for bottom-disturbing activities (e.g., anchoring, installation of meteorological buoys) to cause damage to cultural resources very low.

Installation of meteorological buoys would likely not be visible from shore based on the low profile of the structure; distance from shore; and earth curvature, waves, and atmosphere. Visual impacts to onshore cultural resources would be limited and temporary in nature and would consist predominately of vessel traffic, which most likely also would not be distinguishable from existing vessel traffic. Therefore, the likelihood of impacts on onshore cultural resources from meteorological structures and from construction vessel traffic also would be very low.

Conclusion

Bottom-disturbing activities have the potential to affect historic properties. However, existing regulatory measures, information generated for a Lessee's initial site characterization activities, and the unanticipated discoveries requirement make the potential for bottom-disturbing activities (e.g., coring, anchoring, installation of meteorological buoys) to have an adverse effect (i.e., cause significant impact or damage) on historic properties, very low. Visual impacts on onshore cultural resources from meteorological structures, and vessel traffic associated with surveys and structure construction, are expected to be negligible and temporary in nature.

3.10.3 No Action Alternative

Under the No Action Alternative, no leases or grants would be issued in the Humboldt WEA at this time, and therefore no lease-related site assessment and characterization impacts on offshore cultural, historical, or archaeological resources would occur. Although leases would not be issued under the No Action Alternative, BOEM expects ongoing activities (such as bottom trawling) and changing environmental conditions to have continuing impacts.

3.11 ENVIRONMENTAL JUSTICE

The effects of this federal action on minority and low-income populations were considered for this analysis in accordance with Executive Order (EO) 12898 (FR 1994), EO 14008 (FR 2021), and the CEQ Environmental Justice Guidance Under NEPA (CEQ 1997).

3.11.1 Affected Environment

The Proposed Action's potential area of impact on the human environment is Humboldt County, California, which is the corresponding onshore area with respect to the Humboldt WEA. The county is heavily forested and mountainous with 80 percent of its 2.3 million ac being heavily wooded. Approximately one-quarter of the county is agricultural.

A major geographic feature of Humboldt County is Humboldt Bay, which stretches 22.5 km (14 mi) along the county's western shoreline. The land area around Humboldt Bay contains most of the county's population, concentrated in the cities of Eureka (the county seat), Arcata, Fortuna, and the CDP, McKinleyville.

3.11.1.1 Demographics

In Table 3-12, Humboldt County demographics are compared to those of the SOC to determine if there is a basis for disproportionate impact.

Table 3-12: Demographic Analysis Comparing Humboldt County to California

Category	Humboldt County	California
Total population	135,558	39,512,223
White alone	83.2%	71.9%
Black or African American alone	1.5%	6.5%
American Indian and Alaska Native alone	6.4%	1.6%
Asian alone	2.9%	15.5%
Native Hawaiian and Other Pacific Islander alone	0.3%	0.5%
Hispanic or Latino	12.1%	39.4%
White alone, not Hispanic or Latino	73.8%	36.5%
Persons in poverty	19.1%	11.8%
Language other than English spoken at home age 5 years +	11.7%	44.2%

Source: U.S. Census Bureau, 2019.

Environmental justice issues most often occur on a localized, sub-county scale. The EPA's EJSCREEN tool was used to construct Table 3-13 to determine if there are concentrated pockets of minority or low-income populations whose numbers are obscured by regional demographics. Table 3-13 shows demographic data for a 4.8-km (3-mi) radius using Fields Landing, Schneider Dock, and the city of Arcata as epicenters. Fields Landing and Schneider Dock were chosen because they were identified by a BOEM study as being potential sites for wind energy staging activities (Porter 2016). The city of Eureka, as well as a third potential staging site, Redwood Terminal, is encompassed in the 4.8-km (3-mi) radius of Schneider Dock. The city of Arcata was chosen because it characterizes the demographics near the northern terminus of Humboldt Harbor and is also the second most populous city in Humboldt County.

Table 3-13: Demographic Analysis of Three Selected Locations Near Humboldt Bay

Category	Fields Landing	Schneider Dock	Arcata
Population	5,717	36,884	20,936
White	78%	77%	93%
Black	1%	2%	3%
American Indian	1%	3%	2%
Asian	7%	6%	2%
Pacific Islander	1%	6%	0%
Other	5%	0%	7%
Total Hispanic Population	15%	12%	16%
Speak English Less Than "Very Well"	25%	17%	7%
Spanish Spoken at Home	14%	8%	11%
Household Income Base <$25,000	17%	28%	37%
Household Income Base <$50,000	40%	56%	62%

3.11.2 Impacts of the Proposed Action

The Proposed Action involves one or more vessels conducting geophysical and geological operations and deploying and servicing buoys. The IPFs with respect to environmental justice are related to air and water pollutant releases. The air emissions are derived primarily from internal combustion engines used for propulsion of the vessels and auxiliary engines used for powered equipment such as cranes and winches. These emissions are primarily NO_x, SO_2, CO, and PM. Other sources are the emission of hydrocarbons from fuel and lubricants. Fuel and lubricants can be released during both normal operations and in emergency conditions. In the unlikely event of a marine vessel capsize or hull breach, hydrocarbons will enter the marine environment and either vaporize or become entrained in the seawater. Liquid and gaseous pollutants can also be released during the vessel refueling process and as breathing losses from storage tanks. The possibility of hydrogen releases from buoy lead-acid batteries exists but is negligible.

Conclusion

- Due to the limited scope and short duration of activities, the Proposed Action is not expected to cause any notable adverse effects in the communities surrounding Humboldt Bay, nor in further inland portions of Humboldt County. Therefore, no disproportionately high adverse human health or environmental effects on minority and low-income populations are expected.
- The population of the affected area is overwhelmingly white, and the proportions of minorities are all below California percentages, except for the American Indian population (6.4 percent in

Humboldt County compared to 1.6 percent in California).

