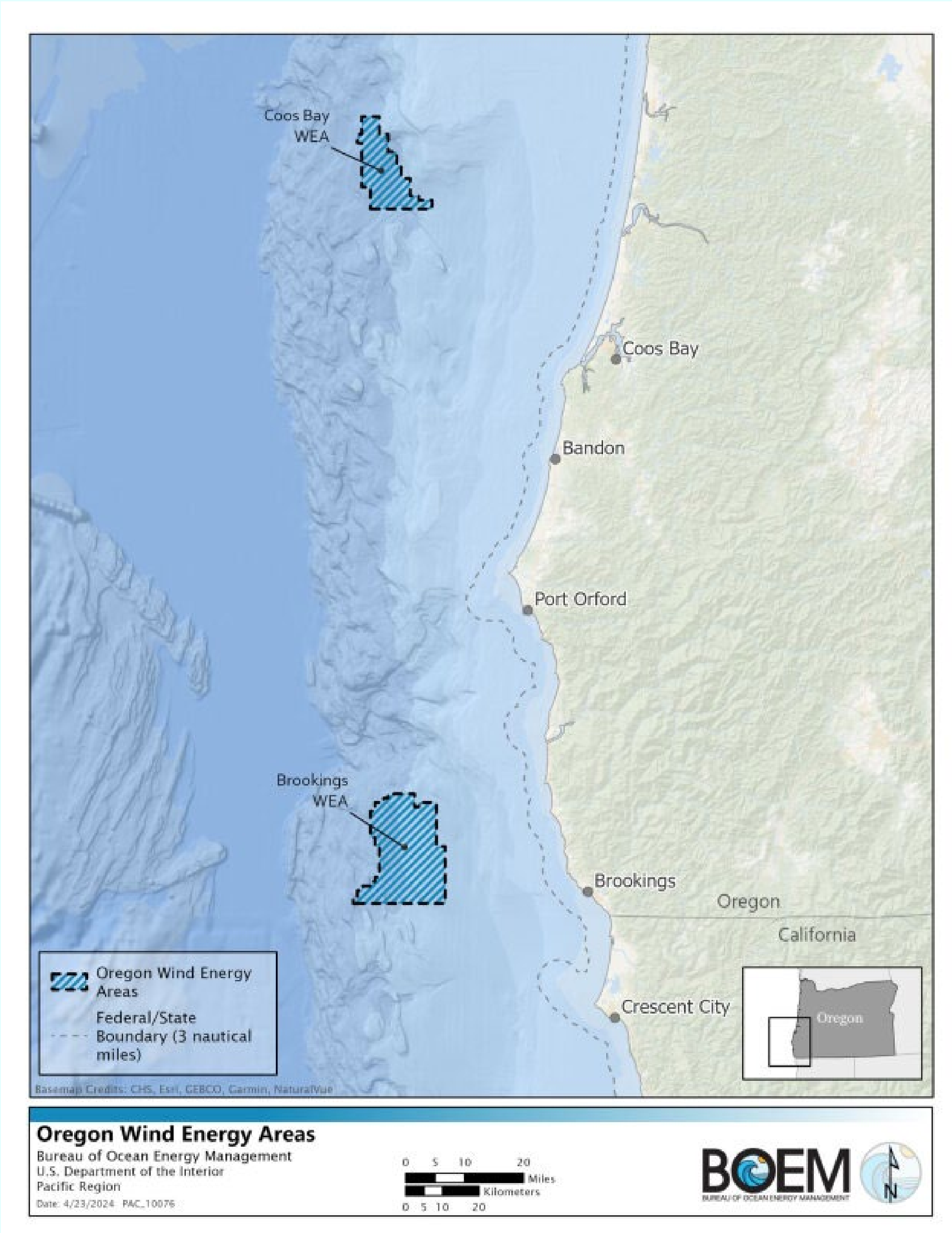
Final Environmental Assessment

Commercial Wind Lease Issuance on the Pacific Outer Continental Shelf, Offshore Oregon



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Volume I

Commercial Wind Lease Issuance on the Pacific Outer Continental Shelf, Offshore Oregon

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Abbreviations and Acronyms

§	section
ACHP	Advisory Council on Historic Preservation
ADCP	acoustic Doppler current profiler
AIS	Automated Identification System
APCD	Air Pollution Control District
AUV	autonomous underwater vehicle
BIA	biologically important areas
BLS	Bureau of Labor Statistics
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
BSR	Bottom Simulating Reflector
CalEPA	California Environmental Protection Agency
CD	Consistency Determination
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
chirp	compressed high-intensity radar pulse
CO_2	carbon dioxide
CO	carbon monoxide
COP	Construction and Operations Plan
CPT	cone penetrometer
cSEL	cumulative sound exposure level
CTCLUSI	Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians
CTSI	Confederated Tribes of Siletz Indians
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CWA	Clean Water Act
dB	decibel
DEQ	Department of Environmental Quality
DLCD	Department of Land Conservation and Development (Oregon)
DOI	Department of the Interior
DPS	distinct population segment
E.O.	Executive Order
EA	environmental assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	environmental impact statement
EJ	environmental justice
EPA	U.S. Environmental Protection Agency

ESA	Endangered Species Act
ESU	Evolutionary Separate Unit
ft	foot or feet
FTE	full-time equivalent
G&G	geological and geophysical
GAP	General Activities Plan
GDP	gross domestic product
GEBCO	General Bathymetric Chart of the Oceans
GHG	greenhouse gas
HAP	hazardous air pollutant
HBS	hydrate-bearing sediment
HRG	high-resolution geophysical
HSZ	hydrate stability zone
Hz	hertz
IMR	Injury & Mortality Reporting
IPF	impact-producing factor
kg	kilogram
kHz	kilohertz
km	kilometer
km^2	square kilometer
kn	knot
lb	pound
LEP	Limited English Proficiency
LiDAR	light detection and ranging
µPa	micropascal
m/s	meters per second
m^2	square meters
m	meters
MBPC	Morro Bay Port Complex
MBTA	Migratory Bird Treaty Act
mi^2	square mile
mi	mile
MISLE	Marine Information for Safety and Law Enforcement
MMPA	Marine Mammal Protection Act
MRTFB	Major Range and Test Facility Base
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MW	megawatt
MWh	megawatt hour
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NCCOS	National Centers for Coastal Ocean Science
NEPA	National Environmental Policy Act

NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOMAD	Naval Oceanographic and Meteorological Automated Devices
nm	nautical mile
NMFS	National Marine Fisheries Service (aka NOAA Fisheries)
NREL	National Renewable Energy Laboratories
NRHP	National Register of Historic Places
NTL	Notice to Lessees
OCMP	Oregon Coastal Management Program
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
ODFW	Oregon Department of Fish and Wildlife
OSU	Oregon State University
PA	programmatic agreement
PacFIN	Pacific Fisheries Information Network
PACPARS	Pacific Coast Port Access Route Study
PCB	polychlorinated biphenyls
PFMC	Pacific Fishery Management Council
PM	particulate matter
PMSR	Point Mugu Sea Range
PNNL	Pacific Northwest National Laboratory
PSO	protected species observer
PTS	permanent threshold shift
ReCFIN	Recreational Fisheries Information Network
RMS	root mean square
ROV	remotely operated vehicle
ROW	right-of-way
RUE	right-of-use and easement
SAP	Site Assessment Plan
SEL	sound exposure level
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SO_X	sulfur oxides
TCP	traditional cultural property
TSS	traffic separation scheme
TTS	temporary threshold shift
U.S.C.	United States Code
USBL	ultra-short baseline
USCG	U.S. Coast Guard

USV	un-crewed surface vessel
USFWS	U.S. Fish and Wildlife Service
UTP	underwater transponder positioning
VGP	Vessel General Permit
VMS	vessel monitoring system
WEA	wind energy area

1 Introduction

The U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) prepared this environmental assessment (EA) to analyze whether the issuance of leases and grants within the wind energy areas (WEAs) offshore Oregon (Figure 1-1) would result in significant impacts on the environment and therefore require preparation of an environmental impact statement (EIS) prior to lease issuance. This EA is prepared to evaluate the Proposed Action in compliance with the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [U.S.C.] § 4331 et seq.) and the Council on Environmental Quality's (CEQ) regulations of the implementing NEPA (40 Code of Federal Regulations [CFR] § 1500-1508).

The Proposed Action for this EA is the issuance of commercial wind energy lease(s) within the Oregon WEAs (Figure 1-1) on the Outer Continental Shelf (OCS) and granting of rights-of-way (ROWs) and rights-of-use and easements (RUEs) supporting wind energy development. Issuing leases or grants allows for site characterization activities, including surveys, to gather data and information to support submittal of a Construction and Operations Plan (COP) for BOEM's consideration and approval.

In accordance with 30 CFR § 585.113 and 585.200, a lease issued under this part confers on the lessee the right to apply for one or more project easements, without further competition, for the purpose of installing, maintaining, repairing and replacing: gathering, transmission, and distribution, and inter-array cables; power and pumping stations; facility anchors; pipelines; and associated facilities and other appurtenances on the OCS as necessary for the full enjoyment of the lease. Issuance of a lease does not constitute an irreversible and irretrievable commitment of resources.

The lessee must apply for the project easement (30 CFR 585.200 (b)), and BOEM conduct additional analysis under NEPA, usually part of a COP review, and incorporate, if approved, the project easement into the associated lease as an addendum. If/when BOEM receives a project easement application, BOEM will invite government-to-government consultation with potentially affected federally recognized Tribes, as well as undertake any necessary consultation under other applicable laws.

Therefore, this environmental analysis focuses on the effects of site characterization and site assessment activities expected to occur after the issuance of commercial wind energy leases. The purpose is to allow lessees access to the WEAs to gather the physical and biological data required to submit a COP. BOEM is responsible for offshore renewable energy development in Federal waters. BOEM requires information from lease holders to evaluate future offshore wind plans. The issuance of a lease by BOEM to a lessee conveys no right to proceed with construction of a wind energy facility. BOEM may decide to issue leases within all, a portion, or none of the WEAs analyzed in the EA; BOEM's decision regarding lease issuance is memorialized in a Final Sale Notice.

On February 13, 2024, BOEM released the Announcement of Area Identification Memorandum (Memorandum). This Memorandum documents the analysis and rationale supporting the recommended designation of two WEAs offshore Oregon for environmental analysis and leasing consideration. BOEM partnered with the National Centers for Coastal Ocean Science (NCCOS) to compile relevant data and develop spatial models to identify suitable areas for offshore wind energy development in the region (Carlton et al. 2024). The Oregon WEAs encompass approximately 194,995 acres offshore southern Oregon; their closest points to shore range from approximately 18–32 miles (mi), and water depths are 567–1,531 meters (m) (1,860–5,023 feet [ft]; Table 1-1).

Figure 1-1: Map of Wind Energy Areas Offshore Oregon

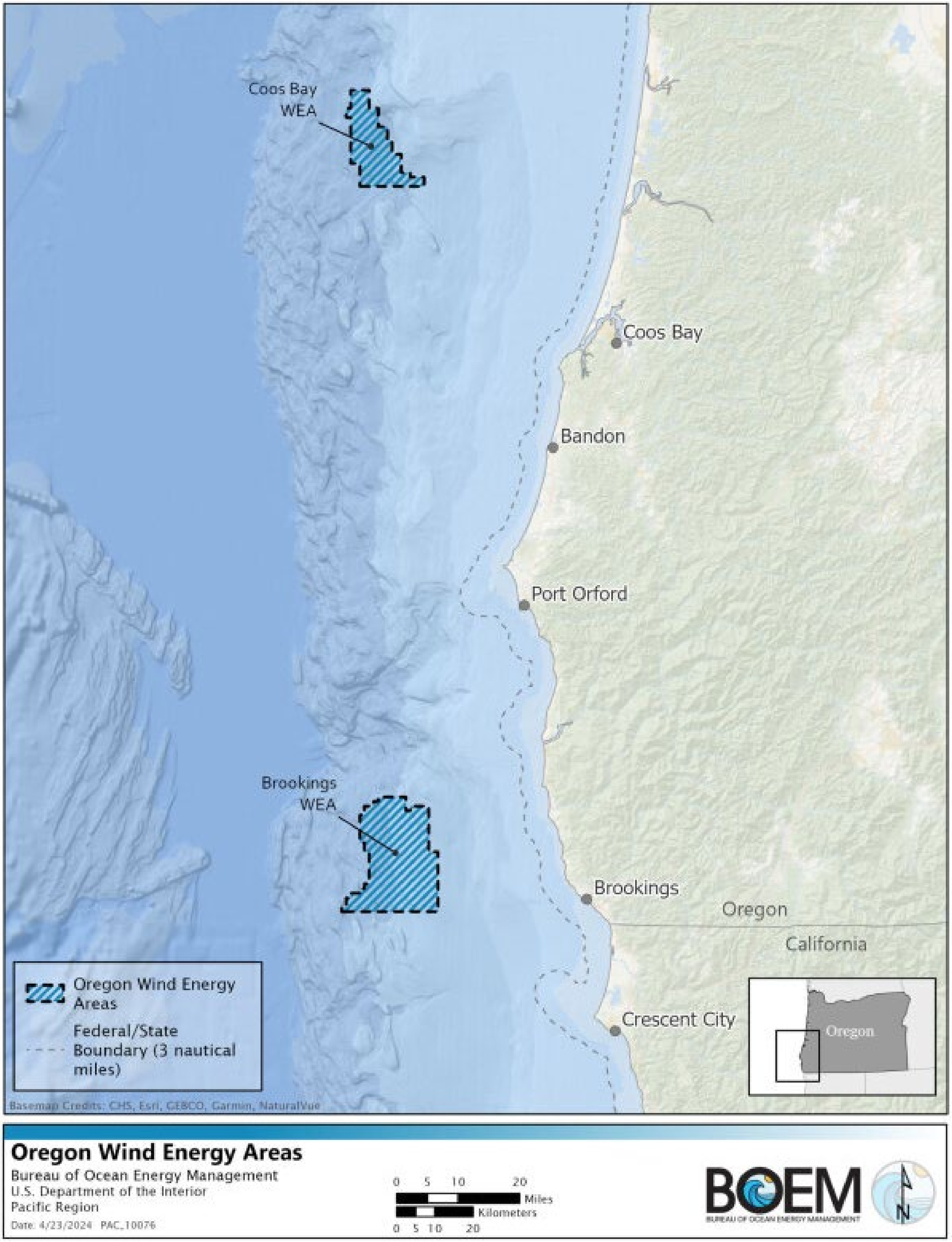


Table 1-1: Descriptive Statistics for the Recommended Oregon Wind Energy Areas

WEA	Acres	Installation Capacity (MW)[1]	Homes Powered (MW)[2]	Power Production (MWh/yr): 40% Capacity Factor[3]	Power Production (MWh/yr): 60% Capacity Factor[4]	Maximum Depth (meters)	Minimum Depth (meters)
Coos Bay	61,203	991	346,752	3,471,482	5,207,224	1,414	635
Brookings	133,792	1,166	758,012	7,588,788	11,383,182	1,531	567
Total (or max, min)	194,995	3,156	104,764	1,060,270	16,590,406	1,531	567

Key:

1. Megawatts (MW) based upon 4 MW/km^2 (Musial et al. 2023)
2. Number of homes powered, based upon 350 homes per MW
3. The 40% capacity factor is calculated as follows: Capacity (MW) × 8,760 (hrs/yr) × 0.4 (capacity factor)
4. The 60% capacity factor is calculated as follows: Capacity (MW) × 8,760 (hrs/yr) × 0.6 (capacity factor)

On May 1, 2024, BOEM initiated a 30-day public comment period, with a subsequent 2-week extension, on the Draft EA. BOEM is using this analysis to determine if the Proposed Action would cause significant effects and therefore requires preparation of an EIS. This review occurred concurrently with a public comment period on the Proposed Sale Notice. After this document's publication, BOEM intends to publish a Final Sale Notice.

2 The Purpose of and Need for the Proposed Action

The CEQ's regulations implementing NEPA require agencies to specify the underlying purpose of and need for which the agency is responding in proposing action alternatives, including the Proposed Action (40 CFR 1502.13). The purpose of this Proposed Action is the issuance of up to two commercial leases within the two WEAs and grant ROWs and RUEs in the region of the OCS offshore Oregon. The need for BOEM's issuance of these leases and grants is to (1) confer the exclusive right to submit plans to BOEM for potential wind energy development, such that the lessees and grantees develop plans for BOEM's review and commit to site characterization and site assessment activities necessary to determine the suitability of their leases and grants for commercial offshore wind production and/or transmission; and (2) impose terms and conditions intended to ensure that site characterization and assessment 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.

2.1 THE PROPOSED ACTION AND ALTERNATIVES

2.1.1 The Proposed Action

The Proposed Action is the issuance of: (a) one commercial wind energy lease and associated easements within the Coos Bay WEA and one lease within Brookings WEA (Figure 1-1; Table 1-1); and (b) to grant ROWs and RUEs to support wind energy development. Under the Proposed Action, BOEM would potentially issue leases that could cover the entirety of the WEAs, issue easements associated with each lease, and issue grants for subsea cable corridors and associated offshore collector/converter platforms. The potential ROWs, RUEs, and easements would all be within the Oregon OCS and could include corridors extending from the OCS through state waters to the onshore energy grid. BOEM's regulatory authority is limited to the OCS, and therefore BOEM cannot approve site assessment or characterization activities in state waters or onshore areas.

Because the issuance of a lease only grants the lessee the exclusive right to conduct site characterization activities and submit to BOEM survey plans and a COP, it does not constitute an irreversible and irretrievable commitment of resources thereby requiring BOEM to consider the impacts associated with the siting, construction, and operation of any commercial wind power facilities.

The Proposed Action of lease issuance would be followed by site characterization and assessment activities. After lease issuance, a lessee would conduct surveys to collect data and install meteorological and oceanographic devices to characterize the site's environment and assess wind resources in the proposed lease area. Site assessment activities would most likely include the temporary placement of meteorological and oceanographic buoys (i.e., meteorological buoys) and other oceanographic devices within a lease area. Site characterization activities, or surveys, would most likely gather geophysical, geotechnical, biological, archaeological, and/or ocean data. See Section 2.3 and **Appendix A** for more details on the meteorological buoys, oceanographic devices, and survey details and examples.

BOEM would evaluate the potential impacts of the activities described in the COP in a separate NEPA document tied to the level of potential impacts, likely an EIS. The NEPA process would include an analysis of the potential impacts and reflect, but is not limited to, required consultations with the appropriate Federal, Tribal, state, and local entities; public involvement including public meetings and comment periods; collaboration with the BOEM Oregon Intergovernmental Renewable Energy Task Force; and preparation of an independent, comprehensive, site- and project-specific impact analysis using the best available information.

A COP contains design parameters such as turbine size, anchoring type, project layout, installation methods, and associated onshore facilities as informed from the site assessment and site characterization activities. Pursuant to 30 CFR 585.628, BOEM uses information and analysis provided in the NEPA document when determining whether to approve, approve with conditions or disapprove a lessee's COP. After lease issuance, but prior to project implementation, BOEM retains the authority to prevent the environmental impacts of a commercial wind power facility from occurring by disapproving a COP for failure to meet the statutory standards set forth in OCSLA (43 U.S.C. §§ 1331 et seq).

The timing of lease issuance, as well as weather and sea conditions, are the primary factors influencing timing of site assessment and site characterization survey activities. Under the reasonably foreseeable planned actions scenario, BOEM could issue leases in late 2024. For leases issued in late 2024, surveys and site assessment activities could begin in spring 2025. Lessees have up to 5 years to perform site assessment activities before they must submit a COP (30 CFR 585.235(a)(1)). Therefore, site assessment activities could continue through late 2029 or early 2030.

2.1.2 No Action Alternative

Under the No Action Alternative, no leases or grants would be issued in the Oregon WEAs 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 serves as the baseline of current conditions against which action alternatives are evaluated.

2.1.3 Alternatives Considered but Not Discussed Further

Because the Proposed Action would 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 additional action alternatives that could entail meaningful differences in impacts on resources analyzed in this EA. Public comments from the draft WEA suggested excluding seafloor areas that could potentially have hard substrate, chemosynthetic communities, or other unique and fragile habitats. The Area Identification Memorandum 2024 acknowledges there would likely be multiple seafloor areas where leaseholders will be excluded from placing structures to avoid protected habitats.

This EA considers a total number of devices that accounts for sampling and surveying anticipated to research the feasibility of multiple cable corridors in and around the WEAs. Alternatives that do not meet the purpose of and need for the Proposed Action are not considered in a NEPA analysis; thus, alternate methods of combating climate change suggested in public comments, such as reducing energy use, implementing other forms of energy development such as nuclear or solar, or including water desalinization plants on wind energy platforms are not evaluated in this EA.

BOEM notes that several Tribal Nations, stakeholders, and the Ad Hoc Marine Planning Committee (Committee) of the Pacific Fishery Management Council (PFMC) recommend a U.S. West Coast-wide cumulative effects analysis of all wind energy proposed areas (taking into consideration all areas closed to fishing) on all commercial and recreational fisheries, fishing communities, and impacts on domestic seafood production (including port-based, fishery-specific facilities and related services). BOEM anticipates, and is planning for, future coordination with the PFMC and continued consultation with Tribal Nations on this and other recommendations.

2.2 INFORMATION CONSIDERED IN DEVELOPING THIS ENVIRONMENTAL ASSESSMENT

BOEM considered the following non-exhaustive list of information sources as a part of earlier outreach and comment periods related to siting WEAs offshore Oregon with links available through BOEM Oregon Activities:

- Data Gathering and Engagement Summary Report: Oregon Offshore Wind Energy Planning 2020, 2022
- Oregon Offshore Wind Mapping Tool (OROWindMap)
- Comments received in response to the 2022 Call for Information and Nominations (Docket No. BOEM-2022-0009)
- Comments received in response to the 2023 Request for Comment on the draft WEAs (Docket No. BOEM-2023-0033)
- Comments received in response to this EA (see **Appendix B**)
- BOEM NCCOS Report: A Wind Energy Siting Analysis for the Oregon Draft WEAs (Carlton et al. 2024)
- BOEM Oregon Intergovernmental Renewable Energy Task Force meetings, including public comment at the end of the meetings
- Comments received at consultation meetings and written comments from federally recognized Tribes. BOEM notified more than 80 federally recognized Tribes of the draft WEAs and invited government-to-government consultation.
- Input from Federal and state agencies and state renewable energy goals
- Domestic and global offshore wind market and technological trends.

2.3 FORSEEABLE ACTIVITIES AND ASSUMPTIONS FOR THE PROPOSED ACTION

BOEM expects the Proposed Action of lease issuance to be followed by site characterization and assessment activities on the OCS and state waters. However, until BOEM receives survey plans, which does not occur until after a lease is issued, information in this section and **Appendix A** focuses on the most common activities and equipment used offshore the U.S. West Coast or in similar ocean conditions. For example, lessees often install buoys and conduct surveys in ocean waters as a first step to obtain information necessary to support a COP.

2.3.1 Site Assessment: Meteorological Buoys and Ocean Devices

2.3.1.1 Buoy Installation, Operations and Maintenance, and Decommissioning Assumptions

Meteorological buoys are anchored at fixed locations to monitor and evaluate the viability of wind as an energy source. In addition, lessees usually gather data on wind velocity, barometric pressure, atmospheric and water temperatures, and current and wave measurements. To obtain these data, scientific measurement devices such as anemometers, vanes, barometers, and temperature transmitters are mounted either directly on a buoy or on a buoy's instrument support arms. Floating light detection and ranging (LiDAR) is of increasing interest to measure wind speeds at multiple heights. BOEM anticipates up to six buoys would be deployed in and near to each leased area in the Oregon WEAs. BOEM knows of no LiDAR offshore data available to validate wind models and assumes that multiple LiDAR buoys and placements would be needed for each lessee.

Onboard power supply sources for buoys could include solar arrays, lithium or lead-acid batteries, and diesel generators, which require an onboard fuel storage container with appropriate spill protection and environmentally sound methods for refueling activities.

The National Data Buoy Center maintains a status list of buoys deployed offshore Oregon maintained by the National Oceanographic and Atmospheric Administration (NOAA). The National Renewable Energy Laboratories (NREL) and Pacific Northwest National Laboratories (PNNL) regularly deploy LiDAR buoys offshore (PNNL 2019). BOEM assumes buoy installation and decommissioning operations would take approximately one day, in agreement with PNNL's typical deployment procedure. On-site inspections and preventative maintenance (e.g., marine fouling, wear, or lens cleaning) are expected to occur with one vessel trip per year per buoy. Site assessment involves the deployment and decommissioning of meteorological buoys, which will be permitted by the U.S. Army Corps of Engineers (USACE) under the Nationwide Permit 5. Lessees have up to 5 years to perform site assessment activities before they must submit a COP (30 CFR 585.235(a)(2)).

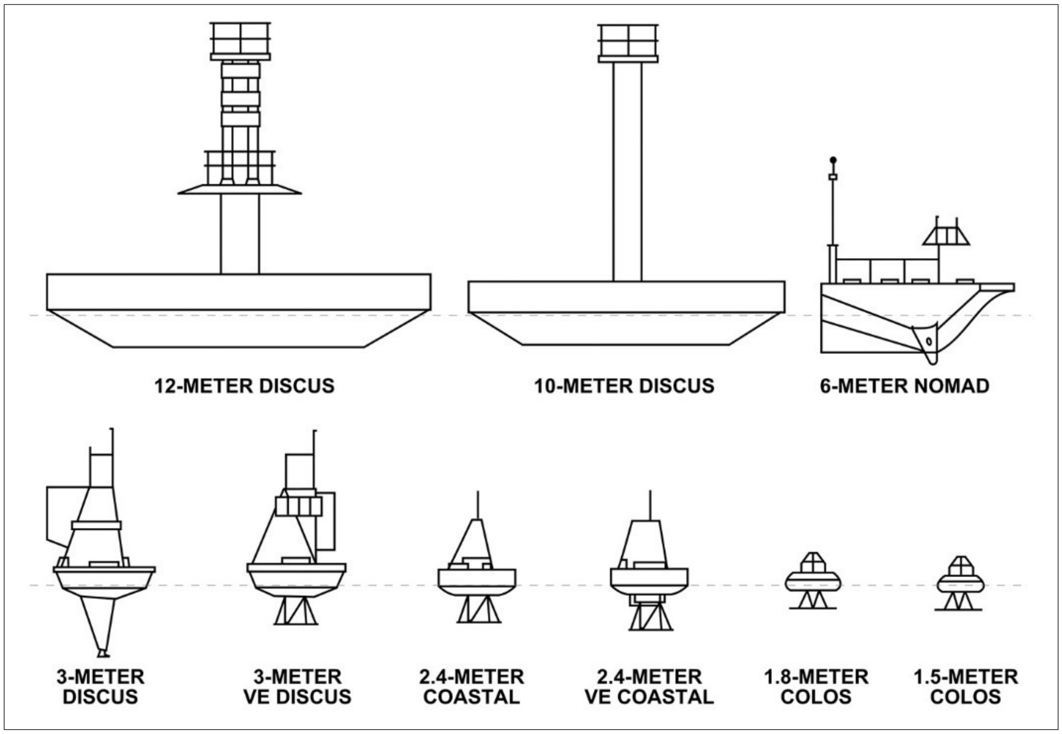
2.3.1.2 Buoy Hull Types and Anchoring Systems

The hull type used usually depends on installation location and measurement requirements. Discus-shaped, boat-shaped, and spar buoys (Figure 2-1) are the buoy types most likely to be adapted for offshore wind data collection. A large discus-shaped hull buoy has a circular hull of 10–12 m (33–40 ft) in diameter (Figure 2-2). A boat-shaped hull buoy is an aluminum-hulled buoy that is 6 m long, in the case of NOAA's NOMAD buoy (Figure 2-1; Figure 2-2).

Mooring design depends on hull type, location, and water depth (National Data Buoy Center 2008). For example, a smaller buoy in shallow coastal waters could be moored using an all-chain mooring. On the OCS, a larger discus-type or boat-shaped hull buoy could require a combination of chain, nylon, and buoyant polypropylene materials designed with one or two weights (National Data Buoy Center 2008).

In 2020, PNNL installed two LiDAR buoys off California with a boat-shaped hull and moored with a solid cast iron anchor weighing approximately 4,990 kilograms (kg; (11,000 pounds [lbs]) with a 2.3-square-meter (m^2) footprint. The mooring line was approximately 1,200 m long and comprised of chain, jacketed wire, scour chain, nylon rope, polypropylene rope, and subsurface floats to keep the mooring line taut to semi-taut (PNNL 2019).

Figure 2-1: Buoy Schematic



Source: National Data Buoy Center (2008)

Figure 2-2: Ten Meter Discus-Shaped Hull Buoy (left); Six Meter Boat-Shaped Hull Buoy (right)

Source: National Data Buoy Center (2008)

2.3.1.3 Buoy Installation, Operation, and Decommissioning

Onshore activities (fabrication, staging, or launching of crew/cargo vessels) related to installing buoys are expected to use existing ports and infrastructure. Boat-shaped and discus-shaped buoys are typically towed or carried aboard a vessel to the installation location. The buoy is then lowered to the ocean from the deck of the transport vessel or placed over the final location and the mooring anchor is dropped. The accuracy of the anchor bottom location and the size and type of anchor used depends on the buoy type, bottom slope, sediment type, depth, and water currents of the local area. The buoy is anchored to the seafloor with a solid cast iron anchor weighing approximately 11,000 lb (2.3 m^2 footprint). The approximate 1,200–3,000-m-long mooring line connecting the buoy to the mooring anchor is comprised of various components and materials, including chain, jacketed wire, nylon rope, polypropylene rope, and subsurface floats to keep the mooring line taut to semi-taut, reduce slack, and eliminate looping. Since the mooring line would be taut to semi-taut, it is unlikely that the chain at bottom of the mooring line would sweep and disturb the seafloor. Meteorological buoy anchors deployed at similar depths in California used a solid cast iron anchor weighing approximately 11,000 lbs with a footprint of approximately 2.3 m^2 (PNNL 2019), but larger anchors could be used depending on site conditions. BOEM anticipates that bottom disturbance associated with the installation of meteorological buoys would disturb the seafloor up to an estimated 10 m^2 per buoy. The buoy would have a watch circle (i.e., excursion radius) of approximately 1,250 m. After installation, the transport vessel would likely remain in the area for several hours while technicians configure proper operation of all systems (PNNL 2019).

Monitoring information transmitted to shore includes 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 onboard radio system that transmits the data string to a receiver onshore (Tetra Tech EC Inc. 2010).

Decommissioning is assumed to be essentially the reverse of the installation process, removing BOEM- and BSEE-approved facilities, and returning the site of the lease or grant to a condition that meets the requirements under 30 CFR 285 subpart I and 30 CFR 585. Decommissioning buoys is expected to be completed within one day per buoy and is performed with the support of a vessel(s) equivalent in size and capability to that used for installation.

2.3.1.4 Other Equipment and Instrumentation

Multiple instrumentation types are commonly installed upon a buoy to measure meteorological data and attached to the buoy or cable to measure oceanographic or biologic parameters. In addition to LiDAR, conventional anemometers, sonic detection, and ranging equipment could be used to obtain meteorological data. A meteorological buoy could also accommodate environmental monitoring equipment such as avian monitoring equipment including thermal imaging cameras, tagging receivers, acoustic monitoring for marine mammals, data logging computers, visibility sensors, water measurements including temperature, and communications equipment.

The speed and direction of ocean currents would likely be assessed with Acoustic Doppler Current Profilers (ADCPs). The ADCP is a remote sensing technology that transmits sound waves at a constant frequency and measures the ricochet of the sound wave off fine particles or zooplankton suspended in the water column. The ADCPs could be mounted independently on the seafloor, attached to a buoy, or have multiple instruments deployed as a subsea current mooring. A seafloor-mounted ADCP would likely be mounted in a tripod or a trawl resistant mount. One subsea current mooring might have 8–10 ADCPs vertically suspended from an anchor combined with several floats made of syntactic foam.

These moorings do not breach the surface. A typical ADCP has 3 to 4 acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300–600 kilohertz (kHz) with a sampling rate of every 1 to 60 minutes. A typical ADCP is about one to two feet tall and one to two feet wide. Its mooring, base, or cage (surrounding frame) would be several feet wider. Based on information from existing West Coast lessees, BOEM anticipates multiple ADCP moorings installed in the lease area with approximately 10 additional moorings installed along potential export cable routes.

2.3.2 Site Characterization Surveys

BOEM regulations require that the lessee provide data from surveys with its COP (30 CFR 585.626(b)) that characterize and model the site of the lessee's proposed project. BOEM guidelines provide recommendations to lessees to obtain information required for a COP. *BOEM Guidelines for Information Requirements for a Renewable Energy COP* is available online. BOEM national survey guidelines for some resources can be found online. In addition, BOEM's guidelines for *Information Needed for Issuance of a Notice of Intent (NOI) Under the National Environmental Policy Act (NEPA) for a Construction and Operations Plan (COP)* outlines information and data needed for the NEPA review of a COP.

2.3.2.1 Surveying and Sampling Assumptions

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 identify shallow hazards. These survey methods can also be used to inform archaeological and historic resources assessments. Biological surveys are also part of site characterization surveys and collect data on potentially affected habitats, marine mammals, birds, sea turtles, and fishes.

Lessees would likely focus survey effort within the entire WEA proposed for lease and multiple potential cable easement routes during the 5-year site assessment term. The purpose of site characterization surveys is to collect required information prior to the submission of a COP. Table 2-1 describes the types of site characterization surveys, equipment, and deployment methods that could be used. If sufficient survey data are available, additional surveys may not be necessary.

For the Proposed Action, BOEM assumes that the lessee would employ these methods to obtain information required under 30 CFR § 585.626. Lease holders could propose additional methods if they are within the degree of impact proposed in this document.

2.3.2.2 Geophysical Information: High-Resolution Geophysical Surveys

High-resolution geophysical (HRG) surveys would be performed to determine siting for geotechnical sampling; whether hazards would interfere with seabed support of the turbines; the type of hazards; archaeological and habitat resources; and to define seabed slope, water depth, and seafloor conditions. HRG surveys use electrically induced sonar transducers to emit and record acoustic pulses, and do not use air or water compression to generate sound.

Table 2-1: Site Characterization Surveys, Equipment, Methods, and Resources

Survey Type	Resource Surveyed or Information Used to Inform	Survey Equipment or Method	Code of Federal Regulations
High-resolution geophysical surveys	Shallow hazards, archaeology, bathymetry, benthic zone	Side-scan sonar, sub-bottom profiler, magnetometer, multibeam echosounder; ROV; AUV; HOV	30 CFR 585.626(b)(1) 30 CFR 585.626(b)(3)
Geotechnical/sub-bottom sampling	Geological	Vibracore, piston, gravity cores; cone penetration tests	30 CFR 585.626(b)(1)
Biological	Presence of hard bottoms, live bottoms, and marine features	Benthic sled; underwater imagery/ sediment profile imaging; ROV; AUV	30 CFR 585.626(b)(2)
Biological	Avian	Aerial digital imaging; visual observation; radar; thermal or acoustic monitoring	30 CFR 585.626(b)(2)
Biological	Bats	Ultrasonic detectors installed on buoys and survey vessels, radar, thermal monitoring	30 CFR 585.626(b)(2)
Biological	Marine mammals, sea turtles	Aerial or vessel-based surveys, acoustic monitoring	30 CFR 585.626(b)(2)
Biological	Fishes, invertebrates	Direct sampling using vessel-based surveys; underwater imagery; acoustic monitoring; environmental DNA	30 CFR 585.626(b)(2)

Key: AUV = autonomous underwater vehicle; HOV = human-occupied vehicle; ROV = remotely controlled vehicle.

Following BOEM's guidelines to obtain geophysical data to fulfill information requirements listed in 30 CFR §§ 585.626 and 585.627, surveys would be undertaken using equipment and methods described in Table 2-1 and Table 2-2. Estimated numbers of vessel trips and survey days for site characterization activities are shown in Table 2-4. Equivalent technologies to those listed in these tables could be used if potential impacts are similar to those analyzed for the equipment described in this EA and are reviewed by BOEM prior to the surveys being conducted. Vessels performing surveys are relatively slow moving (approximately 0–11.1 kilometers (km)/hour or 4–6 knots [kn]).

The line spacing for HRG surveys varies depending on the data purpose, as follows:

- To collect geophysical data for shallow hazards assessments (including multibeam echosounder, side-scan sonar, and sub-bottom profiler systems), BOEM recommends surveying at a 150-m (492-ft) primary line spacing and a 500-m (1,640-ft) tie-line spacing over the proposed lease area (BOEM 2023a).
- To collect geophysical data for archaeological resources assessments (including magnetometer, multibeam echosounder, side-scan sonar, and sub-bottom profiler systems), BOEM recommends surveying at a 30-m (98-ft) primary line spacing and a 500-m (1,640-ft) tie-line spacing over potential pre-contact archaeological sites once part of the terrestrial landscape and since inundated by global sea level rise during the Pleistocene and Holocene epochs, generally thought to be in waters less than 130 m depth, which is typically in cable landing areas (Clark et al 2014).

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 (multibeam echosounder)	Collection of bathymetric data for shallow hazards, archaeological resources, and benthic habitats	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 multibeam bathymetry systems, which could be more appropriate than other tools to characterize those lease areas containing complex bathymetric features or sensitive benthic habitats such as hardbottom areas.
Gradiometer	Collection of geophysical data for shallow hazards and archaeological resources assessments	Gradiometer surveys would be used to detect and aid in the identification of ferrous or other objects having a distinct magnetic signature. The gradiometer 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 is not anticipated to be used at this time in the WEAs since depths are 500 m or greater, but will be used to survey potential cable routes occurring in depths shallower than 100 m.
Side-scan sonar	Collection of geophysical data for shallow hazards, hardbottoms, and archaeological resource assessments	This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (MMS 2007a). A typical side-scan sonar system consists of a top-side processor, tow cable, and towfish with transducers (or “pingers”) on the sides that generate and record the returning sound traveling through the water column at a known speed. BOEM assumes 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 trackline surveyed. Another type of sub-bottom profiler that could 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.

Key: chirp = compressed high-intensity radar pulse; kHz = kilohertz

Several different survey methods can be used to collect HRG data. Typically, these methods are based on the water depth of the survey area. However, equipment availability could affect which survey methods are chosen. The following is a description of each of the possible decisions for these survey methods:

- Autonomous Underwater Vehicle (AUV) survey. AUV surveys consist of an autonomous (non-tethered), submersible vehicle with its own power supply and basic navigation logic. An AUV can run many geophysical sensors at once and typically consists of a multibeam echosounder, side-scan sonar, magnetometer, and a sub-bottom profiler. AUVs also have forward-looking sonar for terrain avoidance, a doppler velocity logger for velocity information, an internal navigation system for positioning, an ultra-short baseline (USBL) pinger for positioning, and an acoustic modem to communicate with a surface survey vessel. For single AUV operations, the surface survey vessel follows the AUV, keeps in communication via the acoustic modem, provides navigation information to the AUV, and monitors the health of the AUV. During multiple AUV surveys, several AUVs are deployed at once. These AUVs run independently from the survey vessel. Navigation updates and modem communication are provided by a network of underwater transponder positioning devices (UTPs). These transponders are deployed to the seabed in known locations. In both operation methods, the survey vessel recovers, maintains, and launches the AUV(s) and UTPs (for further details, see **Appendix A**). A survey vessel could deploy AUVs and UTPs through a moon pool, which is a large opening through the deck and bottom of a vessel to lower tools and instruments into the sea.

- <u>Shallow multi-instrument towed survey.</u> Towed surveys typically occur in shallower waters. A survey vessel tows side-scan sonar, magnetometers, and/or gradiometers with winches to provide altitude adjustments. In addition, passive acoustic monitoring, and, if needed, medium-penetration seismic instruments can be towed from hardpoints on the vessel. The survey vessel usually has hull-mounted multibeam echosounders, a sub-bottom profiler, and a USBL system.
- <u>Deep-tow survey.</u> Deep-tow surveys use towed methodology in deep waters. The vessel uses a large winch with thousands of meters of cable to tow the survey instruments at depth. The survey instruments usually consist of a large weight (depressor) followed by a side-scan sonar, sub-bottom profiler, and potentially a multibeam echosounder mounted on a survey vehicle. In deep waters, the survey vehicle might be 8–10 km behind the survey vessel, sometimes requiring the use of a chase vessel to provide USBL navigation for the survey vehicle. Vessels maintain slower speeds of 4–6 kn when towing equipment.
- <u>Un-crewed Surface Vessel (USV) survey</u>. USVs are remote-controlled vessels that are controlled by operators on shore or from another vessel. USVs can be simple, with a single instrument, designed for shallow waters, and controlled by an operator that maintains visual contact with the USV. USVs can also be larger, the size of a small survey vessel, are operated over the horizon, could tow instruments, and use radar and cameras to operate safely and monitor for protected species. USVs can be electrically powered with batteries, sail/solar powered, and/or use diesel motors and generators.

Additionally, BOEM calculated an estimated HRG survey duration for the OCS blocks[1] within the two Oregon WEAs. These calculations are based on BOEM's *Geophysical and Geotechnical Guidelines* and assume a single AUV and a single survey vessel conducting 24-hour operations. The calculated line miles for the Brookings WEA are approximately 5,718 km (3,553 mi) and the Coos Bay WEA are approximately 2,257 km (1,402 mi). Daily maintenance of the AUV was estimated at four hours, line turns were estimated to be 10 minutes in duration, with AUV speeds at 1.5 meters per second (m/s) (~3 kn). Additionally, 10% equipment downtime and 10% weather downtime were added. Transits to and from port due to weather, equipment failure, resupply, and crew changes were not considered due to the lack of sufficient data. For example, BOEM has no means to determine which ports might be used at this time. The total estimated survey time for both areas was estimated to be 89 days. BOEM acknowledges this calculated survey is, perhaps, the best-case scenario, as weather and equipment downtimes are unknown. A more conservative estimate for survey time is 178 days.

[1] OCS lease blocks serve as the legal definition for BOEM offshore boundary coordinates that define small geographic areas within an Official Protraction Diagram for leasing and administrative purposes.

2.3.2.3 Geotechnical Surveys

Geotechnical surveys are conducted to measure the physical properties of sediments on the seafloor and deeper. These measurements are used to design anchor systems, foundations, conduct slope stability studies, determine the armor level of export cables, and determine appropriate cable burial methods. Geotechnical evaluations use HRG surveys to select sites for sampling, ensuring the sites are free from archaeological, geological, and benthic hazards. Geotechnical evaluation samples are collected either by direct sampling or *in-situ* methods. Direct sampling usually employs a dredge or corer off a survey vessel, which retrieves a sediment sample from the seabed and returns it to the deck of the vessel for further analysis. *In-situ* methods use a probe, that is pushed or dropped into the seabed, and can record various sediment properties. Common methods to obtain geotechnical data range in size and cause direct impacts on the seafloor and sedimentation to the water column ranging from an area of less than 1 m^2 up to 10 m^2 per sample (Table 2-3).

The BOEM *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information* (BOEM 2023a) recommend high-frequency, sub-bottom profiler data and medium-penetration seismic surveys. Medium-penetration seismic systems, such as boomer, sparker, or other low-frequency systems can provide information on sedimentary structures that exceed the penetrative capability of a high-frequency, sub-bottom profiler system. BOEM guidance recommends collecting sedimentary structure data 10 m (3.3 ft) beyond the depth of disturbance, which may not be possible with a high-frequency, sub-bottom profiler system in certain sediment types (i.e., sand). Survey contractors could elect to acquire medium-penetration seismic data in areas predicted to have poor sub-bottom penetration.

BOEM anticipates that a geotechnical sample would be taken at every proposed wind turbine anchor site, every anchor touchdown point, every export cable touchdown point, and every km along an export cable route. An unknown number of geotechnical samples might be needed for slope stability studies. In addition, the amount of effort and number of vessel trips required to collect the geotechnical samples vary greatly by the type of technology used to retrieve the sample. The seabed area disturbed by individual sampling events (e.g., collection of a core) and placement of meteorological buoy anchors could range up to an estimated 10 m^2 (Table 2-3), although the majority of sampling will have a maximum disturbance of less than 1 m^2. Some vessels require anchoring for brief periods using small anchors; however, deployments for work in depths above about 100 m would likely involve a vessel with dynamic positioning capability (i.e., no seafloor anchoring impacts) (BOEM 2014). If a vessel intends to anchor, an anchoring plan must be submitted.