- In Humboldt County, low income appears to be the most relevant environmental justice criteria. The poverty level is 19.1 percent compared to California's 11.8 percent. In Arcata, 62 percent of households make less than twice the federal poverty level. Compared to California and the U.S., the Redwood Coast Region (which includes Humboldt County) has higher poverty rates for every race/ ethnicity (Van Arsdale et al. 2008).
- Two of the basic tenets of environmental justice are disclosure and public participation. There is a large Hispanic population in Humboldt County, and a number of people may have Limited English Proficiency. This potential problem may be resolved by providing translation and interpretation services to the public.

3.11.3 No Action Alternative

Under this alternative, commercial leases and grants would not be issued in the Humboldt WEA. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts. For the reasons stated above, however, these ongoing impacts are not expected to have disproportionately high adverse human health or environmental effects on minority and low-income populations.

3.12 TRIBES AND TRIBAL RESOURCES

3.12.1 Affected Environment

A number of Tribes have ancestral and current connections to northern California coasts, offshore areas, and marine species and ecosystems. Tribes' connections to the region include their traditional and ancestral homelands, reliance on migratory marine/anadromous resources for food and cultural connections, and stewardship of marine resources and ecosystems within their ancestral waters (Van Pelt et al. 2017)). Tribes often identify the abundant natural resources of the Northern California region, especially salmon and other anadromous fish and the coastal redwood forest ecosystems, as a vital element of their lifeways and cultural identities (Wiyot Tribe 2021a; Yurok Tribal Council 1993). Coastal landscapes and seascapes, including viewsheds, are integral and sacred elements of Tribal cultural connections to the region. Tribes with ancestral ties to the coast have expressed to BOEM that their territory extends from the coast "as far as the eye can see." Additionally, as discussed in Section 3.10, Historic Properties, before the last rise in sea levels, the coastline of the region extended beyond the present-day coast to include now-submerged areas that were likely inhabited by ancestors of northern California Tribes.

The coastline and coastal areas of northern California near Humboldt Bay and the Humboldt WEA are within or near the traditional cultural region of several Tribes and cultural groups. These include Wiyot-, Yurok-, Mattole-, Chilula-, Whilkut-, Nongatl-, and Sinkyone-affiliated Tribes (CANAHC 2021a; Van Pelt et al. 2017). Humboldt Bay and the surrounding land area is within the cultural region of Wiyot-affiliated Tribes. Wiyot-affiliated Tribes include Blue Lake Rancheria, Bear River Band of the Rohnerville Rancheria, and the Wiyot Tribe (CANAHC 2021c). Blue Lake Rancheria identifies their location as within the aboriginal territory of the Wiyot people (Rancheria 2021). The Bear River Band of the Rohnerville Rancheria identify themselves as people of the Eel River basin (BRBRR 2021). The Wiyot Tribe define their ancestral homelands as ranging from the Little River to the north, Bear River Ridge to the south, and from the Pacific Coast out to as far as Berry Summit in the northeast and Chalk Mountain in the southeast (Wiyot Tribal Council 2017). Within their homelands, the Wiyot identify their role as stewards of the physical and biological resources on which they have traditionally relied (Wiyot Tribal Council

2021). Marine resources fill important roles in the Wiyot's connection to the region and their overall well-being: "marine resources, especially anadromous species, such as valuk (salmon), tswal (steelhead), ba'm (green sturgeon), and gou'dow (Pacific lamprey), are integral to the well-being of the Tribe (Hernandez 2019). Within Humboldt Bay, Tuluwat Island is a culturally significant and important Wiyot historic site (Wiyot Tribe 2021b). The historic site of two Wiyot villages, Tuluwat Island was traditionally the location of the Tribe's annual World Renewal Ceremony. A series of orchestrated massacres by settlers during the World Renewal Ceremony occurred on Tuluwat Island in 1860. The Wiyot Tribe regained full ownership and management of the Island in 2019 (Greenson 2019; Helvarg 2020).

To the north of Humboldt Bay, the cultural region of Yurok-affiliated Tribes and Yurok's ancestral homelands covers coastal and inland regions spanning the border between what are today Humboldt and Del Norte Counties (CANAHC 2021a; Yurok Tribe 2014). Yurok-affiliated Tribes include Big Lagoon Rancheria, Blue Lake Rancheria, Cher-Ae Heights Indian Community of the Trinidad Rancheria, Resighini Rancheria, and the Yurok Tribe (CANAHC 2021d). The Klamath River and its related streams provide essential cultural, subsistence, and spiritual connections to the land and ocean: "*The Yurok people's traditional subsistence diet and practices they derive from the river and coast are a vital part of their cultural identity, creating an intricate connection between them, the species, river, land, and seasons,"* (Cozzetto et al. 2018). Coastal areas to the south of Humboldt Bay, in what are today southern Humboldt and Mendocino counties, are within the traditional and cultural regions of Mattole, Sinkyone, and Yuki (CANAHC 2021a).

Other Tribes in the Northern California region whose ancestral lands are farther from the Humboldt WEA maintain cultural, spiritual, and customary connections to marine resources of the region. Pacific salmon, Pacific lamprey, steelhead, and other anadromous fish resources are culturally significant to northern California Tribes, including those farther inland, who harvest from rivers. Tribes farther along the coast from the Humboldt Bay area value the broader northern California and Pacific Northwest marine ecosystem as a whole, as well as migratory marine species that could be impacted by activity in the Humboldt WEA. Along the coast north of Humboldt Bay, the ancestral homelands of the Tolowa Dee-Ni' Nation cover coastal and riverine areas spanning the California-Oregon border, roughly between the Smith and Sixes rivers (Tolowa Dee-ni' Nation 2016). Tolowa-affiliated Tribes include Big Lagoon Rancheria, Blue Lake Rancheria, Cher-Ae Heights Indian Community of the Trinidad Rancheria, Elk Valley Rancheria, and the Tolowa Dee-ni' Nation (CANAHC 2021b). Tolowa peoples traditionally fished and hunted sea lions and other marine species from redwood canoes (Bommelyn 2011). A number of inland Tribes in the Northern California region have connections to the marine environment through river systems and their associated migratory species. These include the Karuk Tribe in what is today Del Norte County (Karuk Tribe 2019) and the Hoopa Valley Tribe in the Trinity River valley, and Shasta-affiliated tribes in several northwest California counties and southern Oregon. Anadromous fish runs in the Klamath River and its tributaries, as well as other river systems, are of vital cultural importance to these Tribes (Karuk Tribe and Salmon River Restoration Council 2017; Marshall 2018). Other Tribes who may be connected to marine resources through river systems include Lassik- and Wailaki-affiliated Tribes along the Eel and Van Duzen rivers (Van Pelt et al. 2017). To the south, the cultural region of Pomo-affiliated tribal groups covers coastal and inland areas of what are today Sonoma and Lake counties, and coastal Pomo Tribes traditionally utilized marine resources such as fish, abalone, muscles, and seaweed, as well as other coastal resources (CANAHC 2021a; Van Pelt et al. 2017).