2.3.3 Vessel Trips for Site Assessment and Site Characterization

Vessel trips anticipated for site assessment and site characterization activities were estimated (Table 2-4). BOEM projected vessel trips information from the deployments of two LiDAR buoys in the Humboldt and Morro Bay WEAs offshore California (PNNL 2019). PNNL used a marine vessel, transiting at 5 kn, to tow the Morro Bay LiDAR buoy from shore to deployment site and back to port in one day. To assist with estimating vessel trips needed for meteorological buoys, BOEM followed the PNNL plan which was three vessel trips for a 12-month deployment (buoy deployment, mid-year maintenance, buoy recovery).

Vessels performing surveys or towing equipment are relatively slow moving at approximately 7.4–11.1 km/hr [4–6 kn]. Buoy installation vessels are typically 20 to 30 m (65 to 100 ft) in length. Crew boats used for buoy operations and maintenance are usually 16 to 17 m (51 to 57 ft) in length with 400- to 100-horsepower engines and 1,800-gallon fuel capacity.

Table 2-3: Likely Methods to Obtain Geotechnical Data, Associated Sounds, and Estimated Seabed Disturbance.

Geotechnical Method	Use	Description of Equipment and Methods	Acoustic Noise	Seabed Disturbance
Dredge	Collect upper 5–10 cm of sediment	A spring-loaded dredge is lowered to the seabed by hand or with a small winch. Interaction with the seabed releases the spring and tension on the line provides the closing force for the dredge. This is useful to identify the type of seabed sediment.	None	< 1 m^2
Box Cores	Collect undisturbed “box” of sediment up to 0.5 m x 0.5 m x 1.0 m.	A box core is lowered to the seabed by winch and penetrates the seabed; when tension is applied, the box core jaws close, sealing the sample inside. Once on deck, various tests can be performed. This type of equipment is also used for benthic studies.	USBL beacon for positioning	< 4 m^2
Gravity / Piston Coring / Jumbo Piston Coring	Collect a core of sediments for analysis, 3–4” diameter, 10 m–20 m.	Coring is typically conducted off a survey vessel. Gravity coring simply uses a weighted core barrel to take a sample. Piston coring uses a trigger to drop the weighted core barrel into the seabed with a piston that attempts to preserve the seabed. A jumbo piston core is a larger piston corer with increased diameter and length.	USBL beacon for positioning	< 4 m^2
Cone Penetrometer (CPT)	Measures several properties including tip resistance, pore water pressure, sleeve resistance, among others.	An electrically operated machine pushes a coiled rod into the seabed with a cone penetrometer at the tip. Typically deployed from survey vessels. They are winched to the seabed and remain connected to the survey vessel via umbilical for data transmission and power.	USBL beacon for positioning. Motor noises during operation.	< 10 m^2
Stinger CPT	Measures several properties including tip resistance, pore water pressure, sleeve resistance, among others.	A hydrodynamic dart with a CPT at the tip. CPT Stingers are typically deployed from survey vessels, much like a gravity core. The CPT records as the equipment embeds into the seafloor. It could then push the CPT further into the seafloor.	USBL beacon for positioning. Motor noises during operation.	< 4 m^2

Geotechnical Method	Use	Description of Equipment and Methods	Acoustic Noise	Seabed Disturbance
Vibracore	Obtains samples of unconsolidated sediment; could also gather information to aid archaeological interpretation of features identified through HRG surveys (BOEM 2020).	Vibracore samplers typically consist of a core barrel and an oscillating driving mechanism that propels the core barrel into the sub-bottom. Once the core barrel is driven to its full length, the core barrel is retracted from the sediment and returned to the deck of the vessel. Typically, cores up to 6 m long with 8-cm diameters are obtained, although some devices have been modified to obtain samples up to 12 m long (MMS 2007a; USACE 1987).	Vibrations from the motor.	< 10 m^2
Borings	Sampling and characterizing the geological properties of sediments at the maximum expected depths of the structure foundations (MMS 2007a).	A drill rig is used to obtain deep borings. The drill rig is mounted over a moon pool on a dynamically positioned vessel with active heave compensation. Geologic borings can generally reach depths of 30–61 m within a few days (based on weather conditions). The acoustic levels from deep borings can be expected to be in the low-frequency bands and below the 160 dB threshold established by NMFS to protect marine mammals (Erbe and McPherson 2017).	Vessel and drill noise.	< 10 m^2

Key: CPT = cone penetrometer; dB = decibel; NMFS = National Marine Fisheries Service; USBL = ultra-short baseline

Table 2-4: Estimated Number of Vessel Trips for Site Characterization and Site Assessment During a 3–5 Year Period for Each Lease Area

Survey Task	Estimated Number and Duration of Survey Days/Round Trips[1]
HRG surveys of all OCS blocks within lease area(s) [2]	89 to 178 days
Geotechnical and benthic sampling	20 trips of 24 hours each or 250 trips of 10 hours each
Avian surveys[3]	30 to 60 trips of 10 hours each
Fish surveys[3]	8 to 370 trips of 10 hours each
Marine mammal and sea turtle surveys[3]	30 to 60 trips of 10 hours each
Meteorological buoy installation	6 (1 round trip x 6 buoys)
Meteorological buoy maintenance trips (at 1 per year)	30 (6 buoys x 5 years)
Meteorological buoy decommissioning	6 (1 round trip x 6 buoys)
Additional trips for maintenance/weather challenges	45–60
Total estimated number of round trips	264–1,020

Key:

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. Number of vessel trips are intended to be conservative estimates of survey requirements, with actual numbers likely to be lower.
2. To calculate HRG survey days via AUV, see Section 2.5.2.2. For geotechnical sampling, the lower range assumes 24-hour survey days, whereas the upper range assumes 10-hour survey days.
3. Avian, fish, marine mammal, and sea turtle surveys are typically conducted during daylight hours (10 hours). Surveys could occur simultaneously from the same vessel but not concurrently with HRG surveys. Totals include vessel trips for both.

2.3.4 Non-Routine Events

Non-routine and low-probability events and hazards that could occur in the WEAs 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 vessels or marine life; (2) spills from collisions or fuel spills resulting from generator refueling; and (3) recovery of lost survey equipment.

2.3.4.1 Allisions and Collisions

An allision occurs when a moving object (i.e., a vessel) strikes a stationary or moored object (e.g., meteorological buoy); a collision occurs when two moving objects strike each other. A meteorological buoy in the WEA could pose a risk to vessel navigation. An allision between a ship and a meteorological 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. Vessels associated with site assessment and site characterization activities could collide with other vessels, resulting in damages to the vessels, petroleum product spills, or capsizing. However, risk of allisions and collisions is reduced through routing measures such as traffic separation schemes (TSS), safety fairways, anchorages, and United States Coast Guard (USCG) Navigation Rules and Regulations. Thus, collisions and allisions are considered unlikely. Further, areas of relatively higher traffic were excluded from the WEAs, further reducing the risk. Risk of allisions with buoys would be reduced by USCG-required marking and lighting.

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.

2.3.4.2 Spills

A petroleum spill could result from allisions, collisions, 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 could float on the water's surface or be dispersed into the water column by waves. Diesel would be expected to dissipate rapidly, evaporate, and biodegrade within a few days (MMS 2007b).

BOEM used NOAA's Automated Data Inquiry for Oil Spills 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 modeling 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% varied between 0.5 and 2.5 days, depending on ambient wind direction and speed (Tetra Tech EC Inc. 2015), suggesting that 88 gallons would reach similar concentrations faster and limit the potential environmental impact to negligible.

Most modern meteorological buoys do not use petroleum, further reducing the possibility of a spill. Any vessels used to conduct survey activities would be required to comply with USCG spill prevention requirements and follow 33 CFR Parts 151, 154, and 155, which contain guidelines for spill response plans and shipboard oil pollution emergency plans. Further, a spill would be expected to dissipate rapidly and then evaporate and biodegrade within a day or two, limiting the potential impacts to a localized area for a short duration.

2.3.4.3 Lost Survey Equipment

In the event of equipment loss during surveys or a meteorological buoy disconnecting from its anchor, recovery operations could be undertaken. Recovery operations could 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, bottom disturbances could result from dragging the line along the bottom until it hooks the lost equipment. In addition, after the line catches the lost equipment, components are dragged along the seafloor until recovery.

Survey equipment could be carried away by currents or become embedded in the seafloor. Additional bottom disturbance could also occur. For example, a broken vibracore rod that cannot be retrieved could need to be cut and capped 1–2 m (3–6.5 ft) below the seafloor. For the recovery of lost survey equipment, BOEM would 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 with stakeholders could be necessary. Potential impacts associated with recovery of lost survey equipment could include vessel trips, noise and lighting, air emissions, and routine vessel discharges from a single vessel. Bottom disturbance and habitat degradation could also occur from recovery operations.

2.4 IMPACT-PRODUCING FACTORS

The analysis in this EA considers the potential effects of routine and non-routine activities associated with lease issuance, site assessment activities, and site characterization activities within the WEAs. This EA uses a reasonably foreseeable scenario of site assessment activities and site characterization surveys that could be conducted because of the Proposed Action. Section 2.5 and **Appendix A** describe activities and surveys to meet the requirements of the renewable energy regulations at 30 CFR Part 585 and are based on BOEM's guidance for lessees, previous lease applications and plans that have been submitted to BOEM, and previous EAs prepared for similar activities.

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

- Noise
- Bottom disturbance
- Lines and cables used in site assessment and characterization (entanglement risk to marine wildlife)
- Vessel trips
- Economic impacts
- Air emissions.

2.5 OFFSHORE ACTIVITIES AND RESOURCES ELIMINATED FROM FURTHER CONSIDERATION

BOEM has focused the main body of this EA on the potential impacts for resources with potential impacts known or stated as concerns in public comments. This EA uses a four-level classification scheme (negligible, minor, moderate, and major) to characterize the environmental impacts predicted if the Proposed Action or the No Action Alternative is implemented. Some resources that are expected to experience negligible or no impacts from the site assessment and site characterization activities have been scoped out of this EA because NEPA analyses are intended to concentrate on issues that are most important to the action (40 CFR 1500.1(b)); some resources for which no meaningful impacts are anticipated are excluded from analysis in this EA. However, these resources could be within the scope of analysis for future actions (i.e., development of a wind lease area). Resource areas for which detailed analyses are not carried out in this EA include water quality and bats (see **Appendix C**).

2.6 CURRENT AND REASONABLY FORESEEABLE PLANNED ACTIONS

Current and reasonably foreseeable actions that could occur in the vicinity of the Proposed Action can be found in **Appendix D**. Also included are ongoing and planned actions that overlap with this regional area and could occur between the start of Proposed Action activities in 2024 through approximately 2029. BOEM used a localized geographic scope to evaluate impacts from planned actions for resources that are fixed in nature (i.e., their location is stationary, such as benthic and archaeological resources), or for resources where impacts from the Proposed Action would only occur in waters in and directly around the proposed lease areas. There is no indication that the issuance of a lease or grant of a ROW or RUE and subsequent site characterization would involve expansion of existing port infrastructure.

3 Description of Affected Environment and Environmental Impacts

This section describes aspects of the natural and human environment that could be impacted by the Proposed Action and briefly describes those impacts. Resources unlikely to be impacted by the Proposed Action are discussed in Section 2.5. Additional resources that are unlikely to be affected by the Proposed Action are noted in the individual resource sections with an accompanying statement explaining why impacts are not expected.

The Proposed Action for some resources includes Best Management Practices (BMPs) to reduce or eliminate potential risks to or conflicts with specific environmental resources. If leases or grants are issued, BOEM will require the lessee to comply with BMPs through lease stipulations. Specific information on the BMPs is listed in **Appendix E**.

3.1 GEOLOGY

3.1.1 Affected Environment

The area impacted by the Proposed Action is within the submerged Cascadia Subduction Zone, a forearc basin bordered by the Juan de Fuca and North American tectonic plates. The local geomorphology is influenced by regional subduction, mass wasting, and mixed fault vergence within the Cascadia deformation front (Watt and Brothers 2020). The area is seismically active with several 7.0+ earthquakes occurring since 1900, none directly offshore Oregon but near the Mendocino Triple Junction in California and on Vancouver Island, Canada. However, the last major megathrust earthquake, measuring 9.1 magnitude, occurred on January 26, 1700 (Tajalli Bakhsh et al. 2020).

The Oregon continental shelf is relatively broad, followed by an abrupt descent into the continental slope and abyssal plain. Seafloor slopes range from 0–2° on the continental shelf, 0–5° on the mid-upper continental slope and exceed 10° near mass-wasting scarps and submarine canyon walls on the lower slope (Lenz et al. 2018). Common seafloor and near-seafloor features documented in the available marine geological and geophysical (G&G) data include shallow faults/folds, fluid pockmarks, rock outcrops, and mass-wasting deposits.

Compared to Washington and California, Oregon lacks a diverse network of submarine canyons (Hill et al. 2022), with only the major Astoria Canyon and much smaller Rogue Canyon as submarine gorges of note. Littoral drift, which has trended to the northwest throughout the Pleistocene (Carlson and Nelson 1969, McAdoo et al. 2000), is concentrated through Astoria Canyon (Goldfinger et al. 2014), and the associated deepwater Astoria fan.

The absence of significant Pleistocene/Holocene sediment loading over much of the central-southern Oregon continental slope indicates that shallow continental shelf and slope sediments are generally stable and strong (shear strength), even at steeper seafloor slopes greater than 10° (Lenz et al. 2018). Mapped mass-wasting features offshore Oregon commonly exhibits the “block geometry” of a major *in situ* slope failure, likely caused by a very large regional earthquake or major gas hydrate dissociation (Lenz et al. 2018). These “blocky failures” are concentrated in the deeper, steeper, lower slope of the Cascadia deformation front (Hill et al. 2022). There is an absence of failures in the forearc basins of central and southern Cascadia (Hill et al. 2022). The Brookings WEA sits largely in the Eel River forearc basin. The Coos Bay WEA sits in the middle of these two regions, with the Heceta Bank (and slide) area to the east, the deformation front to the west, and is potentially in a piggy-back basin.

Hydrographic surveys by NOAA indicate potential seafloor hazards in the WEAs. Bathymetry, potential faults with surface expression, areas of anomalous high backscatter, seeps detected in the water column, and other mapped instances of outcropping rock are presented in Figure 3-1.

Legacy 2D seismic, acquired in the late 1970s and early 1980s for oil and gas exploration, indicates a Bottom Simulating Reflector (BSR) along most of the Oregon and Washington continental slope. This BSR is observed in water depths between 600 to 2,000 m and extends across large portions of the continental shelf and slope. BSRs can indicate the presence of methane hydrate in the seabed (Shipley et al. 1979). The BSR itself is the buried end of the Hydrate Stability Zone (HSZ) with Hydrate-Bearing Sediments (HBS) possible between the BSR and the seabed. The area of potential HBS is shown in Figure 3-1.

3.1.2 Proposed Action Impacts

Although the geology of the Oregon continental shelf is complex, the anticipated impacts on the local geologic resources by site characterization activities include HRG surveys and geotechnical sampling. Geotechnical sampling within the WEAs would result in a temporary disturbance of the upper 25 m (82 ft) of sediment that underlies the seafloor.

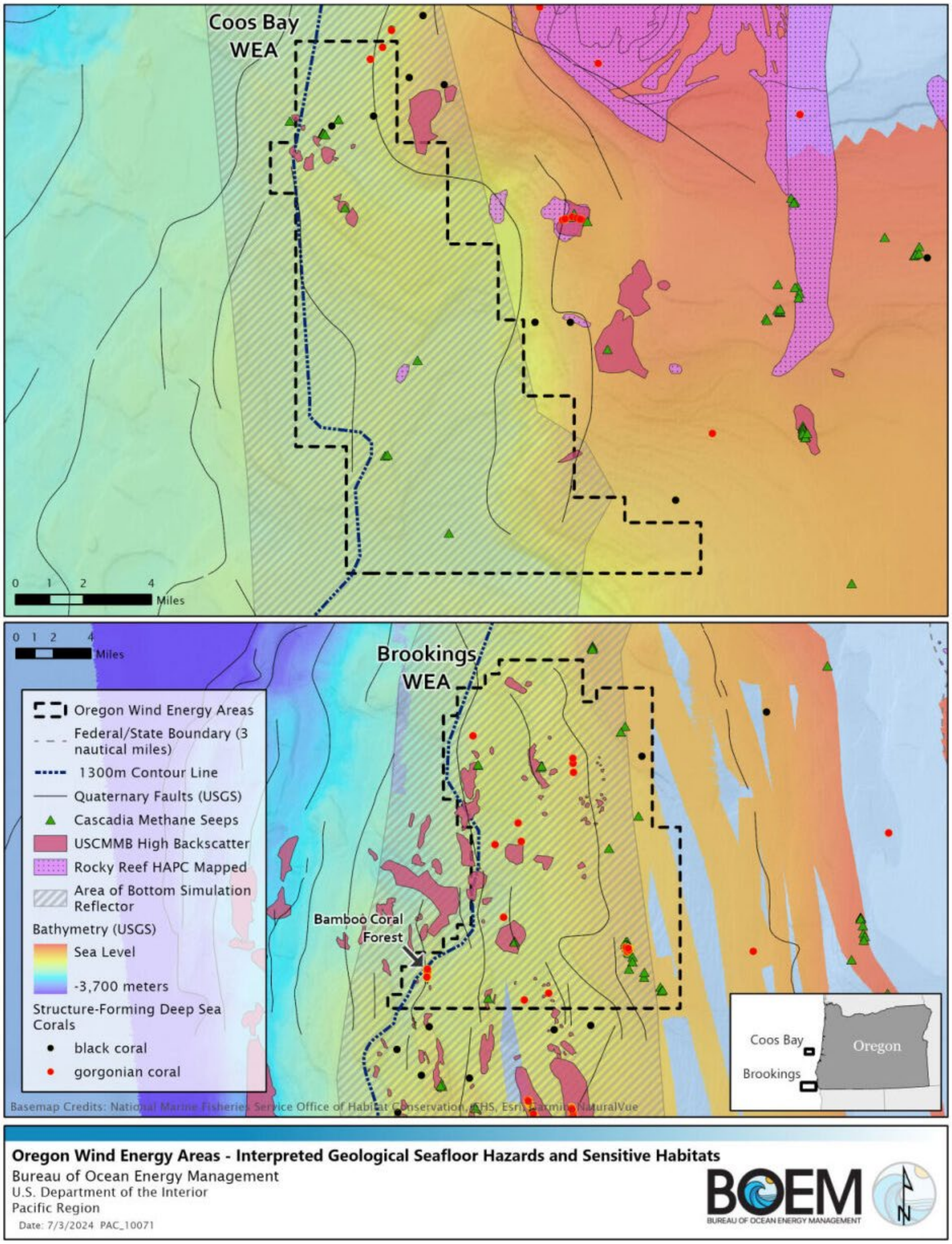
Conclusion

Impacts on geologic resources would be limited to the lease area and potential export cable routes. HRG survey activity would be temporary and short-term. A geologic impact would not be measurable, so **negligible**.

3.1.3 No Action Alternative Impacts

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

Figure 3-1: Seafloor Features, Including 1,300 m Contour, Bathymetry, Faults, Methane Seeps, HAPC, Hardbottom, and Essential Fish Habitat Conservation Areas for Oregon WEAs: Coos Bay (top panel) and Brookings (lower panel)



Sources: Conrad and Rudebusch (2023); HAPC: OSU Active Tectonics & Seafloor Mapping Lab; Hard bottom: U.S. Cascadia Margin Multibeam Backscatter; Methane Seeps: Merle et al. (2021)

3.2 AIR QUALITY

3.2.1 Affected Environment

Air quality is defined by the concentration of pollutants, including greenhouse gases (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, presence of sunlight, and barriers to transport such as mountain ranges.

The Proposed Action could impact the air quality of onshore areas corresponding to the Coos Bay WEA (Coos County) and the Brookings WEA (Curry County). The western coastal areas of Douglas, Lane, and Lincoln counties also have the potential to be impacted, depending on wind velocity and vessel activity.

Air pollutants can be classified as criteria pollutants, hazardous air pollutants (HAPs), and GHGs. The criteria pollutants are carbon monoxide (CO), lead, ground-level ozone, particulate matter (PM), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2), which are all 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 (CO_2), methane, and nitrous oxide. Fossil fuel combustion represents most of the energy-related GHG emissions, with CO_2 being the primary GHG (EPA 2022). In contrast to the NAAQS and HAPs contaminants, which have more local impacts, GHGs have a global impact.

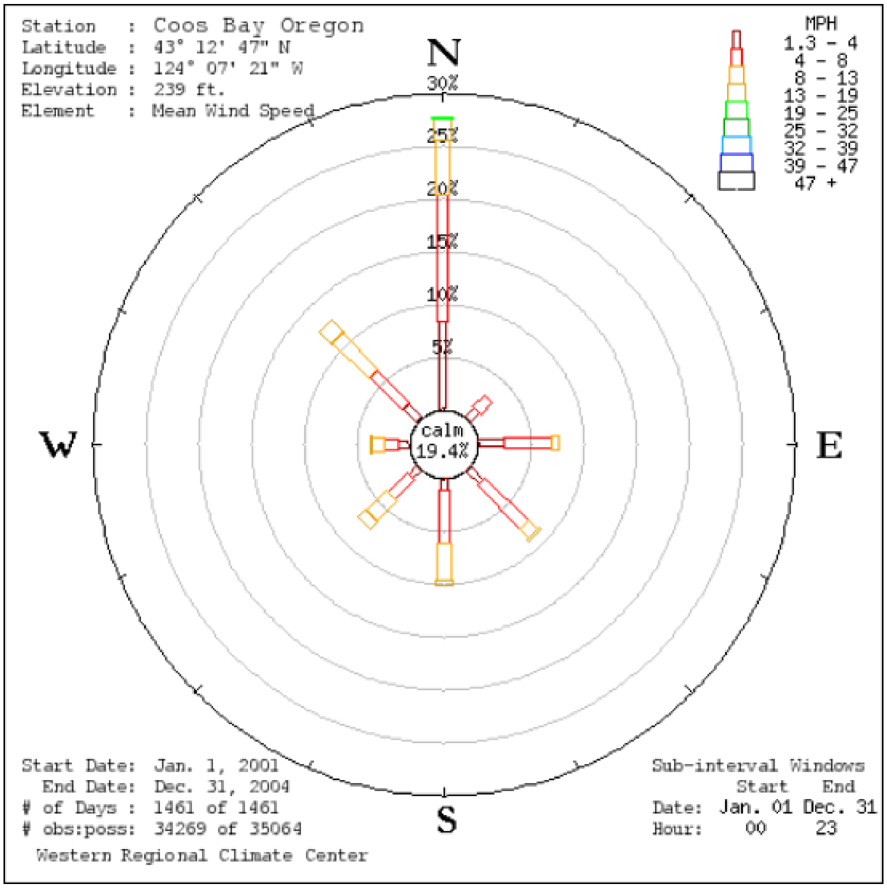
When the monitored pollutant levels in an area exceed the NAAQS for any pollutant, the area is classified as being in “nonattainment” for that pollutant. The Federal and state attainment status for Coos, Brookings, Douglas, Lane, and Lincoln counties NAAQS contaminants is found at 40 CFR § 81.338. None of the potential areas of impact are classified as nonattainment for any NAAQS criteria pollutants. The U.S. Environmental Protection Agency (EPA) has air quality permitting jurisdiction over sources on the OCS offshore Oregon. The Oregon Department of Environmental Quality (DEQ) and the Cleaner Air Oregon regulation (OAR-340-245) has air quality permitting jurisdiction over Oregon state waters and lands (with the exception of areas covered by the Lane Regional Air Protection Agency). According to OCS Air Regulations in 40 CFR Part 55, depending on the leases granted and wind development areas identified in the Brookings WEA, the proposed activity may be required to comply with Oregon DEQ and OAR-340-245 regulation (i.e., requirements of the corresponding onshore area), as determined by the EPA. This does not apply to the Coos Bay WEA, which is more than 25 miles from Oregon’s state seaward boundary.

The Clean Air Act gives special air quality and visibility protection to national parks larger than 6,000 acres and national wilderness areas larger than 5,000 acres, which are known as Class I areas (42 U.S.C. §7472). Very little degradation of air quality, including air quality-related values such as visibility, is allowed in Class I areas (42 U.S.C. §7491). The nearest Class I area to an Oregon WEA is the Kalmiopsis Wilderness, approximately 60 miles east of the Brookings WEA in eastern Curry County.

Air pollutants are transported primarily by wind, so the wind speed and direction are significant factors to consider in determining adverse impacts. Based on wind monitoring near Coos Bay, the wind comes predominantly from the north and northwest (Figure 3-2). This indicates that pollutant emissions created in the Coos Bay WEA tends to drift south toward open water and southeast toward Coos Bay. Wind monitoring in Red Mound (Figure 3-3) suggests that pollutant emissions created in the Brookings WEA, if they were to transport to land, could drift to the southeast and south-southeast.

In addition to Coos and Curry counties, the western portions of Douglas County, Lane County, and Lincoln County can also be considered potential impact areas, depending upon wind direction and level of emissions.

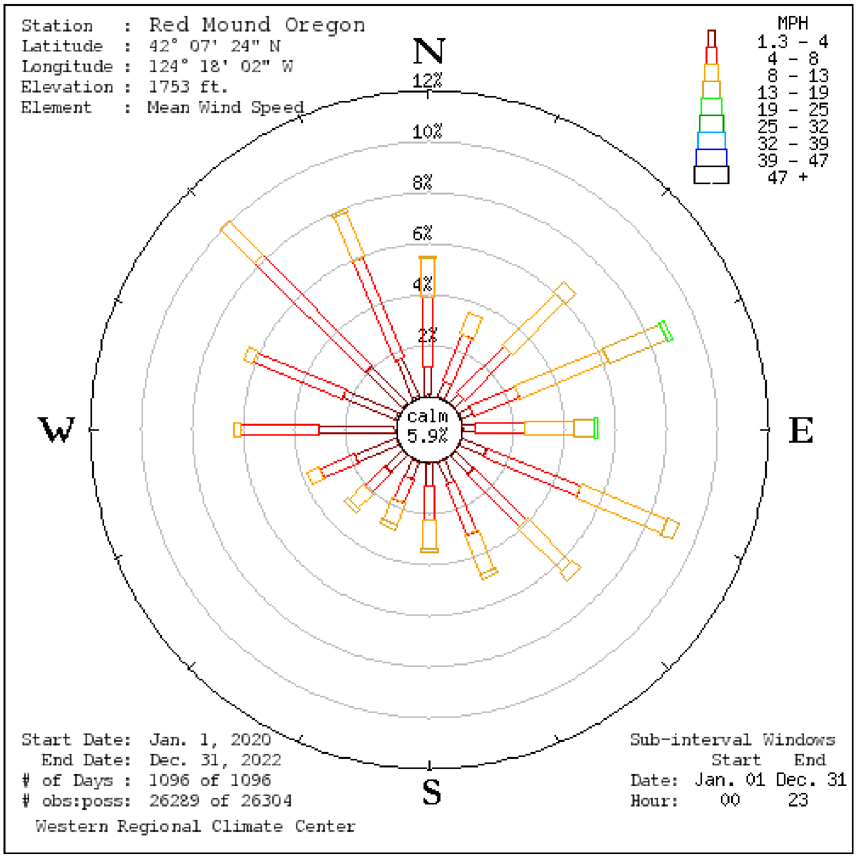
Figure 3-2: Coos Bay Wind Rose, 2001–2004



Notes: Wind rose represents the frequency, mean speed, and direction of winds observed between January 1, 2001, and December 31, 2004, at a station near Coos Bay, Oregon (43.2131° N, 124.1225° W). This station is 13.8 miles inland from the coastline, at an elevation of 239 ft. Length of color bars represents the frequency with which winds blew from a given direction, and the colors indicate the wind speed (in mph) observed (see legend in top right corner). Dates chosen were subject to data availability.

Source: Western Regional Climate Center (2023a)

Figure 3-3: Red Mound Wind Rose, 2020–2022



Notes: Wind rose represents the frequency, mean speed, and direction of winds observed between January 1, 2020, and December 31, 2022, at a station near Brookings in Red Mound, Oregon (42.1233° N, 124.3006° W). This station is 2.7 miles inland from the coastline, at an elevation of 1,753 ft. Length of color bars represents the frequency with which winds blew from a given direction, and the colors indicate the wind speed (in mph) observed (see legend in top right corner). Dates chosen were subject to data availability.

Source: Western Regional Climate Center (2023b)

3.2.2 Proposed Action Impacts

The factors associated with this Proposed Action that can potentially produce adverse impacts on air quality are summarized in Table 3-1. The primary air contaminants emitted are CO, NO_2, SO_2, fine particulate matter ($PM_{2.5}$), and GHGs, although these emissions would be generated in negligible quantities due to the size and limited number of emissions sources. Marine diesel and lube oils, to a lesser degree due to their low volatility, are also potential contaminants.

Marine diesel and lube oils could 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, another NAAQS contaminant). NO_2, in the presence of sunlight, is also an ozone precursor. GHGs, in contrast to the other contaminants in Table 3-1, have a global, rather than local, impact. CO_2 traps heat in the atmosphere and dissolves in seawater, resulting in global warming and ocean acidification, respectively, as well as other related climate change impacts.

Table 3-1: Emissions Sources Potentially Producing Adverse Impacts on Air Quality

Source	Impact-Producing Factors	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, GHGs
Auxiliary engines	• Stack emissions • Fugitive emissions[1] • Fuel and lubricant spills	CO, NO_2, $PM_{2.5}$, SO_2, marine diesel, lube oils, GHGs
Buoy back-up generators	• Stack emissions • Fugitive emissions[1] • Fuel and lubricant spills	CO, NO_X, $PM_{2.5}$, SO_2, marine diesel, lube oils, GHGs
Trucks and locomotives	• Engine exhaust	CO, NO_X, $PM_{2.5}$, SO_2, GHGs
Goods-movement equipment (includes cranes, winches, and gantries)	• Engine exhaust	CO, NO_X, $PM_{2.5}$, SO_2, GHGs

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

Key: CO = carbon monoxide; GHG = greenhouse gas; NO_X = Oxides of nitrogen; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; SO_2 = sulfur dioxide.

3.2.2.1 Marine Vessels

Marine vessels are the source of stack emissions from the main exhaust stack of the engine used to propel a vessel. These emissions are primarily the products of combustions: CO, nitrogen oxides (NO_X), $PM_{2.5}$, oxides of sulfur (SO_X), and GHGs. Fugitive hydrocarbon emissions could occur from the transfer and storage of fuel. Hydrocarbon emissions could also result from fuel and lubricant spills. Fuel and lubricants can be released during both normal operations and because of emergency events. In the unlikely event of a marine vessel capsize or hull breach, hydrocarbons enter the marine environment and either vaporize, become entrained in the seawater, or, if met with an ignition source, would create combustion contaminants, including visible emissions and odors. Liquid and gaseous pollutants can also be released during the vessel refueling process and as breathing losses from both onboard and onshore storage tanks. Stack emissions from marine vessels are the primary emissions sources associated with this Proposed Action. Diesel PM, which constitutes most of the $PM_{2.5}$ emissions, is an important contaminant to consider during idling of vessels in port due to its potential health impacts.

All marine vessels used for surveys are expected to comply with Federal and state air quality regulations for engine upgrade requirements, as well as monitoring, recordkeeping, and reporting requirements.

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_X, $PM_{2.5}$, and GHGs, primarily CO_2. Fugitive hydrocarbon emissions could occur from the transfer and storage of fuel for these engines. Hydrocarbon emissions could also result from fuel and lubricant spills.

3.2.2.3 Back-up Generator for Buoys

Buoys could be deployed with onboard back-up generators if the buoy batteries or battery recharging system fails. The possibility of hydrogen releases from buoy lead-acid batteries exists but is negligible, due to the extremely small amounts released. Buoy back-up generators are generally powered by diesel fuel. Air emissions are primarily CO, NO_X, $PM_{2.5}$, and GHGs. The possibility of a fuel spill also exists during filling operations and if the generator's fuel tank is ruptured.

3.2.2.4 Truck and Locomotive Traffic

Trucks and trains could be used to transport equipment and personnel to and from the onshore staging area(s). Associated air emissions include CO, No_x, $PM_{2.5}$, SO_X, and GHGs.

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_X, and GHGs.

Conclusion

Vessel activity would primarily occur between 20 and 50 mi offshore, and, if there are multiple leases granted, survey activity may not occur simultaneously. Truck and locomotives activity, if they occur, would be involved if needed to transport parts and equipment to the staging area. The emissions from these activities are expected to be insignificant due to their short-term nature. Emissions would mix in the ambient atmosphere, be quickly dissipated, and be indistinguishable from emissions created by other daily vessel traffic offshore Coos, Curry, Douglas, Lane, and Lincoln counties.

As a comparison to the Oregon WEAs, three WEAs off of North Carolina with a total area of approximately 300,000 acres, had no criteria pollutant emissions estimates exceeding 100 tons per year during site characterization and assessment (Table 3-2), which is the default value for the major source threshold. For analysis purposes, North Carolina serves as a conservative (high) estimate for construction, deployment, and decommissioning of meteorological buoys and equipment. The emissions from survey activities for the Oregon WEAs, whose total area is almost 200,000 acres, should be substantially less. Survey vessels and ancillary equipment emit a variety of air pollutants, including NO_2, SO_2, PM, volatile organic compounds (VOCs), CO, and GHGs. The air emissions from this Proposed Action are anticipated to be primarily from the survey vessels' propulsion engines and engines that power ancillary equipment. Lesser amounts of air pollutants could be emitted from trucks, locomotives, and goods-movement equipment if they are used to transport equipment and personnel to the project staging area.

The GHG emissions from this action would be from marine vessels operating per lease and, while this level of emissions would be additive to the global inventory, it is not expected to have any measurable impacts on the local environment.

Impacts on Class I areas are expected to be **negligible** because the emissions from marine vessels would be too small to affect air quality in any Class I areas.

3.2.3 No Action Alternative Impacts

Under this alternative, commercial leases and grants would not be issued in the Coos Bay or Brookings WEAs, and G&G activities would not occur pursuant to wind energy development. Impacts from urban development and increasing air, vessel, and onshore traffic will continue to contribute to climate change and have negative impacts on air quality. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts on air quality from existing actions.

Table 3-2: Emissions Estimates from Site Characterization and Site Assessment of Three North Carolina WEAs

Activity	CO	NO_X	VOCs	PM_{10}	$PM_{2.5}$	SO_X	CO_2	N_20	CH_4	CO_2e
Site Characterization Surveys	3.50	37.99	1.46	2.07	2.07	3.74	1,828.78	0.05	0.24	1,900.47
Site Assessment: Construction of Meteorological Towers[1]	0.36	2.11	0.43	0.14	0.14	0.20	131.33	0.003	0.04	144.39
Site Assessment: Operation of Meteorological Towers	4.03	22.04	1.85	1.47	1.47	1.64	790.99	0.01	0.04	801.83
Site Assessment: Decommissioning of Meteorological Towers[1]	0.36	2.75	0.44	0.16	0.17	0.27	164.32	0.00	0.04	176.07
Sum of Emissions from All Sources[2]	8.26	64.89	4.18	3.85	3.85	5.86	2,915.42	0.07	0.35	3,022.77

Notes: Units are tons per year (metric tons per year for GHGs) in a single year.

1. Towers are not being considered but this serves as a conservative (high) estimate for construction, deployment, and decommissioning of meteorological buoys and equipment.

2. Sum of individual values may not equal summary value because of rounding.

Key: CO = carbon monoxide; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; CH_4 = methane; N_2O = nitrous oxide; NO_x = oxides of nitrogen; PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less; $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less; VOCs = volatile organic compounds.

Source: BOEM (2015)

3.3 MARINE AND COASTAL HABITATS AND ASSOCIATED BIOTIC ASSEMBLAGES

3.3.1 Affected Environment

A variety of marine and coastal habitats exist within and nearby the WEAs, and species that reside in these habitats are characteristic of the Oregonian (cool-temperate) Biogeographic Province. Large-scale upwelling brings dissolved nutrients to the surface, which enhance biological productivity and support significant biodiversity and biomass in the region. General references describing the study region or relevant ecological patterns within the California Current System include Allen et al. (2006) and Kaplan et al. (2010); these studies are incorpated by reference into this section. Key habitats and species that could be affected by the site assessment and site characterization activities are sumarized below. The PFMC classifies all of these habitats as EFH for one or more federally managed fisheries.

3.3.1.1 Benthic Habitat

Soft substrate dominates benthic habitat along Oregon’s continental shelf and upper slope, grading from coarse sand and shell at shallow depths to finer sand on the inner and middle continental shelf (extending to ~100 m depth) and fine silt and mud on the outer shelf (~100 to 200 m) and slope (> 200 m) (Romsos et al. 2007; Cochrane et al. 2017). A variety of habitats could occur in the area of potential impact, including offshore banks, rock outcrops, gas seeps, submarine canyons, and artificial substrates (marine debris, shipwrecks).

Key structuring processes for invertebrate communities show cross-shelf patterns (i.e., perpendicular to the coastline) (Henkel et al. 2020; Goldfinger et al. 2014), and environmental drivers include depth, sediment grain size, dissolved oxygen levels, and organic material/silt. 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 and other rockfish species, sablefish, and hagfishes.

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 offshore banks (Tissot et al. 2008), seeps and their associated chemosynthetic communities (Kennicutt et al. 1989), and submarine canyons (BLM 1980). A model of potential suitable hard substrate habitat for selected deep-sea coral species shows that Coos Bay and Brookings WEAs are not likely to be hotspots of deep-sea coral occurrence (Carlton et al. 2024). These data were included into the natural resources sub-model of a relative suitability for offshore wind in Oregon. Maps show the southern part of Brookings WEA has most potential for sensitive seafloor habitats such as deep-sea corals, sponges, and species associated with active chemosynthetic venting. Within this southern area of the Brookings WEA is a bamboo coral forest research site in Aliquot NK10-04 7018M (Figure 3-1).

Benthic habitats within the WEAs are 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 (Carlton et al. 2024). The WEAs have generally avoided the shelf break and EFH (see Section 4.3.2) conservation areas, as well as rocky reef EFH Habitat Areas of Particular Concern for Pacific Coast groundfish (Figure 3-1).

3.3.1.2 Pelagic Environments

This ecosystem is defined here as all open water habitat seaward of coastal habitats. The central California Current System is highly productive due to wind-driven upwelling of nutrient-rich water (Ryan et al. 2009). 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). 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).

3.3.1.3 Intertidal and Coastal Habitats

Defined as the interface between terrestrial and marine zones, two types of intertidal habitats exist: soft sediments (e.g., sandy and cobble beaches, mudflats) and hard substrate (e.g., rock outcrops, human-made structures such as rock walls). The coastal zone is defined in this document as benthic and water column habitats and species that reside seaward of intertidal habitats out to the Federal-state waters boundary (3 nm from shore). Key references summarizing details concerning regional coastal habitats are described by Kaplan et al. (2010). Special coastal features include kelp forests, seagrasses, and estuaries, all of which are also desginated as Habitat Areas of Particular Concern for Pacific Coast groundfish.

3.3.1.4 Threatened and Endangered Species

Twenty-eight 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 3-3).

Table 3-3: Marine Fish Taxa Listed as Threatened or Endangered Under the ESA

Common Name	Scientific Name	Federal Status
Chinook salmon ESUs[1]	*Oncorhynchus tshawytscha*	
Sacramento River Winter-Run	-	Endangered
Upper Columbia River Spring-Run	-	Endangered
California Coastal	-	Threatened
Central Valley Spring-Run	-	Threatened
Lower Columbia River	-	Threatened
Puget Sound	-	Threatened
Snake River Fall-Run	-	Threatened
Snake River Spring/Summer-Run	-	Threatened
Upper Willamette River	-	Threatened
Chum salmon ESUs[1]	*Oncorhynchus keta*	
Columbia River	-	Threatened
Hood Canal Summer-Run	-	Threatened
Coho salmon ESUs[1]	*Oncorhynchus kisutch*	-
Central California Coast	-	Endangered
Lower Columbia River	-	Threatened
Oregon Coast	-	Threatened
Southern Oregon/ Northern California Coast	-	Threatened
Steelhead DPS[2]	*Oncorhynchus mykiss*	-
Southern California	-	Endangered
Central California Valley	-	Threatened
Central California Coast	-	Threatened
Lower Columbia River	-	Threatened
Middle Columbia River	-	Threatened
Northern California	-	Threatened
Puget Sound	-	Threatened
Snake River Basin	-	Threatened
South-Central California Coast	-	Threatened
Upper Columbia River	-	Threatened
Upper Willamette	-	Threatened
Green sturgeon, Southern DPS[2]	*Acipenser medirostris*	Threatened
Eulachon, Southern DPS[2]	*Thaleichthys pacificus*	Threatened

Notes: 1. As defined under the ESA, ESU refers to Evolutionarily Separate Unit
2. As defined under the ESA, DPS refers to Distinct Population Segment

3.3.2 Proposed Action Impacts

Stressors to the environment could include benthic disturbance and the associated water quality changes from disturbance (turbidity and sediment suspension), noise, introduction of artificial habitat, and accidents. This impact analysis assumes that regulations and BMPs to avoid hard substrates and the creation of marine debris would be implemented by lessees when required. See **Appendix E** for Best Management Practices to Minimize Potential Adverse Impacts on Sensitive Seafloor Habitats and Marine Debris Awareness and Prevention.

3.3.2.1 Benthic Habitats

Meteorological buoys deployed are estimated to disturb a maximum of 2.3 m^2 (25 ft^2) of seafloor from its solid cast iron anchor (PNNL 2019). BOEM assumes that each buoy could disturb up to 10 m^2 and up to six meteorological buoys per lease (12 total) could be installed as part of the Proposed Action. Impacts on the outer shelf and upper slope seafloor habitats, including EFH, include crushing or smothering of organisms by an anchor. Sediment suspension by anchor placement would cause temporary turbidity increases in the water column and could interfere with filter-feeding of nearby invertebrates and the respiration and feeding of fishes.

Sensitive habitats would be avoided by lessees adhering to the BMPs included in **Appendix E**. In addition, prior to commencing bottom-disturbing activities, lessees would provide BOEM with information about the planned location of activities and methods used to avoid sensitive habitats. If existing high-resolution seafloor data are not available, surveys to examine the proposed area of seafloor disturbance would be conducted; survey methods include high-resolution sonar and/or other visual methods.

Physical sampling methods (grab samplers, benthic sleds, bottom cores, deep borings) could disturb, injure, or cause mortality to benthic resources and EFH in the immediate sampling area (see Table 2-3 for examples of equipment and areas of disturbance). These sampling methods are expected to disturb less area than buoy anchors, with most types of sampling disturbing less than 4 m^2, and some disturbing less than 1m^2. In total, hundreds of geotechnical samples would be collected; most seafloor contacts are geotechnical samples with a relatively low bottom-disturbance footprint, and a smaller number of geotechnical samples would have a larger footprint. Approximately 10 ADCP moorings could be deployed per lease. Combined, geotechnical samples and ADCP moorings are estimated to total 1,500 m^2 of bottom disturbance per lease area. These estimates of sampling equipment types, numbers, and areas of disturbance are based on preliminary survey plans in California, personal communication with industry, and *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information* (BOEM 2023a). The use of UTPs placed on the seafloor would lead to additional bottom disturbance per lease. In total, and assuming conservatively that all seafloor contacts are estimated to directly or indirectly disturb 10 m^2, a maximal total estimate of 3,128 m^2 of sediment disturbance (1,564 m^2 per lease area) would occur.

Data collection buoys and associated mooring systems could act as small artificial reefs within an area that could exclude fishing, and these areas could provide a benefit to local benthic and fish assemblages associated with hard substrate. Decommissioning buoys could create short-term sediment suspension and would remove or reduce the artificial reef effect. Impacts on benthic fishes and EFH could occur from the potential introduction of non-native or invasive species from non-local project vessels or by the introduced structure (anchors) providing habitat for these species. These potential effects are not expected to affect viability of regional populations or cause long-lasting damage to habitats; buoy moorings and anchors would be removed during decommissioning.

In the unlikely event of recovering lost equipment, seafloor disturbance would be expected during the recovery operation. Impacts on 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.

Noise from HRG surveys and project vessels could alter larval, juvenile, and adult fish behavior within the WEAs but the effect would be temporary and last only for the duration of the noise-producing activities. It is not expected to affect viability of regional populations because (1) a fraction of the regional stock would be affected; and (2) no detectable increase in mortality for the regional population is expected. Further details of noise from HRG surveys are discussed in Section 3.4, Marine Mammals and Sea Turtles.

3.3.2.2 Pelagic Environments

Noise from HRG surveys and project vessels could alter larval, juvenile, and adult fish behavior within the WEAs but the effect would be temporary and last only for the duration of the noise-producing activities. It is not expected to affect viability of regional populations because (1) a fraction of the regional stock would be affected, and (2) no detectable increase in mortality for the regional population is expected. Further details of noise from HRG surveys are discussed in Section 3.4, Marine Mammals and Sea Turtles.