The importance of fish resources, and access to fisheries, is a connecting theme among many Tribes in northern California. Tribes in the region traditionally fished in marine waters and inland rivers and streams, often relying on anadromous fish runs as a major food source and as an important element of their cultural identity. Many Tribes in the region have federally and state recognized rights to fish certain waters, often protected through treaties. Tribal members are keenly aware of their fishing rights and the role of treaties in protecting their rights (Marshall 2018). In addition to in-river fishing rights, Tribes in California have a right to hunt, fish, and gather in marine waters. The West Coast Ocean Tribal Caucus's tribal engagement guidance (West Coast Ocean Tribal Caucus 2020) states: "*In California, 'California Native American Tribes' are defined as both federally recognized Tribes and non-federally recognized Tribes that are listed on the California Native American Heritage Commission's Contact List. Tribal Governments retain all hunting, fishing, and gathering rights within marine waters; these rights were never ceded and have never been explicitly revoked by Congress. In recognition of those retained rights, California law affirms the right of federally recognized Tribes to utilize marine resources within specific marine protected areas for subsistence, cultural, and other related purposes. Federal law likewise has acknowledged some California Tribal Governments' rights to fish in-river."*

Tribes in northern California were displaced from much of their ancestral homelands with the arrival of large numbers of white settlers in the mid-19th century following the discovery of gold in California. The subsequent onslaught of disease, vigilante violence and genocide, forced removals, and unfulfilled treaties resulted in tremendous population declines and displacement from loss of Tribal lands. Many Tribal landholdings now consist of a number of Rancherias located throughout the Northern California region. Unique to California and resulting from a history of land-takings and broken treaties, Rancherias are often composed of individuals from a number of Indian Nations or Bands. Many Rancherias are federally recognized Tribes, and they provide governance and services and operate business ventures to serve their Tribal members. Rancherias in the Northern California coastal region include: the Bear River Band of the Rohnerville Rancheria, Table Bluff Rancheria, Blue Lake Rancheria, Cher-Ae Heights Indian Community of the Trinidad Rancheria, Big Lagoon Rancheria, Elk Valley Rancheria, and Smith River Rancheria (CANAHC 2021a). Tribal rosters of the Rancherias may include people of Wiyot, Mattole, Yurok, Hoopa, and Tolowa descent, along with other regional Native cultural groups, depending on the specific Rancheria. In addition to these Rancherias, the Yurok Reservation extends along the Klamath River from the river mouth to approximately 70.8 km (44 mi) upriver, and the Hoopa Valley Reservation centers on the Trinity River. Tribal governments provide a variety of services for their members and consult with other government entities on issues of importance to their Tribes and members. Several Tribes in the region have successfully worked to re-acquire traditional Tribal lands or have supported conservation initiatives to gain protected status for traditional land areas (ISWC 2021; Kleinschnitz and Tully 2021; Oxendine 2021).

Several Tribes operate economic and commercial ventures tied to coastal and marine resources which are essential to the livelihoods of some Tribal members. Tribal enterprises provide revenue for Tribes to support services and economic opportunities for their members, and commercial and business enterprises operated by Tribal members provide important sources of income. Coastal and marine-related enterprises include commercial fisheries, marine-based tourism and recreation businesses, small boat harbor service, and other small businesses. Other businesses are indirectly tied to the health of the environment and natural resources of the region such as tourism, recreational charters, and hotels/ hospitality. Additionally, some Tribes in the region have expressed interest in potential economic benefits of offshore wind energy for Tribes, including workforce development (Ciara et al. 2020). Tribes have identified the importance of local involvement and control over offshore wind development as a critical aspect of broader economic benefits (workforce development, regional energy independence, etc.) of offshore wind development (Ciara et al. 2020).

Tribes in northern California are facing changing environmental conditions and impacts from the effects of climate change. Several Tribes in the region are working to address and adapt to impacts of climate change on traditional Tribal rivers, including impacts on fisheries. In recent years, rivers in the region have experienced fish die-off events affecting fish species traditionally harvested by Tribes, particularly Pacific salmon. The Wiyot Tribe issued an emergency declaration for several of their traditional rivers that are affected by drought conditions and warmer temperatures, as well as other impacts that have led to diminished native fish populations (Wiyot Tribal Council 2021). The Klamath River, important to the Yurok, Hoopa, and Karuk Tribes, has had drought declarations in 8 out of the last 12 years (Karuk Tribe 2021a). The Karuk Tribe declared a climate emergency in response to record low precipitation in the Klamath Basin and a related fish die-off in the summer of 2021 (Karuk Tribe 2021b), and the Yurok Tribe is also experiencing effects of the juvenile salmon die-off (Yurok Tribe 2021). The Karuk and Hoopa Tribes also requested, and were granted, fishery disaster assistance for loss of Klamath River commercial salmon fisheries from the Secretary of Commerce for several seasons. Causes for the fishery disasters were identified as changing ocean conditions, drought, degraded Klamath River water quality, and fish disease (NMFS 2021). In addition to impacts on their rivers, Tribes are facing increased wildfire frequency and intensity, which can impact Tribal lands and put strains on Tribal response resources. Tribal, local, state, and federal governments, along with other partners, are working to mitigate and minimize causes of climate-related impacts on Tribes and Tribal resources in the region (e.g., California Energy Commission et al. 2018; (Karuk Tribe 2019); (Yurok Tribe 2021); STACCWG 2021).

3.12.2 Impacts of the Proposed Action

This analysis considers impacts from issuance of lease(s) in the Humboldt WEA, site assessment activities, and site characterization. Development, construction, and operation of a wind farm is not included in this assessment; such activities would be analyzed following submission of a COP by a lease holder. Impacts on Tribes and Tribal resources of lease issuance, site assessment, and site characterization are assessed in the context of spatial and temporal considerations and the potential for avoidance or reduction of impacts through mitigation. The assessment of potential impacts to Tribes is informed by communications between Tribes and BOEM through a number of informational and consultation meetings broadly relating to offshore energy development in California over several years. While the topic of these meetings varied over time, the issues raised by Tribes are informative of potential impacts of energy development activities in the region. BOEM and the California Renewable Energy Task Force held a number of meetings with California Tribes to discuss potential issues and concerns related to offshore wind in general; these meetings and the issues raised are summarized in BOEM and CEC (2018). In addition, a summary of Government-to-Government consultations with Tribes regarding the Humboldt WEA is provided in Chapter 4.3, Consultation.

Impacts on Tribes and Tribal resources in the region could occur through impacts on biological or archaeological resources important to Tribes from noise, bottom disturbance, and entanglements. Tribes may also be impacted by nearshore survey vessel traffic, economic impacts, and changes in coastal viewsheds. Tribal representatives have expressed to BOEM that Tribes identify themselves as part of their inter-connected coastal ecosystems and they often consider impacts to other elements of the ecosystem to be impacts on the Tribe since they view everything as interconnected.

3.12.2.1 Noise

In discussions with BOEM about offshore wind in California, some Tribal representatives expressed an interest in understanding the impacts of noise during site characterization surveys on marine species. Tribes may identify impacts to Tribal resources if fish, marine mammals, and other marine organisms are affected by noise produced during HRG surveys. As described in Section 3.4, Marine and Coastal Habitats and Associated Biotic Assemblages, impacts to fish and EFH from HRG surveys and vessels are expected to be minimal and temporary in duration. No fish species are identified as potentially experiencing population-level impacts from HRG survey or vessel noise. Impacts to marine mammals, along with required mitigation measures to reduce impacts, are described in Section 3.5, Marine Mammals and Sea Turtles. Noise impacts on marine mammals from HRG surveys are expected to be negligible and consist primarily of short, intermittent behavioral effects on individual animals. Overall, impacts of noise on marine species potentially valued by Tribes are expected to be negligible to minimal. Throughout the leasing and site assessment process, BOEM will continue to engage with Tribes interested in HRG surveys, associated noise, and potential effects on marine organisms.

3.12.2.2 Bottom Disturbance and Entanglements

Bottom disturbance associated with seafloor and sub-bottom sampling, metocean buoy anchoring, and recovery of lost survey equipment has potential to impact Tribal resources through effects on submerged and buried archaeological sites and cultural resources, and through impacts on biological resources from benthic disturbance. As described in Section 3.10, Historic Properties, areas off the coast that were once above sea level may contain submerged landscapes that were once inhabited by pre-contact Native peoples. These paleolandscapes, and any potential archaeological and cultural resources they may contain, could hold cultural importance for Northern California Tribes. As identified in Section 3.10, Historic Properties, water depths in the Humboldt WEA preclude potential for submerged paleolandforms or pre-contact archaeological resources, although cable route survey activities or recovery of lost survey equipment along cable routes have potential to impact such resources in shallower water depths (less than approximately 120 m (393 ft)). Impacts on archaeological resources from seafloor disturbance would be avoided or mitigated by the requirement for an archaeological survey prior to the occurrence of any seafloor disturbing activities within the lease area.

Section 3.4, Marine and Coastal Habitats and Associated Biotic Assemblages, describes impacts of bottom disturbance on fish and invertebrates as being localized to the area of sampling or survey equipment recovery and the buoy anchors, and temporary in duration. In addition, Section 3.5, Marine Mammals and Sea Turtles, identifies potential impacts to marine mammals from entanglement with survey equipment or metocean buoy mooring systems to be discountable. Overall, impacts of bottom disturbance or entanglements on potential Tribal resources are expected to be negligible.

3.12.2.3 Vessels

Vessels associated with site assessment and characterization have potential to impact Tribes through interference with Tribal uses of the Humboldt Bay and offshore areas for cultural and commercial and customary fishing activities.

BOEM assumes vessels supporting surveys and metocean buoy installation would launch from the Port of Humboldt Bay or another existing port facility, and no additional onshore infrastructure would be needed. Should the Port of Humboldt Bay serve as the base of survey operations and, depending on which dock facilities within the port are used, lease-related vessels may be visible from parts of Tuluwat Island, a culturally important location for the Wiyot Tribe. However, BOEM expects the types of vessels and the level of vessel activity departing from and entering Humboldt Bay to mostly be indistinguishable from the existing level of vessel activity. After departing Humboldt Bay, vessels would transit directly to the leased area(s) within the WEA, approximately 32 km (20 mi) from shore.

Survey vessels transiting from ports to the WEA lease area(s) also have potential to coincide with nearshore and offshore Tribal fishing activities. A number of Tribes in the region maintain rights to customary subsistence and commercial fisheries, including marine fisheries (West Coast Ocean Tribal Caucus 2020)). As with other fishing groups, there is potential for Tribal fishers to experience reduced efficiency of fishing efforts from increased vessel congestion in ports and nearshore areas. The level of increased vessel activity and associated potential space-use conflicts with Tribal fishers would likely result in few short-term occurrences or would be indistinguishable from existing levels of vessel activity in nearshore areas. Accidental impacts such as damage or entanglement to Tribal fishers' gear from survey vessels or debris are possible, but the likelihood of such events can be reduced or avoided through general vessel safety mitigation measures, as described for commercial fishing (Section 3.7). Overall, impacts from near-shore vessel activities are anticipated to be negligible to minor given the limited total number of vessel trips expected in the context of existing levels of activity in the Humboldt Bay region.