3.3.2.3 Intertidal Coastal and Habitats

Impacts on benthic resources in coastal and 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. Impacts on fishes and EFH could occur from noise generated by project vessels and potential introduction of non-native or invasive species from non-local project vessels. These potential effects are not expected to affect viability of regional populations or cause long-lasting damage to habitats.

3.3.2.4 Threatened and Endangered Species

The regional population viability of species listed in Table 3-3 is not expected to be adversely affected by the stressors associated with the Proposed Action, and thus no additional protective measures are proposed.

Conclusion

Impacts on benthic resources would be limited to the immediate footprint of unconsolidated sediment seafloor contacts from anchors or direct sampling. Sediment suspension would be temporary and short-term of minutes to hours from a contact. Noise impacts from HRG surveys and project vessels to EFH and fishes would be temporary for the duration of the survey and recovers once the survey is done. The artificial reef effect could provide a local, short-term (less than 5 years) benefit to benthic fish populations. Overall, impacts on marine and coastal habitats and associated biotic assemblages are expected to be **minor**.

3.3.3 No Action Alternative Impacts

Under the No Action Alternative, climate change would continue to impact marine and coastal habitats and benthic assemblages within the analysis area. These impacts 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. Local climate change-induced impacts on marine and coastal habitats and associated biotic assemblages, such as sea level rise or physiological stress from ocean acidification, are likely to be incremental and would be difficult to discern at short time scales (less than 5 years) from effects of other actions such as urban development, fishing, mariculture, shipping and vessel discharges, point and non-point sources of pollution, and dredging. Implementing the No Action Alternative would not meaningfully reduce ongoing impacts on coastal habitats and associated biotic assemblages when compared to the Proposed Action.

3.4 MARINE MAMMALS AND SEA TURTLES

3.4.1 Affected Environment

There are more than 30 species of marine mammals known to occur in Oregon waters including baleen whales, toothed whales, dolphins, seals, and sea lions, some of which are listed under the ESA (NOAA Fisheries 2023; Table 3-4). Three ESA-listed species of sea turtles could occur in waters offshore Oregon (Table 3-4). Detailed species descriptions, including state, habitat ranges, population trends, predator/prey interactions, and species-specific threats are described in the U.S. Pacific Marine Mammal Stock Assessments (Carretta et al. 2023; NOAA Fisheries 2023) and sea turtle status reviews (NMFS and USFWS 2020a; 2020b; Seminoff et al. 2015). These documents are incorporated by reference. Table 3-4 lists the protected species likely to occur in the Proposed Action Area, and Figure 3-4, Figure 3-5, and Figure 3-6 show critical habitat and biologically important areas (BIAs) that occur in the Proposed Action Area, which includes the Brookings and Coos Bay WEAs, potential cable routes, and vessel transit routes to and from the ports.

A discussion of marine mammals expected to be in the Proposed Action Area, including a description of the threatened and endangered birds that could occur there, is available at Marine Mammals Affected Environment (boem.gov).

Species that are unlikely to be present in the Proposed Action Area—due to their location outside of the species' current and expected range of normal occurrence—is not considered further in this document. The olive ridley sea turtle (*Lepidochelys olivacea*) and green sea turtle (*Chelonia mydas*) are considered tropical, subtropical, and warm-temperate species and rarely stray into cold waters. Green sea turtles (*Chelonia mydas*) are described as "unlikely to be present in the Proposed Action Area," based on existing scientific literature documenting green sea turtle habitat use. BOEM actively reviews scientific literature and will incorporate new information about green sea turtle habitat use into future reviews and analyses as appropriate.

3.4.2 Proposed Action Impacts

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

BOEM recommends lessees incorporate BMPs into site characterization and site assessment activities and COPs to minimize potential impacts. These have been developed through years of conventional energy operations and refined through BOEM's renewable energy program and consultations with the National Marine Fisheries Service (NMFS), including vessel strike avoidance BMPs, visual monitoring, and shutdown and reporting. These BMPs, which minimize or eliminate potential effects from site assessment and site characterization activities to protected marine mammal and sea turtle species, are in **Appendix E**.

In compliance with Section 7 of the ESA, BOEM consults with NMFS regarding the potential impacts of the Proposed Action on ESA-listed species. The analysis presented below will be reflected in the consultation with NMFS.

Table 3-4: Marine mammal and sea turtle species (MMPA stock or DPS) that could occur in the Action Area, ESA and MMPA status, occurrence (or seasonality), and critical habitat designation

Common Name	Scientific Name	Stock MMPA or DPS	ESA/MMPA Status	Occurrence	Citations for ESA Listing	Critical Habitat
Baleen whales						
Blue whale	*Balaenoptera musculus*	Eastern North Pacific	Endangered/ Depleted	Late summer and fall	35 FR 18319; December 2, 1970. 2020 Recovery plan	N/A
Fin whale	*Balaenoptera physalus*	California, Oregon, and Washington	Endangered/ Depleted	Year-round	35 FR 8491; June 2, 1970. 2010 Recovery plan	N/A
Bryde's whale	*Balaenoptera edeni*	Eastern Tropical Pacific	N/A	Occasional	N/A	N/A
Sei whale	*Balaenoptera borealis*	Eastern North Pacific	Endangered/ Depleted	Uncommon	35 FR 12024; December 2, 1970. 2011 Recovery plan	N/A
Minke whale	*Balaenoptera acutorostrata*	California, Oregon, and Washington	N/A	Occasional	N/A	N/A
Humpback whale	*Megaptera novaeangliae*	Central America DPS	Endangered/ Depleted	Spring to fall	81 FR 62260; September 8, 2016. 1991 Recovery plan	86 FR 21082, April 21, 2021
Humpback whale	*Megaptera novaeangliae*	Mexico DPS	Threatened/ Depleted	Spring to fall	81 FR 62260; September 8, 2016. 1991 Recovery plan	86 FR 21082, April 21, 2021
Gray Whale	*Eschrichtius robustus*	Eastern North Pacific DPS	N/A	Oct-Jan and March-May	N/A	N/A
Gray Whale	*Eschrichtius robustus*	Western North Pacific DPS	Endangered/ Depleted	Unclear	59 FR 31094, June 16, 1994	N/A
North Pacific right whale	*Eubalaena japonica*	Eastern North Pacific	Endangered/ Depleted	Uncommon	73 FR 12024; April 7, 2008. 2013 Recovery plan	73 FR 9000

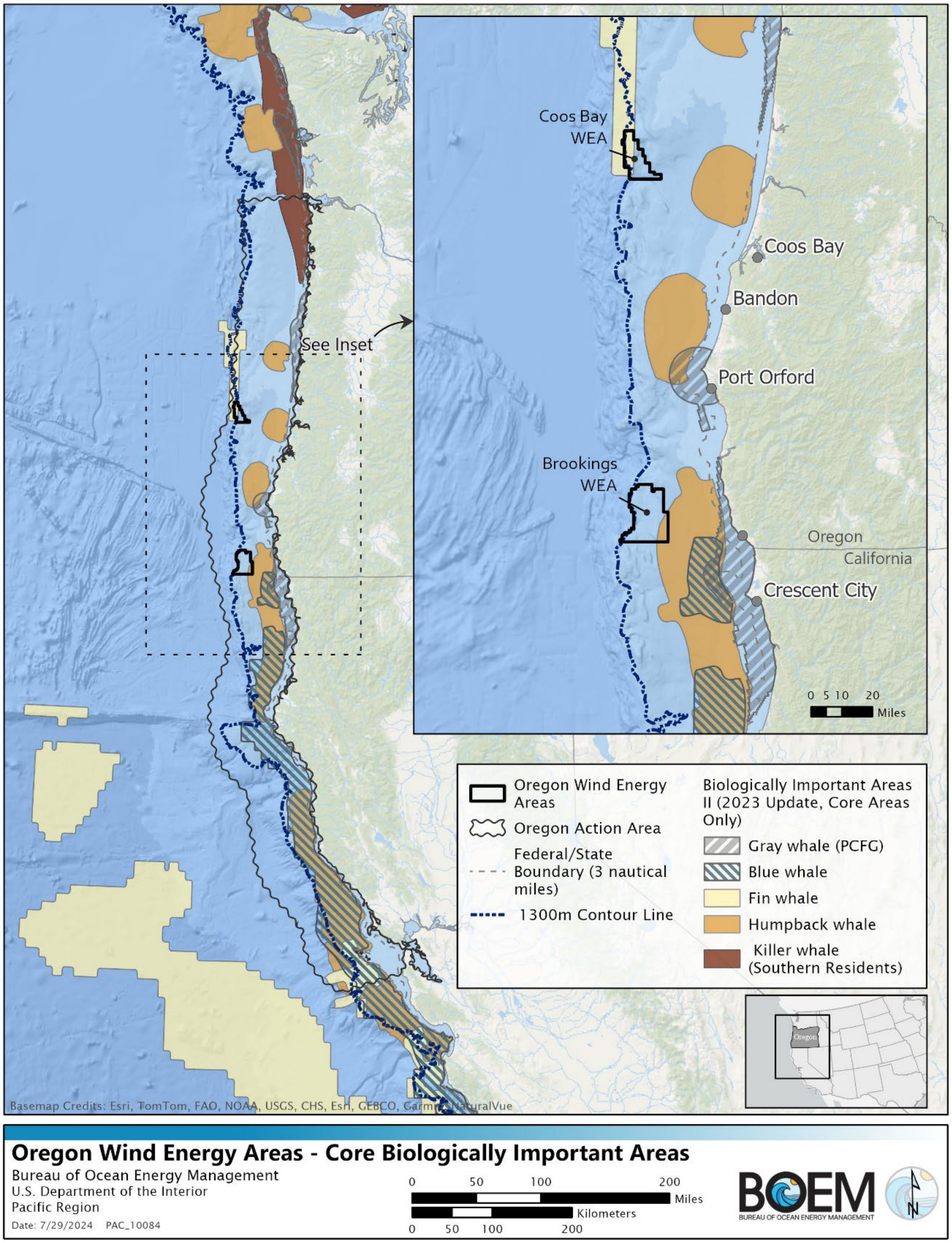
Common Name	Scientific Name	Stock MMPA or DPS	ESA/MMPA Status	Occurrence	Citations for ESA Listing	Critical Habitat
Toothed and Beaked Whales						
Sperm whale	*Physeter macrocephalus*	California, Oregon, and Washington	Endangered/ Depleted	Year-round, except for winter	35 FR 18319; December 2, 1970. 2010 Recovery plan; NMFS. 2023. *Guidelines for Preparing Stock Assessment Reports Pursuant to the Marine Mammal Protection Act*. Protected Resources Policy Directive 02-204-01	N/A
Killer whale	Killer whale	West Coast Transient Stock	Not listed	Limited data	N/A	N/A
Killer whale	*Orcinus orca*	Eastern North Pacific Offshore	N/A	Sporadic	N/A	N/A
Killer whale	*Orcinus orca*	Eastern North Pacific Southern Resident	Endangered/ Depleted	April-Oct; limited sightings	79 FR 20802; April 14, 2014. 2008 Recovery Plan	86 FR 14668, August 2, 2021
Dwarf sperm whale	*Kogia sima*	California, Oregon, and Washington	N/A	Uncommon	N/A	N/A
Pygmy sperm whale	*Kogia breviceps*	California, Oregon, and Washington	N/A	Uncommon	N/A	N/A
Baird's beaked whale	*Berardius bairdii*	California, Oregon, and Washington	N/A	Summer/Fall	N/A	N/A
Cuvier's beaked whale	*Ziphius cavirostris*	California, Oregon, and Washington	N/A	Uncommon	N/A	N/A
Mesoplodont beaked whales	*Mesoplodon spp.*	California, Oregon, and Washington	N/A	Uncommon	N/A	N/A
Short-finned pilot whale	*Globicephala macrorhynchus*	California/Oregon/Washington Stock	Not listed	Year-round, low numbers	N/A	N/A

Common Name	Scientific Name	Stock MMPA or DPS	ESA/MMPA Status	Occurrence	Citations for ESA Listing	Critical Habitat
Risso's dolphin	*Grampus griseus*	California, Oregon, and Washington	N/A	Year-round	N/A	N/A
Northern right whale dolphin	*Lissodelphis borealis*	California, Oregon, and Washington	N/A	Year-round	N/A	N/A
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	California, Oregon, and Washington	N/A	Year-round	N/A	N/A
Common bottlenose dolphin	*Tursiops truncatus truncatus*	CA/OR/WA offshore stock	N/A	Year-round	N/A	N/A
Short-beaked common dolphin	*Delphinus delphis*	California, Oregon, and Washington	N/A	Year-round	N/A	N/A
Dall's porpoise	*Phocoenoides dalli*	California, Oregon, and Washington	N/A	Year-round	N/A	N/A
Harbor porpoise	*Phocoena phocoena*	Northern Oregon/Washington Coast Stock	N/A	Year-round	N/A	N/A
Striped dolphin	*Stenella coeruleoalba*	California/Oregon/Washington Stock	Not listed	Few sightings off Oregon	N/A	N/A
Harbor porpoise	*Phocoena phocoena*	Northern CA-Southern OR stock	N/A	Inshore year-round	N/A	N/A
Sea Lions and Seals						
Steller sea lion	*Eumetopias jubatus*	Eastern DPS	De-listed (critical habitat still in effect)	Year-round	N/A	59 FR 0715; 58 FR 45269
California sea lion	*Zalophus californianus*	U.S. stock	N/A	Year-round	N/A	N/A

Common Name	Scientific Name	Stock MMPA or DPS	ESA/MMPA Status	Occurrence	Citations for ESA Listing	Critical Habitat
Northern fur seal	*Callorhinus ursinus*	California	N/A	Year-round	N/A	N/A
Northern elephant seal	*Mirounga angustirostris*	California	N/A	Year-round	N/A	N/A
Harbor seal	*Phoca vitulina richardsi*	California	N/A	Year-round	N/A	N/A
Harbor seal	*Phoca vitulina richardii*	OR/WA coast stock	N/A	Year-round	N/A	N/A
Guadalupe fur seal	*Arctocephalus townsendi*	Throughout its range	Threatened/ Depleted	Spring/ Summer, seasonal low numbers	N/A	N/A
Sea Turtles						
Leatherback sea turtle	*Dermochelys coriacea*	Throughout range	Endangered	June-Nov; limited sightings (gillnet restriction through Nov. 15th in central CA/southern OR).	35 FR 8491; June 3, 1970. 1998 Recovery Plan	77 FR 4169, January 26, 2012
Loggerhead sea turtle	*Caretta caretta*	North Pacific Ocean DPS	Endangered	Uncommon	76 FR 58868; October 24, 2011. 1997 Recovery Plan	N/A
Green sea turtle	*Chelonia mydas*	East Pacific DPS	Threatened	Extralimital	81 FR 20057; May 6, 2016. Recovery Plan	Proposed 88 FR 46572, July 19, 2023
Olive ridley sea turtle	*Lepidochelys olivacea*	Mexico's Pacific Coast breeding population	Endangered	Extralimital	43 FR 32800; August 27, 1978. 1998 Recovery Plan	N/A
Olive ridley sea turtle	*Lepidochelys olivacea*	All other populations	Threatened	Extralimital	43 FR 32800; August 27, 1978. 1998 Recovery Plan	N/A

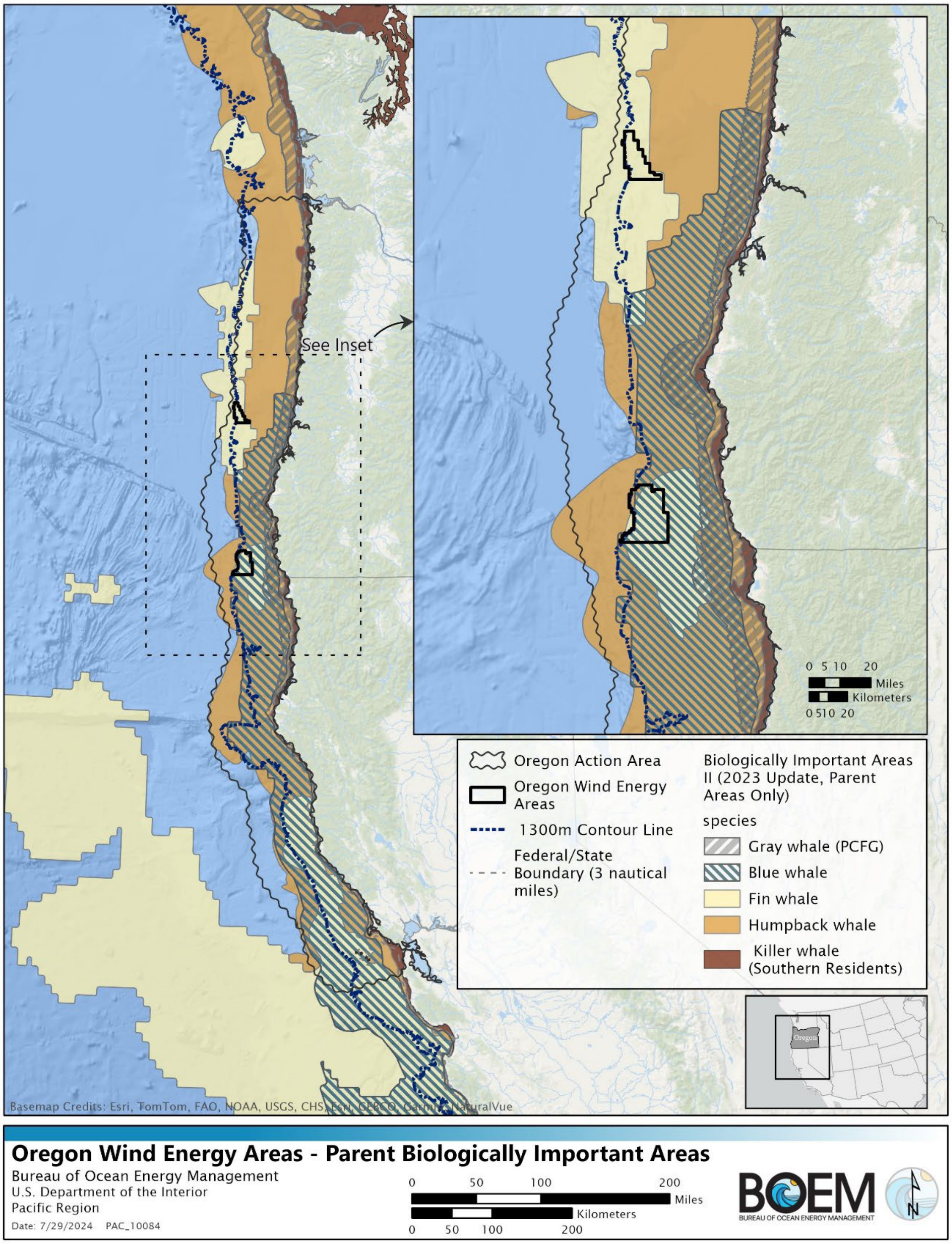
Key: DPS = distinct population segment; ESA = Endangered Species Act; FR = Federal Register; MMPA = Marine Mammal Protection Act

Figure 3-4: Core biologically important areas for four species of baleen whales and for killer whales relative to the Action Area and Coos Bay and Brookings WEAs



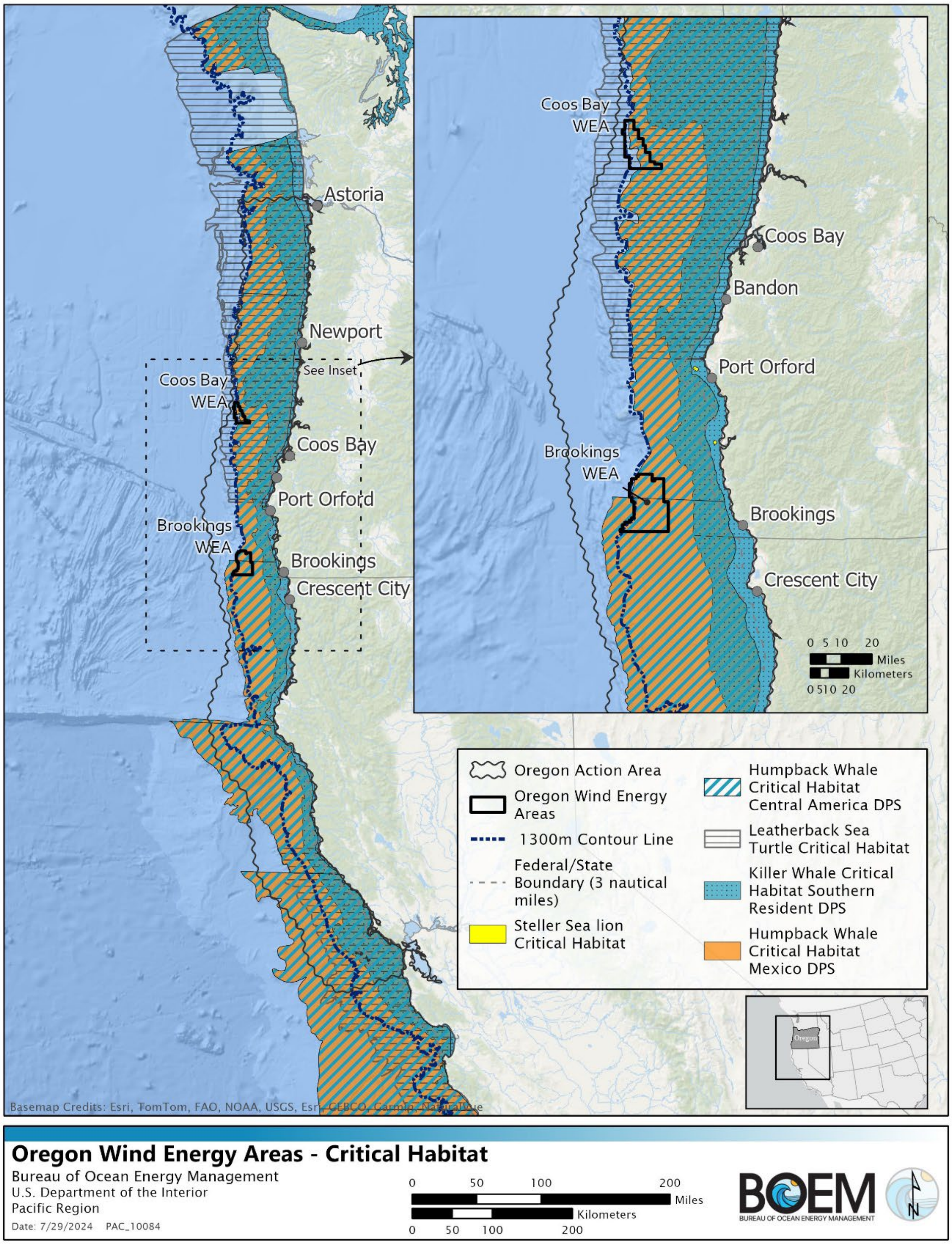
Source: Calambokidis et al. 2024

Figure 3-5: Parent biologically important areas for four species of baleen whales and for killer whales relative to the Action Area and Coos Bay and Brookings WEAs



Source: Calambokidis et al. 2024

Figure 3-6: Critical habitat for the leatherback sea turtle, Steller sea lion, humpback whale, and south resident killer whale relative to the Action Area and WEAs



Sources: Calambokidis et al. 2024, Carlton et al. 2024, Carretta et al. 2023

3.4.2.1 Vessel-based HRG Surveys

For a sound to affect marine species, it must be able to be heard by the animal. Effects on hearing ability or disturbance can result in impacts on important biological behaviors such as migration, feeding, resting, communicating, and breeding. Baleen whales hear lower frequencies; sperm whales, beaked whales, and dolphins hear mid-frequencies; porpoise hear high frequencies (Table 3-5); seals hear frequencies from 50 Hz to 86 kHz; and sea lions hear frequencies from 60 Hz to 39 kHz (NMFS 2016; 2018). Sea turtles are low-frequency hearing specialists with a range of maximum sensitivity between 100 and 800 Hz (Bartol and Ketten 2006; Bartol et al. 1999; Lenhardt 1994; 2002; Ridgway et al. 1969) (Table 3-5).