3.12.2.4 Economic Impacts

Employment and income-related economic impacts in northern California counties from site assessment and characterization activities are expected to be short-term and imperceptible compared to existing conditions (Section 3.9, Socioeconomics). Considering the temporary nature and limited anticipated economic effects of site assessment and characterization activities, economic impacts on Tribes from these activities is expected to be temporary and would represent a limited change, if any, from existing conditions. Overall, economic impacts on Tribes from site assessment and characterization activities are expected to be negligible.

Several Tribes in the region have expressed interest in involvement in energy transitions and in participation in planning processes and potential opportunities in later offshore wind development stages (BOEM and CEC 2018; Ciara et al. 2020). Economic impacts of commercial wind development in the Humboldt WEA, including economic impacts on Tribes, would be analyzed for any COP(s) Lessees submit for leases within the WEA.

3.12.2.5 Changes in Coastal Viewsheds

Changes in coastal viewsheds could impact Tribes for whom unobstructed coastal views hold important cultural and spiritual significance. However, at the lease issuance and site assessment and characterization phase, visual impacts on coastal viewsheds are not anticipated. The Humboldt WEA is over 32 km (20 mi) from shore, and the metocean buoy(s) is not expected to be noticeably visible from shore. A visual resource impact assessment of installed wind turbines would be included in the analyses of specific COP(s) should Lessee(s) choose to submit a COP.

Conclusion

Potential impacts to Tribes and Tribal resources from effects of noise, bottom disturbance, and entanglements on resources important to Tribes are expected to be negligible based on the impact assessment of these factors on fish, marine mammals, and historic properties. Impacts of increased vessel activity on Tribal uses of coastal and nearshore areas would be negligible to minor because vessel activity would likely be mostly indistinguishable from existing levels, or would be temporary, and would not extend beyond the immediate timeframe of survey activities. Impacts of vessels on nearshore and offshore Tribal fishing activities would likely be negligible to minor, with potential for short-term space-use conflicts between individual vessels. Impacts on Tribes from economic effects of the Proposed

Action would be negligible. No impacts from changes in coastal viewsheds are anticipated for site assessment and characterization activities. Overall, impacts to Tribes and Tribal resources from the Proposed Action are expected to be negligible to minor.

3.12.3 No Action Alternative

Under the No Action Alternative, BOEM would not hold a lease sale within the Humboldt Bay WEA, and no lease-related site assessment and characterization activities would occur. Although leases would not be issued under the No Action Alternative, BOEM expects ongoing activities and planned actions, along with changing environmental conditions, to have continuing local and regional impacts on Tribes and Tribal resources over the timeframe considered in this EA.

Ongoing and expected future actions that may impact Tribes and marine Tribal resources include continued commercial and recreational vessel traffic, port utilization and maintenance, commercial and recreational fishing, nearshore maintenance and development projects, and ongoing and future water management regimes, including dams. These actions have potential to produce space-use conflicts or impacts on resource availability for Tribal members; however, such impacts are, for the most part, expected to represent a continuation of existing conditions and impact levels. The largest current and anticipated future contributors to impacts on Tribes and Tribal resources stem from ongoing changes in environmental conditions related to climate change, combined with other factors. Such impacts include drastic declines in Tribal fisheries, particularly several salmon runs as evidenced by recent fisheries disaster petitions and Tribal emergency declarations (Marshall 2018); (NMFS 2021). Tribes and Tribal resources are also expected to be impacted by continuation of recent patterns of increased drought conditions and wildfire frequency and severity (California Energy Commission et al. 2018). Over the timeframe considered in this EA, impacts on Tribes and Tribal resources of ongoing activities and planned actions, along with climate change, are expected to range from minor for most ongoing and planned actions, to moderate, with potential for more severe impacts, when considering climate change.

4 Consultation and Coordination, and Stakeholder Comments

4.1 PUBLIC INVOLVEMENT

In May 2021 the White House, the Departments of the Interior and Defense, and the State of California jointly announced an agreement to advance areas for offshore wind off the northern and central coasts of California in line with the National goal of 30 gigawatts of offshore wind energy by 2030. The BOEM Pacific Regional Office convened the first California Intergovernmental Renewable Energy Task Force (Task Force) meeting on October 16, 2016. The Task Force is a partnership of members of state, local, and federally recognized Tribal governments and federal agencies. The Task Force first met in 2016 and serves as a forum to discuss stakeholder issues and concerns; exchange data and information about biological and physical resources, ocean uses and priorities; and facilitate early and continual dialogue and collaboration opportunities.

BOEM worked in partnership with the State of California to outreach and involve the public in wind energy planning offshore California starting in 2016. After many meetings with the Task Force and t, BOEM issued a Call for Information and Nominations (Call) in the Federal Register in October 2018 and received 118 comments and 14 nominations. In addition to public comment opportunities, BOEM and the State of CA Coordination organized additional outreach and engagement with Tribal Governments, and public stakeholders in over 80 in-person meetings. An outreach document summarizes these activities through 2020 in the CA Offshore Wind Energy Planning Outreach Summary Report. An addendum was published in June 2021 to document the outreach from 2020.

BOEM conducted public scoping to inform the development of an EA on the Humboldt WEA, located approximately 34 km (21 mi) offshore from the city of Eureka in Humboldt County, California. During the 45-day scoping period, BOEM hosted two virtual public scoping meetings to outline its formal environmental review process under NEPA and to solicit public input on issues to be considered. The public scoping period ended on September 13, 2021.

4.2 SUMMARY OF SCOPING COMMENTS

BOEM received 52 comments from the public, agencies, and other interested groups and stakeholders. This included written comments from 28 sources, 23 public meeting comments, and one phone call. Two comments were received after the close of the scoping period. BOEM received comments on the following topics:

4.2.1 Offshore Wind Leasing

Comments about BOEM lease areas included requests to move the area closer to metropolitan centers and other requests that the lease area be moved farther offshore.