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 3-5). PTS results in permanent hearing loss while TTS is a temporary loss in hearing function related to the exposure level and durations. The methodology developed by the U.S. Navy is thought to be the best available data to evaluate effects of exposure to survey noise by sea turtles that could result in physical effects (U.S. Navy 2017) (Table 3-5).

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 and HRG Level B calculator tools, 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 were 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 m/s (4.5 kn), based on the same activities in the Atlantic (Baker and Howson 2021).

Table 3-5: Impulsive Acoustic Thresholds Identifying the Onset of PTS and TTS for Marine Mammals and Sea Turtle 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 183 dB cSEL	213 dB Peak 179 dB cSEL
Mid-frequency (e.g., Dolphins and Sperm Whales)	150 Hz to 160 kHz	230 dB Peak 185 dB cSEL	224 dB Peak 178 dB cSEL
High frequency (e.g., Porpoise)	275 Hz to 160 kHz	202 dB Peak 155 dB cSEL	148 dB Peak 153 dB cSEL
Phocid pinnipeds (True Seals) (underwater)	50 Hz to 86 kHz	218 dB Peak 185 dB cSEL	212 dB Peak 181 dB cSEL
Otariid pinnipeds (Sea Lions and Fur Seals)	60 Hz to 39 kHz	232 dB Peak 203 dB cSEL	226 dB Peak 199 dB cSEL
Sea Turtles	30 Hz to 2 kHz	230 dB Peak 204 dB cSEL	226 dB Peak 189 dB cSEL

Key: cSEL = cumulative sound exposure level; dB = decibels; Hz = hertz; kHz = kilohertz
Sources: mammals: NMFS (2018); sea turtles: U.S. Navy (2017)

Using physical criteria about various HRG sources, such as source level, transmission frequency, directionality, beamwidth, and pulse repetition rate, Ruppel et al. (2022) divided marine acoustic sources into four tiers that could inform regulatory evaluation. Tier 4 includes most high-resolution geophysical, oceanographic, and communication/tracking sources, which are considered unlikely to result in incidental take of marine mammals and therefore termed *de minimis.* Most acoustic sources under this Proposed Action fall into this *de minimis* category, as evidenced in the analysis below. BMPs (**Appendix E**) are therefore applicable to only those acoustic sources that are shown to present a risk of disturbance to protected species (i.e., chirp sub-bottom profilers, boomers, sparkers, and multibeam echo sounder system operating below 160 kHz).

Potential for injury: For marine mammal species expected to occur in the Proposed Action Area, PTS distances are generally small, ranging from 0 to 47 m (0 to 154 ft). The largest possible PTS distance is 251.4 m (825 ft) for porpoise species, only when the 100 kHz multibeam echosounder is used (Table 3-6). However, this range is likely an overestimate since it assumes the unit is operated in full power mode and that it is an omnidirectional source. Additionally, the range does not take the absorption of sound over distance into account.

PTS exposure thresholds (calculated for 204 cumulative sound exposure level [cSEL] and 23 dB peak criteria) (U.S. Navy 2017) are higher for sea turtles than for marine mammals. Based on the PTS exposure thresholds for sea turtles, HRG sound source levels 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 2012).

Table 3-6: Permanent Threshold Shift Exposure Distances (in Meters) for Marine Mammal Hearing Groups from Mobile HRG Sources Towed at 4.5 Knots

a. Mobile, impulsive, intermittent sources

HRG Source	Highest Source Level (dB re 1 µPa)	Low Frequency (e.g., Baleen whales)[1]	Mid-Frequency (e.g., dolphins, sperm whales)[1]	High Frequency (e.g., porpoise)	Phocids (true seals)	Otariids (sea lions, fur seals)	Sea Turtles
Boomers, bubble guns (4.3 kHz)	176 dB SEL, 207 dB RMS, 216 peak	0.3	0	5	0.2	0	0
Sparkers (2.7 kHz)	188 dB SEL, 214 dB RMS, 115 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

b. Mobile, non-impulsive, intermittent sources

Mobile, impulsive, intermittent HRG sources	Highest source level (dB re 1 µPa)	Low Frequency (e.g., Baleen whales)[1]	Mid-Frequency (e.g., dolphins, sperm whales)[1]	High Frequency (e.g., porpoise)	Phocids (true seals)	Otariids (sea lions, fur seals)	Sea turtles
Multibeam echosounder (100 kHz)	185 dB SEL, 224 dB RMS, 228 peak	0	0.5	251.4*	0	0	NA
Multibeam 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

Note: 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).
Key: * = 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

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 3-7).

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 to 502 m (131 to 1,647 ft), with sparkers producing the upper limit of this range. Disturbance distances to protected species are conservative, as explained above, and any behavioral effects would be intermittent and short in duration.

3.4.2.2 AUV-based HRG Surveys

Instead of mounted on vessel hulls, or towed behind vessels, HRG equipment could be deployed on AUVs to conduct site characterization surveys. These surveys may or may not make use of underwater transponder positioning (UTP) systems. UTP systems include an array of transponders placed temporarily on the seabed that communicate with AUVs to improve positioning accuracy. Typical AUV and UTP specifications are described in **Appendix A**. Level B disturbance is expected within 45–48 m of the AUV and UTP for marine mammals and within 9 m for sea turtles. Since the AUVs and UTPs are used intermittently for a few seconds at a time, impacts on marine mammals and sea turtles from UTPs are expected to be discountable.

Table 3-7: Maximum Disturbance Distances (in Meters) for Marine Mammal Hearing Groups from Mobile HRG Sources Towed at 4.5 Knots

a. Mobile, impulsive, intermittent sources

HRG Source	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
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

b. Mobile, non-impulsive, intermittent sources

Mobile, Impulsive, Intermittent HRG Sources	Low Frequency (e.g., Baleen Whales)*	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
Multibeam echosounder (100 kHz)		370	370	NA	NA	NA
Multibeam echosounder (>200 kHz)	NA	NA	NA	NA	NA	NA
Side-scan sonar (>200 kHz)	NA	NA	NA	NA	NA	NA

Note: * = Disturbance distances for listed marine mammals were calculated with NOAA's Associated Level B Harassment Isopleth Calculator using sound source characteristics for HRG sources in Crocker and Fratantonio (2016).
Key: NA = not applicable due to the sound source being out of the hearing range for the group.

3.4.2.3 Geotechnical Surveys

Geotechnical surveys (vibracores, piston cores, gravity cores) related to offshore renewable energy activities are typically numerous, but 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 is conducted. Recent analyses of the potential impacts on protected species exposed to noise generated during geotechnical survey activities determined that effects on protected species from exposure to this noise source are extremely unlikely to occur (NMFS 2021).

3.4.2.4 Project-related Vessel Traffic

Vessel strikes pose a threat to the West Pacific population of leatherback sea turtles. Of leatherback strandings documented in central California between 1981 and 2016, 11 were determined to be the result of vessel strikes (7.3% of total; NMFS unpublished data). The range of the West Pacific population overlaps with many high-density vessel traffic areas, and it is possible that most vessel strikes are undocumented. However, information on leatherback vessel strikes for other locations is not available (NMFS and USFWS 2020a). While some risk of a vessel strike exists for large whales in all the U.S. West Coast waters, 74% of blue whale, 82% of humpback whale, and 65% of fin whale known vessel strike mortalities occur in the shipping lanes in the southern California Bight and outside the San Francisco Bay area, with less than 1% of total mortality for all species occurring in Oregon waters (Rockwood et al. 2017).

The number of vessel trips for surveys within the Proposed Action Area is a conservative estimate (Table 2-4), meaning that BOEM included a higher number of trips than likely in its estimate. All vessels associated with survey activities (transiting [i.e., traveling between a port and the survey site] or actively surveying) must travel at speeds of 10 knots or less within the action area. The only exception is when the safety of the vessel or crew necessitates deviation from these requirements.

Best Management Practices for Vessel Strike Avoidance and Injured/Dead Protected Species Reporting (**Appendix E**) are meant to minimize the risk of vessel strikes to protected species. These include the following:

- Immediate operator reporting of a vessel strike of any ESA-listed marine animal
- Reporting observations of injured or dead protected species
- Having qualified PSOs on board (or dedicated crew) to monitor a vessel strike avoidance zone for protected species
- Steering a course away from any whale detected within 500 m of the forward path of any vessel; or stopping the vessel to avoid striking protected species
- 10 knots or less speed limit in the Action Area for all vessels associated with survey activities (transiting [i.e., traveling between a port and the survey site]).

If a sea turtle is sighted within the operating vessel's forward path, the vessel operator must slow down to 4 kn (unless unsafe to do so) and steer away as possible. Crews must report sightings of any injured or dead protected species (marine mammals and sea turtles) immediately, regardless of whether the injury or death is caused by their vessel, to the West Coast Stranding Hotline. In addition, if it was the operator's vessel that collided with a protected species, the Bureau of Safety and Environmental Enforcement (BSEE) must be notified within 24 hours of the strike. Lessees will also be directed to NMFS' Marine Life Viewing Guidelines, which highlight the importance of these BMPs to avoid impacts on mother/calf pairs.

Additionally, wherever available, lessees will ensure all vessel operators check for daily information regarding protected species sighting locations. These media could include, but are not limited to: Channel 16 broadcasts, whalesafe.com, and the Whale/Ocean Alert App.

Although the project-related vessel traffic would increase the overall vessel traffic and risk of collision with protected marine mammal and sea turtle species in the Proposed Action Area, vessels associated with vessel strikes on the U.S. West Coast do not have mandated vessel strike avoidance protocols. BOEM's BMPs align with recommended types of enhanced conservation measures to decrease ship strike mortality (Rockwood et al. 2017). Similar activities have taken place since at least 2012 in association with BOEM's renewable energy program in the Atlantic OCS, following similar BMPs, and there have been no reports of any vessel strikes of marine mammals and sea turtles. BOEM believes that impacts on protected species from vessel interactions would be negligible because of vessel strike avoidance BMPs, as well as reporting requirements (**Appendix E**).

3.4.2.5 Entanglement or Entrapment

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 (Benjamins et al. 2014; Harnois et al. 2015; Love 2013; Richards 2012; Saez et al. 2021). Animals could swim into moorings accidentally or actively seek out anchor chains or boats as a surface to scratch against (Benjamins et al. 2014).

Reviews of entanglements of large whales and sea turtles have resulted in recommendations to reduce the risk of entangling animals (International Whaling Commission 2016), some of which are practicable for marine industries in general. General recommendations to reduce entanglement risks include reduced number of buoy lines and no floating lines at the surface, which have a high risk of interacting with turtles and whales that spend a good deal of time at the surface of the water. Other recommendations include reducing the amount of slack in line, and using sinking lines, rubber-coated lines, sheaths, chains, acoustic releases, weak links, and other potential solutions to lower entanglement risk.

Including the multiple meteorological buoys deployed along the northeastern Atlantic coast associated with site assessment activities and PNNL's LiDAR buoys in California, 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 of marine mammals and sea turtles. BOEM reviews 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.

Lost or derelict fishing gear could become entangled in the meteorological buoy lines and present an entanglement risk to protected species. Approximately 12 meteorological buoys total for the two lease areas could be deployed as part of the Proposed Action. From 1982 to 2017, direct entanglements in fishing gear were most attributed to unidentifiable gear, netting, and pot/traps (Saez et al. 2021). Changes in gillnet fishing regulations helped address the 1980s increase, which was primarily gray whales entangled with gillnets (Saez et al. 2021). Considering the general inshore deployment (~200 ft water depth) and weight of pot traps, it is unlikely that these will be moved in such a way as to become entangled in meteorological buoy lines and present an entanglement risk to protected species. Risk of secondary entanglement related to buoy deployment and operations are thus expected to be discountable.

Any potential displacement of fishing effort, as a result of leasing and site characterization and site assessment activities, are described in Section 3.7 and are expected to be limited in spatial scope, considering existing fishing grounds, and short-term. Entanglement impacts on marine mammals and sea turtles, because of displaced fishing effort, are expected to be discountable.

Moon pool usage presents a potential for marine mammals and sea turtles to become entrapped. Although moon pools have not been proposed for use offshore Oregon, they could be used to deploy and/or retrieve AUVs. There is no known record of entrapment of protected species in the moon pools in the Pacific. The limited occurrence of sea turtles in Oregon waters, as well as BOEM's BMPs described in **Appendix E**, reduce the potential impact from moon pools to discountable levels.

3.4.2.6 Impacts on Critical Habitat

Effective May 21, 2021, NMFS issued an updated final rule to designate critical habitat for the endangered Central America DPS and the threatened Mexico DPS of humpback whales (NMFS 2021). 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 Oregon WEAs overlap with offshore portions of humpback whale critical habitat where, if humpback whales are present, they are generally present in lower numbers compared to the core feeding areas in shallower water closer to shore (Calambokidis 2024; Figure 3-4). Any displacement of prey species because of vessel transits and surveys conducted as part of the Proposed Action is anticipated to be short-term and temporary and not destroy or adversely modify critical habitat.

The Eastern U.S. stock of Steller sea lions is not listed under the ESA (78 FR 66140) and is not considered depleted under the Marine Mammal Protection Act (MMPA). NMFS is currently reviewing existing Steller sea lion critical habitat to consider any new and pertinent sources of information since the 1993 designation, including the delisting of the eastern DPS. Rookeries at Long Brown Rock, Seal Rock, and Pyramid Rock offshore Port Orford and Gold Beach, respectively, are still designated as critical habitat for Steller sea lions (59 FR 30715). The Proposed Action is anticipated to be short-term and is not expected to restrict access to or use of these rookeries, nor destroy or adversely modify critical habitat.

Critical habitat (feeding) for leatherback sea turtles stretches along the California coast from Point Arena to Point Arguello east of the 3,000-meter depth contour; and 25,004 square miles (mi^2) (64,760 square kilometers [km^2]) stretching from Cape Flattery, Washington, to Cape Blanco, Oregon, east of the 2,000-m depth contour. The Coos Bay WEA overlaps with a small portion of critical habitat for leatherback sea turtles (Figure 3-6). Very few leatherback sightings have been made in the vicinity of the WEA (NMFS 2012) and any displacement of prey species due to vessel transits and 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

BOEM places BMPs, referred to as stipulations, in leases to protect the environment during the proposed activities (**Appendix E**). As a result of these BMPs and the nature of the proposed activities, the impacts on critical habitat and protected marine mammal and sea turtle species from site assessment and site characterization activities, noise from HRG surveys, collisions with project-related vessels, and entanglement in meteorological buoy moorings are anticipated to be **negligible to moderate**. The impacts of the Proposed Action are unavoidable; the viability of the resource is not threatened, and affected marine mammal and sea turtle populations would recover completely when BMPs are implemented.

BOEM evaluates actual HRG survey equipment proposed for use when any future survey plan is submitted in support of any site characterization activities that could occur in the WEAs, and BOEM continues to reevaluate the BMPs as new information becomes available.

3.4.3 No Action Alternative Impacts

Marine mammals and sea turtles in the Proposed Action 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. 2023; NMFS and USFWS 2020a; 2020b). 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 would not be issued in the Oregon WEAs and the impacts on marine mammals and sea turtles from the Proposed Action would not occur. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on marine mammal and sea turtle species for the timeframe considered in this EA.

3.5 COASTAL AND MARINE BIRDS

3.5.1 Affected Environment

The marine and coastal bird population off southern Oregon is both diverse and complex, being composed of as many as 170 species (eBird 2024). 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., grebes, alcids, gulls, terns, loons, albatrosses, storm-petrels, shearwaters, and cormorants), waterfowl (geese and ducks), and shorebirds (e.g., plovers and sandpipers). While some of these species breed in the area, others could spend their non-breeding or "wintering" period in the area or could simply pass through during migration. This analysis considers the Coos Bay and Brookings regions and their shorelines, the offshore cable routes, and WEAs.

Several bird species that have the potential to occur within the Proposed Action Area are protected 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 (MBTA) of 1918, which is enforced by the USFWS. Special-status marine and coastal bird species found within the vicinity of the proposed activities are in Table 3-8. A discussion of birds expected to be in the Proposed Project Area, including a description of the threatened and endangered birds that could occur there, is available at Avian Affected Environment (boem.gov).

Table 3-8: Special-Status Marine and Coastal Birds Within or Near the Proposed Action Area

Common Name	Scientific Name	Federal Status	State Status
Brant	*Branta bernicla*	-	OSS
Harlequin duck	*Histrionicus histrionicus*	-	OSS
Black oystercatcher	*Haematopus bachmani*	BCC	OSS
Western snowy plover	*Charadrius nivosus nivosus*	T, BCC	T
Marbled godwit	*Limosa fedoa*	BCC	-
Red knot	*Calidris canutus*	BCC	-
Rock sandpiper	*Calidris ptilocnemis*	-	OSS
Lesser yellowlegs	*Tringa flavipes*	BCC	-
Willet	*Tringa semipalmata*	BCC	-
Marbled murrelet	*Brachyramphus marmoratus*	T	E
Scripps's murrelet	*Synthliboramphus scrippsi*	BCC	-
Ancient murrelet	*Synthliboramphus antiquus*	BCC	-
Cassin's auklet	*Ptychoramphus aleuticus*	BCC	-
Tufted puffin	*Fratercula cirrhata*	BCC	OSS-C
Western gull	*Larus occidentalis*	BCC	-
California least tern	*Sternula antillarum browni*	E	E
Caspian tern	*Hydroprogne caspia*	-	OSS
Laysan albatross	*Phoebastria immutabilis*	BCC	-
Black-footed albatross	*Phoebastria nigripes*	BCC	-
Short-tailed albatross	*Phoebastria albatrus*	E	E
Fork-tailed storm-petrel	*Hydrobates furcatus*	-	OSS
Leach's storm-petrel	*Hydrobates leucorhous*	-	OSS
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	-
Brandt's cormorant	*Urile penicillatus*	BCC	-
Brown pelican	*Pelecanus occidentalis*	DE	E

Key: BCC = Bird of Conservation Concern; C = Candidate; DE = De-listed (formerly Endangered); E = Endangered; OSS = Oregon Sensitive Species; OSS-C = OSS–Critical; T = Threatened

3.5.2 Proposed Action Impacts

BOEM has conducted several NEPA reviews (e.g., BOEM (2022a), BOEM (2022b)) for offshore wind site assessment activities offshore the Pacific Coast that evaluate impacts on birds. This analysis incorporates some of the elements of those analyses while building upon them with specifics for the Oregon WEAs. The impacts on 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) underwater noise, (4) vessel attraction, (5) disturbance to nesting or roosting, (6) disturbance to feeding or modified prey abundance, (7) aircraft traffic and noise from surveys, (8) meteorological buoys, (9) trash and debris, and (10) accidental fuel spills.

3.5.2.1 Active Acoustic Sound Sources

The primary potential for impact on 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 and Nedwell 1994), 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 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 could 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, toward 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 et al. 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 et al. 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 et al. 2017). Another recent study found that common murres (*Uria aalge*) reacted to underwater sound during experiments in a quiet pool (Hansen et al. 2020). The received sound pressure levels varied from 110 to 137 db re 1 µPa and both individual birds tested showed consistent reactions to sounds of all intensities (Hansen et al. 2020).

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 could 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 toward 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 could 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 et al. (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 HRG 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 acoustic impact, resulting in a negligible impact.

3.5.2.2 Vessel and Equipment Noise and Vessel Traffic

The primary potential impacts on 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 et al. 2011). Since all survey activities are performed from vessels, except for 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.

3.5.2.3 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 et al. 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 could extend to 100 kHz. According to Southall (2005) and Richardson et al. (1995), 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 on 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 on 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 murrelet 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. Therefore, impacts of underwater noise from survey vessels to the marbled murrelet and other diving marine birds and waterfowl are expected to be negligible.

3.5.2.4 Vessel Attraction

A single vessel is typically involved in a site assessment-related survey. This level of vessel traffic is not a significant increase over 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, several 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 (Black 2005; Montevecchi 2006; Montevecchi et al. 1999; Wiese et al. 2001). 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 could also dive to escape disturbance, increasing their potential for collision with a vessel or gear in the water. Vessels will have down-shielded lighting to minimize the potential light attraction of birds (typical BMPs are listed below and in **Appendix E**). However, even if Marbled 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 at less than 4–6 kn (< 11.1 km/hr) 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 despite the potential 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 and are therefore expected to have a negligible impact on 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 any impacts on 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 Oregon WEAs.

3.5.2.5 Disturbance to Nesting or Roosting

There is the potential for impact on marine and coastal birds from the potential disturbance of breeding colonies by airborne noise from vessels and equipment (Turnpenny and Nedwell 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.

If a vessel approaches too close to a breeding colony, vessels could cause a disturbance to breeding birds, with the potential to adversely affect egg and nestling mortality. 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 such that there would be any noticeable effect. 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 on nesting or roosting marine and coastal birds would be negligible.