4.2.2 The NEPA Process

The EPA recommended that the EA compare and present impacts to resources against the existing conditions baseline using a consistent method to measure project impacts for all alternatives. Other commenters noted that development of a wind port also requires an inclusive, transparent, and deliberate process that considers long-term ramifications of industrializing an existing port.

4.2.3 Tribal Concerns

The EPA recommended the EA address the existence of sacred sites in the Project Area that may be considered spiritual sites by regional tribal nations.

4.2.4 Environmental Resources

Several comments expressed concerns about protection of avian and mammal species. Comments covered individual species analysis, collision, entanglement, and displacement.

The EPA requested BOEM address how climate change could potentially influence the Project Area; asked how implementation of the proposed project activities could lessen or potentially mitigate for these impacts; asked BOEM to include a list of all mitigation measures to be implemented as part of project activities; and requested the EA include a detailed discussion of ambient air conditions.

4.2.5 Commercial, Tribal, and Recreational Fishing

Commenters brought up possible use conflicts in the WEA and how these could impact fishing. Commenters requested meaningful participation and more involvement in the general offshore wind process. Groups and individual fishermen highlighted different impacts to the fishing industry and their livelihood. One commentor suggests that BOEM assist in finding other areas for the fishing industry to replace the economic loss from the Humboldt WEA.

4.2.6 Comments Noted but Outside of the Proposed Actions for the Scoping Process

Many commenters had concerns about turbine technologies, their interface with the environment, and the impact of wind towers on the viewshed of coastal areas. Other recommendations had general requests for further data acquisition relating to the seafloor, the benthic environment, economics, water quality, and other resources.

4.3 CONSULTATION

4.3.1 Endangered Species Act

Section 7(a)(2) of the ESA requires each federal agency to ensure that any action that they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the adverse modification of designated critical habitat. To satisfy its ESA obligations, BOEM consults with NMFS and USFWS regarding potential impacts to listed species and designated critical habitat under each Service’s jurisdiction.

BOEM is in discussions with NMFS and USFWS regarding the Proposed Action. BOEM has determined that accurate impact assessments of the potential for the site assessment and site characterization activities considered in this EA, to jeopardize the continued existence of ESA-listed species and/or adversely modify designated critical habitats, will only be possible when project-specific information is available. As such, BOEM will comply with the ESA by following appropriate ESA consultation strategies with NMFS and USFWS when more detailed information is available. BOEM has communicated this approach to the relevant NMFS ESA staff in Long Beach, CA as well as staff in the USFWS Arcata Field Office.

4.3.2 Marine Mammal Protection Act

To ensure compliance with the MMPA, per BOEM regulation 30 CFR§ 585.801(b), BOEM lease requirements will stipulate that lease holders must not conduct any activity under their lease that may result in an incidental taking of marine mammals until the appropriate authorization has been issued under the MMPA of 1972 as amended (16 USC 1361 et seq.).

4.3.3 Essential Fish Habitat Consultation

The Magnuson-Stevens Fishery Conservation and Management Act (as amended) requires federal agencies to consult with NMFS regarding actions that may adversely affect designated EFH. As for ESA, BOEM communicated with the NMFS California Coastal Office that the appropriate consultation strategy will follow when more detailed, project-specific, information is available.

4.3.4 Coastal Zone Management Act

The Coastal Zone Management Act requires that Federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be “consistent to the maximum extent practicable” with relevant enforceable policies of the state’s federally approved coastal management program (15 CFR 930 Subpart C). BOEM prepared a Consistency Determination (CD) under 15 CFR 930.36(a) to determine whether issuing leases and site assessment activities (including the construction/installation, operation and maintenance, and decommissioning of meteorological buoys) in the Humboldt WEA was consistent to the maximum extent practicable with the provisions identified as enforceable by the Coastal Zone Management Programs of the state of California.

4.3.5 National Historic Preservation Act

Section 106 of the NHPA (54 U.S.C. § 306108) and its implementing regulations (36 CFR 800) require Federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment. BOEM has determined that issuing commercial or research leases within the Humboldt WEA and granting ROWs and RUEs within the region constitutes an undertaking subject to Section 106 of the NHPA (16 U.S.C. 470f) and its implementing regulations (36 CFR § 800) as the resulting site characterization and site assessment activities have the potential to cause effects on historic properties.

BOEM has implemented a Programmatic Agreement pursuant to 36 CFR § 800.14(b) to fulfill its obligations under Section 106 of the NHPA for renewable energy activities on the OCS offshore California. BOEM initiated consultation through letters on August 4, 2021, with the California State Historic Preservation Office (SHPO), Advisory Council on Historic Preservation, and the following federal recognized Tribal Nations: Bear River Band of the Rohnerville Rancheria, Big Lagoon Rancheria, Blue Lake Rancheria, Cher-Ae Heights Indian Community of the Trinidad Rancheria, Elk Valley Rancheria, Hoopa Valley Tribe, Karuk Tribe, Resighini Rancheria, Tolowa Dee-ni` Nation, Wiyot Tribe, and Yurok Tribe. BOEM further identified potential consulting parties pursuant to 36 CFR § 800.3(f) through an August 4, 2021, letter to certified local governments, historical preservation societies, and museums, which solicited public comment and input regarding the identification of, and potential effects on, historic properties for the purpose of obtaining public input for the Section 106 review (36 CFR § 800.2(d)(3)) and invited them to participate as a consulting party. BOEM will continue with the consultation process as the Draft EA circulates for Public Comment.

5 List of Preparers and Reviewers

The individuals responsible for preparing this EA are listed below:

Name	**Role in NEPA Process**
Meghan Cornelison	Environmental Justice, Tribes and Tribal Resources
Robert Dame	Geology
Lisa Gilbane	Project Supervisor
Pamela Grefsrud	Water Quality
Katsumi Keeler	Environmental Justice
Tim Harper	Socioeconomics
Katsumi Keeler	Air Quality
David Pereksta	Coastal and Marine Birds
Desray Reeb	Marine Mammals and Sea Turtles
Donna Schroeder, Susan Zaleski	Commercial Fishing Marine and Coastal Habitats and Associated Biotic Assemblages
Tim Harper	Recreation and Tourism
David Ball	Historic Properties
Susan Zaleski, Melanie Hunter	NEPA Coordinators
Shannon Vivian	Technical Writer/Editor

6 References

Allen, L.G., D.J. Pondella, and M.H. Horn. eds., 2006. The ecology of marine fishes: California and adjacent waters. Univ of California Press. Shown as Stephens, et al., 2006.

Anonymous. 2012. Whale drowns after getting hooked on ship's anchor chain. Anchorage Daily News, May 17, 2012 (as cited in Benjamins et al., 2014).

Bartol, S.M. and D.R. Ketten. 2006. Turtle and tuna hearing. US Department of Commerce, NOAA-TM-NMFS-PIFSC. NOAA Tech. Memo. 7, 98-103.

Bartol, S.M., J.A. Musick, and M. Lenhardt. 1999. Auditory evoked potentials of the loggerhead sea turtle (*Caretta caretta*). Copeia 99(3):836-840.

Benjamins, S., V. Harnois, H. Smith, L. Johanning, L. Greenhill, C. Carter, and B. Wilson. 2014. Understanding the potential for marine megafauna entanglement risk from renewable marine energy developments. Scottish Natural Heritage Commissioned Report No. 791.

BLM (Bureau of Land Management), U. S. Department of the Interior. 1980. Final Environmental Impact Statement Proposed 1981 Outer Continental Shelf Oil and Gas Lease Sale Offshore Central and Northern California, OCS Sale No. 53. Volume 1.

CDFW (California Department of Fish and Wildlife). 2021. Final California Commercial Landings, 2009 – 2018. https://wildlife.ca.gov/Fishing/Commercial/Landings, accessed April 19, 2021.

California Energy Commission, California Governor's Office of Planning and Research, & California Natural Resources Agency. 2018. California's Fourth Climate Change Assessment Report: Summary Report from Tribal and Indigenous Communities within California. Retrieved from https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-010_TribalCommunitySummary_ADA.pdf

Craig, S., J. Tyburczy, I. Aiello, R. Laucci, A. Kinziger, P. Raimondi, M. Miner, R. Gaddam, K. Ammann, M. George, L. Anderson, D. Lohse, M. Douglas, N. Fletcher, J. Lopiccolo, and K. Hinterman. 2017. North Coast Baseline Surveys of Rocky Intertidal Ecosystems Final Report.

Crocker, S.E, and F.D. Fratantonio. 2016. Characteristics of sounds emitted during high-resolution marine geophysical surveys. Newport, Rhode Island: Naval Undersea Warfare Center Division. No. NUWC-NPT Technical Report 12,203.

Dooling, R.J., B. Lohr, and M.L. Dent. 2000. Hearing in birds and reptiles. Comparative hearing: birds and reptiles. Springer. p. 308-359.

Frawley, T.H., B.A. Muhling, S. Brodie, M.C. Fisher, D. Tommasi, G. Le Fol, E.L. Hazen, S.S. Stohs, E.M. Finkbeiner, and M.G. Jacox. 2021. Changes to the structure and function of an albacore fishery reveal shifting social-ecological realities for Pacific Northwest fishermen. Fish and Fisheries 22(2):280-297.

Goldfinger C., S.K. Henkel, et al. 2014. Benthic Habitat Characterization Offshore the Pacific Northwest Volume 1: Evaluation of Continental Shelf Geology. US Dept. of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region. OCS Study BOEM 2014-662. 161 pp.

Hackett, S., L. Richmond, and C. Chen. 2017. Socioeconomics of North Coast fisheries in the context of marine protected area formation. Sea Grant report R/MPA-36. La Jolla: California Sea Grant College Program. 299 pp+ appendices.

Hansen, K.A., A. Maxwell, Ul. Siebert, O.N. Larsen, and M. Wahlberg. 2017. Great cormorants (Phalacrocorax carbo) can detect auditory cues while diving. The Science of Nature. 104(5-6):45.

Harnois, V., H.C.M. Smith, S. Benjamins, and L. Johanning. 2015. Assessment of entanglement risk to marine megafuana due to offshore renewable energy mooring systems. International Journal of Marine Energy. 11:27-49. http://dx.doi.org/10.1016/j.ijome.2015.04.001

Howell, S.N., I. Lewington, and W. Russell. 2014. Rare Birds of North America. Princeton University Press.

Industrial Economics, Inc. 2012. Identification of Outer Continental Shelf renewable energy space-use conflicts and analysis of potential mitigation measures. U.S. Department of the Interior, Bureau of Ocean Energy Management, Herndon, VA. OCS Study BOEM 2012-083. 414 pp.

IWC (International Whaling Commission). 2016. Report of the Scientific Committee Annex J: Report of the Working Group on Non-deliberate Human-induced Mortality of Cetaceans, International Whaling Commission, Bled, Slovenia, 7-19 June 2016. IWC/66/Rep01.

Jenkinson, R., Craig, S. 2017. Baseline Monitoring of Rocky Reef and Kelp Forest Habitats along the North Coast of California Final Report.

Kennicutt, M.C., J.M. Brooks, R.R. Bidigare, S.J. McDonald and D.L. Adkison. 1989. An upper slope “cold” seep community: Northern California. Limnology and Oceanography 34:(3):635-640.

Kerr, A. 2013. Happy Whale Day! Ocean Alliance: Conserving whales and our Ocean through research and education (Online). Available from: http://www.whaleorg/happy-whaleday/ (accessed May 5, 2021).

Lacroix, D.L., R.B. Lanctot, J.A. Reed, and T.L. McDonald. 2003. Effect of underwater seismic surveys on molting male Long-tailed Ducks in the Beaufort Sea, Alaska. Canadian journal of zoology. 81(11):1862-1875.

Lauermann, A.R. 2017. North Coast Baseline Program Final Report: Mid-depth and Deep Subtidal Ecosystems.

LWC and HSU (Lisa Wise Consulting, Inc., and Humboldt State University). 2019. Final Draft of Eureka, CA, Fishing Community Sustainability Plan, October 2019. 120 pp.