The western snowy plover is a ground nester along the shoreline. As discussed above, these taxa are 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 on the nesting of these taxa. The marbled murrelet breeds inland in coastal old-growth forests and will not be impacted at their nesting sites. Short-tailed albatross and Hawaiian petrel do not breed near the Proposed Action Area; therefore, these species would not experience nesting impacts from survey activities.

3.5.2.6 Disturbance to Feeding or Modified Prey Abundance

Marine and coastal birds require specialized habitat requirements for feeding (Kushlan et al. 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 small portion of a bird’s foraging range, and it would be unlikely that this temporary relocation would affect foraging success. Impacts on pelagic birds from disturbance associated with vessel and equipment noise would be negligible.

Coos Bay and the southern Oregon coastline are extremely important for transient shorebirds during both northbound and southbound migrations. Possible indirect impacts on marine and coastal birds from vessel and equipment noise could include relocation of some prey species, which is primarily linked to seasonality. During their annual migrations, a number of marine and coastal birds have 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., Coos 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 and brown pelicans forage in nearshore waters 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.

3.5.2.7 Aircraft Traffic and Noise

Potential impacts on 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 et al. 1995) 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 et al. 1995). Because of the expected airspeed (250 km/hr [135 kn]), noise generated by survey aircraft is expected to be brief, and birds could return to relaxed behavior within 5 minutes of the overflight (Komenda-Zehnder et al. 2003); however, birds can be disturbed up to 1 km (0.6 mi) away from an aircraft (Efroymson et al. 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 et al. (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.

3.5.2.8 Meteorological Buoys

Potential impacts on marine and coastal birds from meteorological buoys include noise disturbance/lighting, collisions, loss of habitat, and decommissioning. Noise and other disturbance generated by the installation or decommissioning of meteorological buoys are expected to be short-term and localized, resulting in negligible impacts on 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 could roost on buoys, roosting on buoys does not pose a threat to these birds. Thus, overall impacts on birds from meteorological buoys are expected to be negligible. Although it is possible that peregrine falcons could use a buoy 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 meteorological buoys. However, birds that are night-flying or flying under other conditions that would impair their vision could potentially collide with meteorological buoys, leading to injury or death. Managing the type of lighting present on the buoys can minimize collisions.

Because the meteorological buoys would be 18–32 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 meteorological 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 and thus negligible.

3.5.2.9 Trash and Debris

Plastic is found in the surface waters of all 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 et al. 2004).

Site characterization activities could generate trash comprising paper, plastic, wood, glass, and metal. Most trash is associated with galley and offshore food service operations. However, for the past 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 Notice to Lessees (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. See **Appendix E** for Best Management Practices to Minimize Marine Trash and Debris**.**

3.5.2.10 Impacts of Accidental Fuel Spills

If the accident occurred in nearshore waters, shorebirds (including western snowy plovers), waterfowl, and coastal seabirds (such as alcids [including marbled murrelets] 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 respiratory 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. Impacts on birds from accidents are unlikely; however, if they occur, there could be possible impacts on their food supply. Impacts on 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 on 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. Impacts on 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 on that species since birds are susceptible to oiling impacts.

3.5.2.11 Measures to Minimize Potential Adverse Impacts on Birds

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 may require the lessee to comply with these measures, as deemed appropriate at the time of review, through lease stipulations. The following measures are intended to ensure that the potential for adverse impacts on birds is minimized, if not eliminated.

1. All vessels associated with survey activities (transiting [i.e., traveling between a port and the survey site] or actively surveying) must comply with the vessel strike avoidance measures specified in **Appendix E-9.2** and travel at speeds of 10 knots or less within the Action Area. The only exception is when the safety of the vessel or crew necessitates deviation from these requirements. If any such incidents occur, they must be reported as outlined below under Reporting Requirements (BMP 7). The Vessel Strike and Disturbance Avoidance Zone for birds is defined as 100 meters from any surface-sitting birds including federally listed species under the ESA (e.g., Marbled Murrelet and Short-tailed Albatross). If surface-sitting birds are sighted within the operating vessel's forward path, the vessel operator must slow down to 4 kn (unless unsafe to do so) and steer away as possible. The vessel may resume normal operations once the vessel has passed the individual or flock.
2. During times of year when numbers of birds are known to occur in the survey area, vessels must avoid transiting through areas of visible aggregations, especially for species that can occur in numbers including alcids, albatrosses, shearwaters, storm-petrels, and cormorants. If operational safety prevents avoidance of such areas, vessels must slow to 4 kn while transiting through such areas.
3. Vessels transiting to and from the proposed lease area and investigating potential cable export routes must stay a minimum of 500 m from the offshore rocks that comprise the Oregon Islands National Wildlife Refuge, which hosts large colonies of nesting seabirds, including common murres, tufted puffins, and pigeon guillemots. These areas should be avoided during the breeding and post-fledging periods when nesting seabirds are most likely to be present.
4. 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.
5. Any lights used to aid marine navigation by the lessee during construction, operations, and decommissioning of a meteorological buoys must meet USCG requirements for private aids to navigation (Form CG-2554).
6. For any additional lighting not described in (4) or (5) above, the lessee must use such lighting only when necessary; turn off deck and interior lights when not in use; hood lighting downward,

when possible, to reduce upward illumination and illumination of adjacent waters; use black-out curtains in vessels in windows; and minimize use of high-intensity lighting, steady-burning, or bright lights such as sodium vapor, quartz, halogen, or other bright spotlights that exceed a color temperature of 2,700 degrees Kelvin.

7. Lessees must report all injured or dead birds and bats found on vessels and structures during construction, operations, and decommissioning to the Injury & Mortality Reporting (IMR) system following a standardized template and workflow protocols (including photographs of carcasses to be uploaded to IMR) by BOEM and the USFWS, ideally no more than 72 hours after the sighting. Any identified causes (e.g., lighting) should be rectified to the extent practicable. If practicable, the lessees must carefully collect the dead specimen and preserve the material in the best possible state, contingent on the acquisition of any necessary wildlife permits and compliance with the lessees' health and safety standards. Additionally, lessees must submit quarterly reports documenting any dead or injured birds or bats found on vessels and structures during construction, operations, and decommissioning in the previous quarter. Carcasses with Federal or research bands must be reported to the U.S. Geological Survey's Bird Band Laboratory.
8. Anti-perching devices must be installed on the meteorological buoys to minimize the attraction of birds.

Conclusion

Overall, impacts on birds would be **negligible**. The construction, presence, and decommissioning of meteorological 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 on 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 on birds from trash or debris releases and from accidental fuel spills would be moderate for species that have special-status designations and are susceptible to spills, but since it is an accidental impact and unlikely to happen, the impact on birds in general are expected to be negligible. Potential noise impacts from meteorological 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 a meteorological buoy would be negligible because of buoy height and distance from shore. Additionally, lessees operating on the OCS can reduce impacts on birds by following the BMPs (**Appendix E**).

3.5.3 No Action Alternative Impacts

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 gillnet 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 Coos Bay and Brookings WEAs. However, BOEM expects other ongoing activities and planned actions to have continuing regional impacts on coastal and marine birds during 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 negative impacts on coastal and marine birds. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts on coastal and marine birds from existing and potential future actions. The largest ongoing contributors to impacts on coastal and marine birds and bats stem from habitat destruction, disturbance of marine and coastal environments, and commercial and recreational fishing activities, primarily through bycatch.

3.6 SOCIOECONOMICS

3.6.1 Affected Environment

The area of potential socioeconomic effects from site assessment and site characterization activities in the Oregon WEAs includes Coos, Curry, and Lincoln counties. This affected environment for socioeconomics was selected due to proximity to the WEAs—within 90 mi of the Oregon WEAs (Figure 3-7) and the likelihood that activities associated with the Proposed Action would be based in these ports. Although Winchester Bay, Reedsport, and Florence ports are also within 90 mi or less of the Oregon WEAs, they are in Douglas and Lane counties. Douglas and Lane counties are primarily spatially inland and any change to port utilization would have negligible overall impact on socioeconomics in those counties.

3.6.1.1 Counties

Coos County has a total of 1,596 mi^2 on Oregon's southern coast north of Curry County and south of Douglas County. It is known as a working-class area reliant on resource-based economies, and an Indigenous cultural history (Smith and Masterson 2013). Important features of Coos County include Coos Bay, Oregon's largest estuary and deepest bay on the Pacific Coast between Seattle and San Francisco, and the Coos Bay Rail Line, established in the 1800s, which connects regional manufacturers to the nation's rails system.

Curry County has a total of 1,627 mi^2 on Oregon's southern coast north of Del Norte County, California, and south of Coos County, Oregon. Curry County is a resource-based economy with connections to the Rogue River and Siskiyou National Forest. Recreational activities include windsurfing at Floras Lake, hiking forests and beaches, and sightseeing (Travel Curry County 2024).

Lincoln County has a total of 980 mi^2 on Oregon's northern coast north of Lane County and south of Tillamook County. Travel (primarily tourism), trade, health services, and construction are the primary industries in Lincoln County (Bureau of Economic Analysis 2024). The Port of Newport, situated within the county, is one of the two major fishing ports of Oregon (along with Astoria) and ranks in the top 20 fishing ports in the U.S.

Coos, Curry, and Lincoln counties have smaller workforces, higher unemployment rates, and lower per capita income when compared to statewide data. Total employment is the lowest in Curry County. Coos, Curry, and Lincoln counties' population and labor statistics are detailed in Table 3-9.

Figure 3-7: Ports within 90 Miles of the Brookings and Coos Bay WEAs

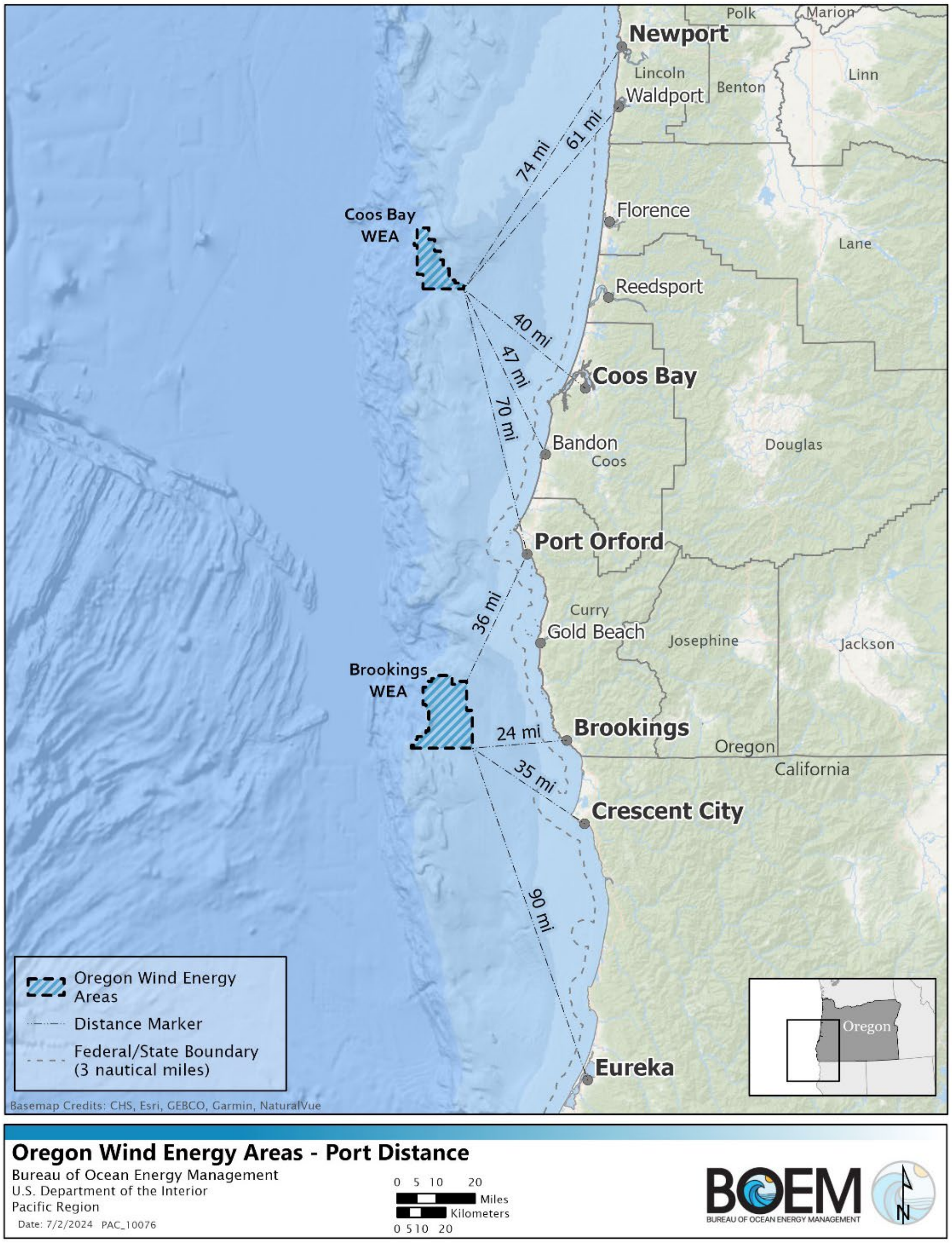


Table 3-9: Population, Labor Force, and Employment Statistics

Area	Population*	Labor Force Participation Rates	Total Employment*	Unemployment Rate	Per Capita Income*
Coos County	64,990	49.1%	18,020	4.4%	$31,824
Curry County	23,447	43.7%	5,343	4.4%	$34,302
Lincoln County	50,813	47.9%	13,733	4.1%	$32,776
Oregon	4,240,137	62.3%	1,575,613	3.4%	$37,816

Source: State of Oregon Employment Department (2024), data for 2021; *U.S. Census Bureau (2022; 2023) Census Quick Facts, Population data for 2022, Employment for 2021; Labor Force percentages from State of Oregon Employment Dept. (2022).

NOAA (2022) defines the total ocean economy as all ocean economic activities—living resources, marine construction, ship and boat building, marine transportation, offshore mineral extraction, and tourism and recreation—within a defined U.S. geography. Coos, Curry, and Lincoln counties' total ocean economy employment and wages are detailed in Table 3-10.

Table 3-10: Ocean Economy Employment and Wages

Area	% of Total Economy	Employed	% of total county employment*	Wages ($ millions)	Wages per Employee
Coos County	14.4%	3,252	18%	$111.5	$34,281
Curry County	19.2%	1,259	23.6%	$32.4	$25,744
Lincoln County	26.1%	4,574	33.3%	$145.5	$31,818
Oregon	2.1%	40,248	2.6%	$1,700	$42,974

Source: NOAA 2022, data from 2021; *total employment from Table 3-9 divided by ocean economy number of individuals employed.

The total ocean economy provides a large portion of the total employment in Coos and Curry counties compared to the statewide data. The total ocean economy provides 3.4% of total county employment in Lincoln County, which is similar to statewide data. The amount of total ocean economy was less than the state average in Lane and Douglas counties (NOAA 2022) and as such, these counties are not further analyzed in this section.

Coos County ocean-related jobs make up 14.4% of employment, 19.2% of employment in Curry County, and 26.1% of employment in Lincoln County, compared to 2.1% statewide. Ocean economy wages per employee are well below the coastal statewide average in Curry and Lincoln counties and modestly below Coos County.

Recreation and tourism are the primary ocean economy sectors in Coos, Curry, and Lincoln counties. Tourism and recreation include eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, science water tours, and recreational fishing (NOAA 2022), which is further explained in Section 3.8. The ocean economy sector in "other" for Coos and Curry counties includes representation from marine construction, ship and boat building, offshore mineral extraction, or non-categorized data. In contrast, living resources is the next highest industry sector for Lincoln County. Living resources includes commercial fishing, fish hatcheries, aquaculture, and seafood processing and seafood markets (NOAA 2022), which is further examined in Section 3.7. Coos, Curry, and Lincoln counties' ocean economy sectors are detailed in Table 3-11.

Table 3-11: Ocean Economy by Sector in 2021

Area	Living Resources	Tourism & Recreation	Marine Transportation	Other**
Coos County	6.7%	80.4%	1.1%	11.9%
Curry County	*	89.5%	*	10.5%
Lincoln County	7.4%	90.1%	*	2.3%
Oregon	5.9%	59.2%	28.3%	6.6%

Key: * = unavailable information; ** = Data classified as "other" contains information that is aggregated.
Source: NOAA 2022

3.6.1.2 Ports

A lessee may use one of the many ports in southern Oregon to perform activities associated with the Proposed Action,[2] such as characterizing a lease site (e.g., installation of meteorological buoys), conducting resource surveys (e.g., meteorological and oceanographic data collection), or testing installation of various technology. However, Musial et al. (2019) identified the ports of Coos Bay and Astoria as potential installation sites, which will be furthered examined in the project-level EIS and not appliable to the activities of the Proposed Action in this EA.

Port facilities and capacity to support the activities, such as site assessments and site characterizations, are associated with the Proposed Action are assessed below. This section describes and summarizes the location, facilities, vessel accommodations and restrictions (shoreside and marine), interests, and employment capacity for Newport (Yaquina), Waldport, Coos Bay, Bandon, Port Orford, Brookings, Crescent City, and Humboldt (Eureka) (See Table 3-12). Except for Waldport (Port of Alsea),[3] maps for each port are in **Appendix F**.

The Port of Port Orford, Oregon

Port Orford is on Oregon’s coast, 250 mi south of the Columbia River and 390 mi north of San Francisco Bay. Port Orford facilities include almost three acres of dock area and two large-capacity hydraulic cranes to lift boats from the water for repairs and/or storage and removing fish catches from boats. The turning basin at Port Orford is 340 ft long, 100 ft wide, and 16 ft deep. The extension to locally constructed breakwater is 550 ft long (USACE 2024a). Port Orford is home to many commercial fishermen and used as a “harbor of refuge” during severe storms (USACE 2024a). About 150 fishing and private boats, ranging from 20 to 40 ft in size, use the dock each year. Although not situated directly on the Port of Port Orford, the Oregon State University (OSU) Port Orford Field Station—part of OSU’s coast-wide Marine Studies Initiative—supports research such as SCUBA surveys, hook-and-line (catch and release) surveys of fish populations, and remotely operated vehicles (ROV) and oceanographic monitoring (OSU c2024). The Port of Port Orford has a five-volunteer Commissioners Board, one general manager, and four part-time crane operators (Port of Port Orford 2024).

The Port of Brookings Harbor, Oregon

The Port District of Brookings Harbor covers an area of 400 mi^2 reaching from the mouth of the Chetco River to the Oregon-California border, north to the drainage of the Pistol River, and east to the Curry-Josephine County line. Commercial boat basin access is 200 ft long, 100 ft wide, and 12 ft deep (USACE 2024b). Details about the location and entrance channel are available on the USACE website (USACE 2024b).

The Port of Brookings has two large boat basins, one for commercial fishing boats and the other for sport boats, and a public boat launching ramp. There are four fish receiving docks and a sea-going barge dock for lumber loading and storage, as well as a U.S. Coast Guard Station and a privately owned marina. The Port of Brookings has more than 502 moorage slips, 280 passable days per year, it is classified as a shallow-draft harbor, and has more than 31,000 bar crossings and 95,000 recreational users annually (Port of Brookings Harbor 2024).

[2] Winchester Bay/Reedsport, Florence, and Waldport do not have facilities, meet depth or drift requirements, or have federally maintained navigation projects to support offshore wind development. Additionally, the aforementioned ports are in Lane and Douglas counties, where the amount of total ocean economy was less than the state average (in contrast to Curry, Coos, and Lincoln counties) and as such, these counties are not further analyzed in this section.

[3] The Port of Alsea in Waldport is not suitable for the Proposed Action and does not have USACE maps available.

Table 3-12: Summary of Port-Critical Components Often Associated with Vessels Carrying Out Proposed Action Activities

Port	Miles from WEA*	Vessel restrictions	Vessel accommodations	Port interests	Employed*	Impact category
Port of Port Orford	70 from Coos Bay; 36 from Brookings	No shoreside capacity, vulnerable to southern storms, shallowness	None	Commercial (boats < 40 ft)	4 (FTE)	Negligible
Port of Brookings	23	Shallowness, jetties, narrow entrance, no maintenance facilities	Few	Recreational	7	Negligible
Port of Bandon	47	Shallowness, jetties, narrow entrance	Medium	Recreational and commercial fishing, and tourism	4	Negligible
Port of Coos Bay	40	Conflict of industrial and privately owned uses, few maintenance facilities	Medium-High	Commercial, Recreation, and Industrial	31	Minor
Port of Waldport/ Alsea	61	Shallowness, no jetties, narrow entrance and placed on the Bay	None	Recreational	3 (FTE)	Negligible
Port of Newport (Yaquina Bay)	74	n/a	Medium-High to High	Commercial, Recreational, Industrial, and Institutional**	28	Minor
Port of Crescent City	32	Shallowness, jetties, narrow entrance, no maintenance facilities	None	Recreation and Tourism	14 (FTE)	Negligible
Port of Humboldt Bay (Eureka)	88 from Brookings; 23 from Lease areas OCS-P 0561 and OCS-P 0562 in California	Conflict of industrial and privately owned uses, few maintenance facilities, precarious channel conditions	Medium to Medium-High	Commercial, Recreation, and Industrial	6	Minor

Key: * = Employment of full-time equivalents (FTE) numbers are estimates from port websites and staff directories; ** = "Institutional" refers to both or either university and/or Federal government research physical (dock space or vessels) and/or human capital.

Sources: Crescent City Harbor District 2018; Humboldt Bay Harbor 2023; Port of Alsea 2024; Port of Bandon 2024; Port of Brookings Harbor 2024; Port of Coos Bay 2024; Port of Newport 2024; Port of Port Orford 2024; USACE 2024a; 2024b; 2024c; 2024d; 2024e; 2024f; 2024g.

The Port of Brooking Harbor has a five-volunteer Commissioners Board, which is responsible for all activities at the port. The port also employs six staff to manage the harbor, office, fuel dock, and beachfront RV park (Port of Brookings Harbor 2024).

The Port of Bandon, Oregon

The Port of Bandon is on the Oregon Coast between the Port of Port Orford and The Port of Coos Bay, 225 miles south of the Columbia River and 420 miles north of San Francisco Bay. It encompasses two jetties at the mouth of the Coquille River with a 1.3 miles navigation channel from the river to the Pacific Ocean (USACE 2024c). Details about the entrance channel depth are available on the USACE website (USACE 2024c).

The Port of Bandon offers marina facilities, service to commercial and recreational fishing vessels, a refurbished fish processing plant, fish cleaning stations, and a scenic Riverwalk and boardwalk (Port of Bandon 2024). The Port of Bandon is governed by five Board of Commissioners and four staff (Port of Bandon 2024).