Love, G.W. 2013. Whale pulled my chain. Available from: https://www.youtube.com/watch?v=MtnK3DHJOaI [accessed May 5, 2021].

McDonald, M.A., J.A. Hildebrand, S.M. Wiggins, D.W. Johnston, and J.J. Polovina. 2009. An acoustic survey of beaked whales at Cross Seamount near Hawaii. The Journal of the Acoustical Society of America, 125(2), pp.624-627.

Miller, D.J. and R.N. Lea. 1976. Guide to the coastal marine fishes of California (Vol. 157). San Diego, CA: State of California, Department of Fish and Game.

Miller, R.R., J.C. Field, J.A. Santora, M.H. Monk, R. Kosaka, C. Thomson. 2017. Spatial valuation of California marine fisheries as an ecosystem service. Canadian Journal of Fisheries and Aquatic Sciences, 74(11):1732-1748.

Mulligan, T., J. Tyburczy, J. Staton, I. Kelmartin, D. Barrett. 2017. Baseline Characterization of Fish Communities Associated with Nearshore Rocky Reefs in the Northern California Marine Protected Area Study Regions Final Report.

NMFS (National Marine Fisheries Service). 2021. Endangered Species Act Section 7 Programmatic Letter of Concurrence. Site assessment and site characterization activities to support the siting of offshore wind energy development projects off the U.S. Atlantic coast. June 29, 2021. https://www.boem.gov/sites/default/files/documents/renewable-energy/Final-NLAA-OSW-Programmatic.pdf

NMFS. 2018. 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-59, 167 p. https://www.fisheries.noaa.gov/resources/documents

NMFS. 2016. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. US Dept of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-55:178.

Nielsen, K.J., J.E. Dugan, T. Mulligan, D.M. Hubbard, S.F. Craig, R. Laucci, M.E. Wood, D.R. Barrett, H.L. Mulligan, N. Schooler, M.L. Succow. 2017. Baseline Characterization of Sandy Beach Ecosystems along the North Coast of California Final Report.

North Coast Unified Air Quality Management District Particulate Matter (PM_{10}) Attainment Plan. Adopted May 11, 1995.

PFMC (Pacific Fishery Management Council). 2020. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington groundfish fishery. Portland (OR): Pacific Fishery Management Council. 159 pp+ amendments.

PFMC. 2019. Coastal Pelagic Species Fishery Management Plan as amended through Amendment 17. Portland (OR): Pacific Fishery Management Council. 49 p.

PFMC. 2018. Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species. Portland (OR): Pacific Fishery Management Council. 92 p.

PFMC. 2016. Pacific Coast Salmon Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California as revised through Amendment 19 (effective March 2016). Portland (OR): Pacific Fishery Management Council. 90 p.

PNNL. 2019. Pacific Northwest National Laboratory. California LiDAR Buoy Deployment. Biological Assessment/Essential Fish Habitat Assessment. Prepared for NOAA Fisheries West Coast Region, Long Beach Office. 34 p.

Pomeroy, C., C.J. Thomson, and M.M. Stevens. 2011. California's North Coast Fishing Communities Historical Perspective and Recent Trends. Sea Grant Publication No. T-072. La Jolla: California Sea Grant College Program, Publication No. T-072. 340 pp.

Porter, A. and S. Phillips. 2016. *Determining the Infrastructure Needs to Support Offshore Floating Wind and Marine Hydrokinetic Facilities on the Pacific West Coast and Hawaii*. US Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region, Camarillo, CA. OCS Study BOEM 2016-011. 238 pp.

Richards, S. 2012. Whale in a tangle with visiting yacht's mooring. Available online at: https://www.bwsailing.com/whale-in-a-tangle-with-visiting-yachts-mooring/ (accessed May 5, 2021).

Ridgway, S.H., E.G. Wever, J.G. McCormick, J. Palin & J.H. Anderson. 1969. Hearing in the giant sea turtle, Chelonia mydas. Proceedings of the National Academy of Sciences USA 64: 884-890.

Schlosser, S., and A. Eicher. 2012. The Humboldt Bay and Eel River Estuary Benthic Habitat Project. California Sea Grant Publication T-075. 246 p.

Schwemmer P., B. Mendel, N. Sonntag, V. Dierschke, and S. Garthe. 2011. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. Ecological Applications. 21(5):1851-1860.

Shaughnessy, F., T. Mulligan, S. Kramer, S, Kullman, J. Largier. 2017. Baseline Characterization of Biodiversity and Target Species in Estuaries along the North Coast of California Final Report.

Simonis, A.E., J.S. Trickey, J. Barlow, S. Rankin, J. Urban, L. Rojas-Bracho, and J.E. Moore. 2020. Passive Acoustic Survey of Deep-Diving Odontocetes in the California Current Ecosystem 2018: Final Report, U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-630.

Stemp, R. 1985. Observations on the effects of seismic exploration on seabirds. In: Proceedings of the Workshop on the Effects of Explosives Use in the Marine Environment. p. 29-31.

Turnpenny, A.W. and J. Nedwell. 1994. Consultancy report. The effects on marine fish, diving mammals and birds of underwater sound generated by seismic surveys Fawley Aquatic Research Laboratories Ltd.

U.S. Census Bureau QuickFacts. (2019). U.S. Census Bureau. https://www.census.gov/quickfacts (accessed on May 5, 2021).

U.S. Navy. 2017. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III). Technical Report. June 2017. Available at: https://www.mitt-eis.com/portals/mitt-eis/files/reports/Criteria_and_Thresholds_for_U.S._Navy_Acoustic_and_Explosive_Effects_Analysis_June2017.pdf

Van Arsdale J., L. Peeters-Graehl, K. Patterson, J. Barry, and A. Bayer. Rural Poverty and its Health Impacts: A Look at Poverty in the Redwood Coast Region. Humboldt State University: California Center for Rural Policy, 2008.

WRCC (Western Regional Climate Center). 2021. https://wrcc.dri.edu/cgi-bin/rawMAIN.pl?laKACV. Accessed on July 16, 2021.