The Port of Coos Bay, Oregon

The Port of Coos Bay is on the Oregon Coast 200 mi south of mouth of Columbia River and 445 mi north of San Francisco Bay; it is about 13 mi long and 1 mi wide, with an area at high tide of about 15 mi^2. The Port of Coos Bay has three channels: (1) from the Pacific Ocean to river mile 1, the channel is 700 ft wide and 47 ft deep; (2) from Coos Bay to Millington, there is a channel 2 mi long, 150 ft wide, and 22 ft deep; and (3) from deep water in Coos Bay to Charleston, the channel is 3,200 ft long, 150 ft wide, and 17 ft deep (USACE 2024d).

The Port of Coos Bay offers public access for fishing and harbor crafts, three lumber docks, and several seafood receiving stations. It also owns a 200-ft dock on the Isthmus Slough, a barge slip, and two small-boat basins capable of mooring 250 fishing and recreation craft (USACE 2024d). There are several industrial and private interests within the Port of Coos Bay, as follows:

- North Bend and Empire (industrial) privately owned mill and lumber docks and oil terminals
- North Split (industrial) T-dock and wood chip loading facility
- Charleston (commercial) receipt of fresh fish and shellfish, and several seafood receiving and processing plants
- Joe Ney Slough (private) floating moorage for mooring about 50 fishing vessels
- Jordan Cove (industrial) 248 ft long dock for wood chip ships.

Oregon International Port of Coos Bay is designated as a state port; consequently, members of the Board of Commissioners are appointed by the governor and confirmed by the Oregon Senate for 4-year terms. There are 12 port staffers, 16 marina staff, including maintenance personnel in Charleston, and 18 staff supporting the adjacent Coos Bay Rail Line (Port of Coos Bay 2024).

The Port of Alsea, Waldport, Oregon

The Port of Alsea is the Alsea River Bay approximately one mile from the Pacific Ocean in Waldport, Oregon. Although it is considered an "ocean port," it is on a small bay of the river. The port is primarily used for recreation and tourism, providing boat and motor rentals, kayaking dock, and launch ramps (Port of Alsea 2024). It is governed by a Board of Commissioners and has two full-time staff and two part-time seasonal staff. The port's location, depth, and ocean access are not suitable to accommodate the Proposed Action (Oregon State Marine Board 2024; Port of Alsea 2024) and is not presented in **Appendix F**.

The Port of Newport (Yaquina Bay), Oregon

The Port of Newport is on the central Oregon Coast in the City of Newport and encompasses approximately 59 mi^2. The Port of Newport has an access channel that is 2,035 ft long, 100 ft wide, and 10 ft deep (USACE 2024e). The Port of Newport has two berths: one is 435 ft long and the second one is 520 ft long, capable of serving ocean-going vessels at McLean Point on the northern side of the bay. Port of Newport has a public wharf with 300 ft of frontage for servicing fishing boats and maintains 510 berths for mooring commercial and sport fishing vessels.

There are about 210 slips and berths for commercial fishing vessels on the northern side of Yaquina Bay, and a separate marina for 450 recreational fishing boats on the southern side of Yaquina Bay (Port of Newport 2024). On the southern side of the bay, about 1.2 mi above the entrance, the Port of Newport has constructed the South Beach Marina, with a 600-pleasure craft and shallow-draft fishing boat capacity. The marina provides shelter for 232 boats and is maintained by the Port of Newport to a depth of 10 ft. In collaboration with the Marine Science Center at OSU, a 220-ft pier is maintained for docking large and small research vessels, as well as a 100-ft float for docking small boats above the port entrance (USACE 2023). The Port of Newport has robust staff compromised of several port managers, including those with specialized financial and operation roles, separate teams of commercial and recreational marina staff, RV park staff, international terminal staff, and at least two NOAA-employee liaisons (Port of Newport 2024).

Crescent City Harbor, California

Upon review of all ports within 90 mi of the WEAs, Crescent City in Del Norte County had the least ability to support activities associated with the Proposed Action, and thereby is not included in the analysis. The Port of Crescent City identified "supporting wind farm development" in their strategic plan (Crescent City Harbor District 2018), but it has little to no physical capacity (infrastructure or geophysical) and few socioeconomic abilities (e.g., harbor staffing) to support activities associated with the Proposed Action. Details about Crescent City Harbor activities and employment is available on their website. Details about the location and entrance channel are available on the USACE website (USACE 2024f).

The Port of Humboldt Bay, California

The Port of Humboldt Bay (Humboldt Harbor) is on the northern California coast approximately 225 nm north of San Francisco and approximately 156 nm south of Coos Bay, Oregon. Humboldt Bay is the only harbor between San Francisco and Coos Bay with deep-draft channels large enough to permit the passage of large commercial ocean-going vessels. The Bar and Entrance Channel is approximately 8,500 ft long and 500 to 1,600 ft wide, with a congressionally authorized depth of 48 ft mean lower low water and an allowable over-depth of 3 ft. The Humboldt Harbor staff oversees and promotes several projects and programs, such as dredging, retention and improvement of commercial fishing facilities, improvement of transportation and maritime facilities, pilotage licensing, oil spill co-op coordination, shoreline protection projects, mariculture, and aquaculture. Humboldt Bay Harbor and Recreation and Conservation District has approximately six full-time personnel (Humboldt Bay Harbor 2024).

3.6.2 Proposed Action Impacts

3.6.2.1 Counties

Temporary increases in employment from Proposed Action activities, such as surveying, buoy fabrication, and construction could occur in various local economies associated with onshore- and offshore-related industries in Coos, Curry and Lincoln counties, Oregon. However, BOEM expects any impacts on employment, population, and the local economies in and around these counties to be short-term and imperceptible, and thus negligible. An analysis of similar projects on the East Coast (BOEM 2014) found that the small number of workers (approximately 10–20 people) directly employed in site characterization surveys is insufficient to have a perceptible impact on local employment and population.

No ports in Curry County can adequately support the activities performed in a site characterization or assessment and therefore no shifts in the local economy. Coos County and Lincoln County have ports that can support the activities performed in a site characterization or assessment. However, the overall beneficial impacts on the local economy, including labor, employment, and wages, would be undetectable when taking into consideration the distribution of activities, total ocean economy, and the time frame over which they would occur in Coos and Lincoln counties.

3.6.2.2 Ports

Port of Port Orford, Port of Bandon, and Brookings in Curry County, Oregon, the Port of Alsea in Waldport, Oregon (Lincoln County), and the Port of Crescent City in Del North County, California have the lowest physical capacity (infrastructure or geophysical) and socioeconomic ability to support Proposed Action activities, such as site evaluation and assessment.

The ports of Coos Bay, Newport, and Humboldt have suitable physical infrastructure or geophysical capacity for hosting maritime vessels frequently used in carrying out the Proposed Action. Coos Bay has the physical characteristics (i.e., a deep-draft navigation channel and available upland space) to serve various staging, operations, and maintenance for floating offshore wind (MacDonald 2022). Trowbridge et al. (2022) notes that the Port of Coos Bay “represents the best option (across metrics) to support floating wind activities in Oregon.” The ports of Coos Bay and Newport have suitable and sufficient human capital to support additional vessels coming in and out of their ports; the Port of Humboldt Bay does not.

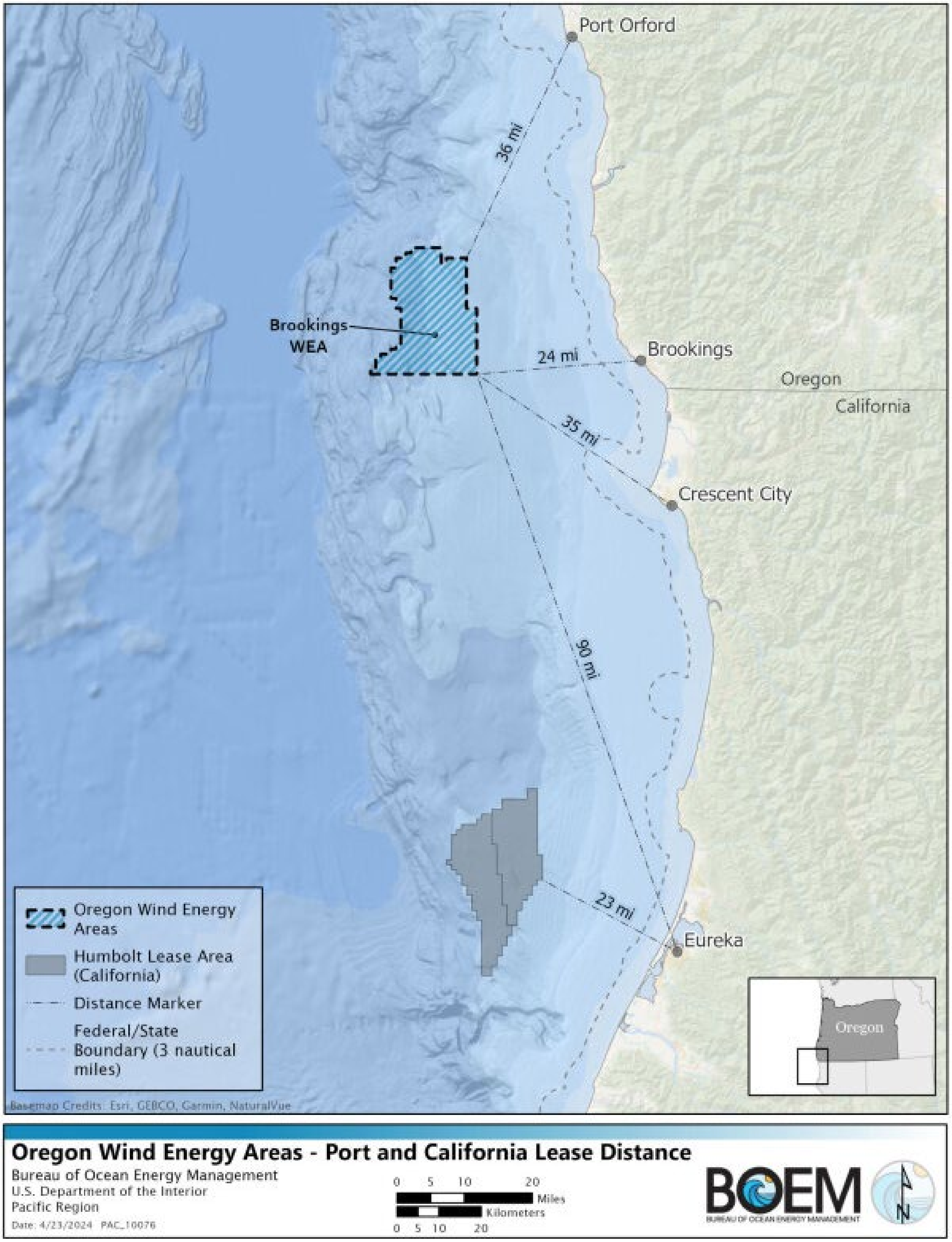
California Lease Area OCS-P 0561 is 23 mi from the Port of Humboldt Bay (Figure 3-8), which could increase its use and attractiveness to vessels conducting surveying and buoy fabrication, and other activities needed to carry out the Proposed Action in Oregon. Vessel deployments for both California and Oregon lease activities could overlap temporally.

Conclusion

The Proposed Action would produce undetectable (i.e., **negligible**) impacts on employment and wages in Curry County. In Coos and Lincoln counties, the Proposed Action would have beneficial, short-term, and therefore **minor** impacts on employment and wages if site characterization and assessment use locally based employees, pay employees state-average wages, and use the Port of Coos Bay facilities (e.g., fuel, repair, storage, docking).

The Port of Crescent City and other smaller Oregon ports are not likely to host Proposed Action activities. The Port of Humboldt Bay, the Port of Newport, and Port of Coos Bay have the highest likelihood of hosting and serving vessels used for site assessment and characterization activities. The impacts on employment, labor, and wages in the ports of Humboldt Bay, Coos Bay and Newport are anticipated to be short-term, and beneficial. Impacts on the port economy would be most noticeable in the Port of Humboldt Bay due to its smaller human capital and ability to support additional vessels coming in and out of their ports. The affect to ports from additional vessel activity would be **minor** as they would recover completely without any mitigation once the Proposed Action activities are complete.

Figure 3-8: Distance Between Port of Humboldt and the Oregon and California WEAs



3.6.3 No Action Alternative Impacts

Under this alternative, commercial leases and grants would not be issued in the Coos Bay or Brookings WEA. However, BOEM expects other activities and planned actions to have continuing regional impacts on economic activity during 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 have negative impacts on the region's economy. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts on economic activities from existing and potential future actions.

3.7 COMMERCIAL FISHING

3.7.1 Affected Environment

The waters offshore Oregon support numerous types of fishing, and stakeholders place high cultural and economic significance on these activities. The tables below summarize the importance of commercial fisheries for the ports in Oregon averaging more than $10M annually in ex-vessel revenues,[4] which are closest to the Oregon WEAs, specifically Newport (Yaquina), Coos Bay, and Brookings. Other notable commercial fishing ports such as Tillamook and Astoria also contribute to Oregon's marine economy, but are outside of the expected affected environment that spans across Oregon's central and southern coast.

Species of commercial interest in Oregon include groundfish, coastal pelagic species, crab, highly migratory species, salmon, albacore, halibut, shellfish, and shrimp. Between 2013 and 2022, average commercial fishery landings and revenue were 107.89 million tons and $54.3 million for the Port of Newport, 107.89 million tons and $27.71 million for the Port of Coos Bay, and 9.82 million tons and $11.36 million for the Port of Brookings, respectively (Table 3-13). Table 3-14 describes Oregon commercial fisheries averaging more than $5 million[5] in ex-vessel landed value each year between 2013–2022 by gear type and locations.

Table 3-13: Commercial Fishery Landings and Revenue for Oregon Port Areas, 2013–2022

Port Areas in Oregon	10-Year Average Landed Weight (million tons)	Ex-vessel Revenue ($ Millions)
Newport	107.89	54.3
Coos Bay	21.34	27.71
Brookings	9.82	11.36

Source: NOAA Fisheries Office of Science and Technology 2024

3.7.2 Proposed Action Impacts

Data collection buoys and vessel traffic associated with the Proposed Action could generate space-use conflicts and interfere with fishing operations by (1) making the area occupied by meteorological buoys temporarily less accessible as fishing grounds, (2) reducing fishing efficiency, and/or (3) causing economic losses associated with gear entanglement. Data collection buoys emplaced within leases could inadvertently be spatially incompatible with nearby fishing operations, particularly for trawling (bottom

[4] Report is generated using NOAA Fisheries Office of Science and Technology, Commercial Landings Query (NOAA Fisheries Office of Science and Technology 2024). The dollar value of landings are ex-vessel (as paid to the fisherman at time of first sale) and are reported as nominal (current at the time of reporting) values.
[5] Values using NOAA Fisheries Office of Science and Technology, Top US Ports Query (NOAA Fisheries Office of Science and Technology 2024).

and mid-water) and pot gear types, due to the challenge of navigating and deploying/retrieving fishing gear near fixed structures. Carlton et al. 2024 identifies groundfish bottom trawl, at-sea hake mid-water trawl, shoreside hake mid-water trawl, and pink shrimp trawl to be especially vulnerable. Fishers could have to alter the timing of when and where gear is deployed based on site assessment and survey activities and the compatibility of that gear with said activities.

Table 3-14: Oregon Commercial Fisheries, Gear Type, and Locations

Fishery*	Gear Type	Range	Average Landed Weight (mt)	Average Annual Ex-vessel Value
Tuna	Mobile (troll/pole, hook, and line)	Generally near surface, 30 nm or more from shore at 50–100 up to 500–2,000 fth	2,590	$6,471,690
Salmon (Chinook)	Mobile (troll, hook, and line)	Breakers to 200 fth; sometimes up to 650 fth	711	$9,566,959
Crab	Fixed (pot)	10-50 fth	8,047	$64,542,846
Shrimp	Mobile (trawl)	30–150 fth; 90% in 60–140 fth; muddy, soft, flat bottom	18,235	$23,787,552
Groundfish	Mobile (bottom- and mid-water trawl, hook, and line)	Breakers to 400–700 fth; 1,200 fth for mid-water, but nets are not this deep	97,590	$43,082,863
Black Cod (Sablefish)	Mobile (trawl); fixed (pots, long line)	100–500/650 fth	2,381	$10,303,417
Whiting (hake)	Mobile (mid-water trawl)	Most common in water between 27 and 273 fth, but adults can be found in water over 500fth deep and 250 miles or more offshore	78,175	$15,518,564

Notes: 1 fathom (fth) = 6 feet; 1 nm (nautical mile) = ~2,025 yards or 1.5 statute (land) miles.
Bottom trawling is not allowed outside of 700 fathoms in the entire West Coast EEZ.
Source: Based on Industrial Economics, Inc. 2012, Table 6-5; NOAA Fisheries 2024a; NOAA Fisheries 2024b; NOAA Fisheries 2024c; * commercial fisheries averaging over $5 million in landed value between 2013-2022 using PacFIN (2024) web tool

Fishers could also suffer decreased efficiency when trying to avoid buoys during their operations (e.g., increased steaming time, fuel costs, resource competition and changes to bycatch composition, which can be difficult to predict and measure due to the large number of externalities that contribute to driving shifts in species compositions) (Hogan et. al 2023). If fishers fail to avoid buoys, subsequent entanglement could result in damage to or loss of fishing gear in addition to potentially increased insurance costs (Chaji and Werner 2023). 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 fishing grounds that could be impacted by buoys and traffic is 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 zone per buoy—a very small fraction of the total fishing grounds available for the Pacific Coast groundfish fishery (PFMC 2020), the Pacific Coast salmon fishery (PFMC 2016), and the West Coast albacore fishery (Frawley et al. 2021). Given that harvest strategies including operation depths vary among individual fishers, potential impacts and exposure could also vary. The PFMC's role and background is further explained in **Appendix D**.

Oregon and its nearshore waters host a variety of commercial fisheries, so the expected increase in activity from Proposed Action vessels would be small compared to the overall level of survey effort. Marine vessels associated with the Proposed Action mobilizing and transiting from ports to the WEA could reduce efficiency of fishing operations due to time delays associated with congestion or avoidance. These vessels could accidentally damage fishing gear (e.g., by cutting trap floats) or release marine debris, which could cause entanglement or interfere with other fishing operations. These impacts would likely be short-term and temporary; lessees have up to 5 years to perform site assessment activities before they must submit a COP (30 CFR 585.235(a)(2)); buoy deployments typically last one year, and the duration of a single survey is days or a few weeks BOEM anticipates that buoys be decommissioned at that time; however, mandating this action falls outside the scope of BOEM's authority and is permitted by the USACE under the Nationwide Permit 5. Therefore, a buoy can be moored for the life of the lease, 20–30 years, making impacts longer lasting.

Many of the region's important fishing grounds are in depths less than 900 m (2,953 ft), so a buoy within the WEA (900 m and 1,300 m [2,953 ft and 4,265 ft] depth) decreases conflict with the fishing industry due to its offshore location. Data collection buoys and associated mooring systems could also act as fish aggregating devices. Ropes and lines could encourage the settlement of marine plants and small crustaceans and mollusks, which in turn attract small fish. Fish aggregating devices are most effective at attracting adult predatory fish when deployed in water deeper than 400 meters (NMFS 2017). Decommissioning of buoys would remove or reduce these effects. When instrumentation is decommissioned and large marine debris objects is removed, any space-use conflict would be eliminated and potential conflicts with fishing and further potential impacts on bottom habitat would be minimized; this includes anchors associated with buoys. 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. Lessees would develop a Fisheries Communications Plan with a designated liaison. Other measures could include a Local Notice to Mariners, vessel traffic corridors, lighting specifications, incident contingency plans, or other appropriate measures. Some of these navigational safety measures are also expected to reduce negative interactions between fishers and project vessels.

Impacts from Proposed Action activities on fish in the Project Area are likely to be largely undetectable and temporary due to the minimal influence project activities could have across larger spatial and temporal scales. Impacts on fish from meteorological buoy installation, HRG and geotechnical surveys, and vessel operations associated with the Proposed Action would be localized and short-term. Impacts are expected to last for the duration of the noise-producing activities and are not expected to have long-lasting consequences. Fish species capable of sensing the introduced noise could alter their behavior and leave the affected area temporarily.

PTS exposure distances (in m) from mobile, impulsive, intermittent HRG sources towed at a speed of 4.5 kn for fishes are the following for the listed HRG sources: boomers, bubble guns (4.3 kHz) 3.2 m, and sparkers (2.7 kHz) 9.0 m. This range is conservative as it assumes full power, an omnidirectional source, and does not consider absorption over distance. Maximum disturbance distances from HRG mobile, impulsive, intermittent sources towed at a speed of 4.5 kn for fishes for the following HRG sources are: boomers, bubble guns (4.3 kHz) 708 m, and sparkers (2.7 kHz) 1,585 m. Other HRG equipment, such as a chirp sub-bottom profiler (5.7 kHz), does not risk PTS or disturbance to fishes, because the sound sources are out of the hearing range of fishes (BOEM 2022c). BOEM anticipates further investigation to all these anthropogenic noise sources in preparation for future environmental review of a COP.

Conclusion

Potential impacts on commercial fishing from the Proposed Action are expected to be **minor** and temporary in duration (five years or less), and primarily associated with a spatial incompatibility around the data collection buoy(s) and interactions with project vessels, which is small when compared to the full extent of available fishing grounds. BOEM recommends lessees incorporate BMPs to minimize adverse effects to commercial fishing from their site assessment and site characterization activities.

3.7.3 No Action Alternative Impacts

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

3.8 RECREATION AND TOURISM

This section defines and describes the recreation and tourism ocean economy and the environments affected by the Proposed Action. Recreation and tourism occur on coastal lands and include shore-based activities such as visiting historic towns and landmarks, biking, bird watching, and beach going. Recreation and tourism also include ocean activities and attractions used by locals and tourists, such as recreational fishing, diving, and scenic water tours.

3.8.1 Affected Environment

The affected environment for recreation and tourism includes Coos, Curry, and Lincoln counties due to their proximity to the WEAs and likelihood that activities associated with the Proposed Action would be based in those ports.

Coos County is home to the Port of Coos Bay and Bandon Dunes Golf Resort, one of the top tourist attractions in Oregon. Coos County is comprised of various historical sites and known as Oregon's Adventure Coast.

Curry County is mostly rural, varied geography, and a mild, wet climate that hosts farming, ranching, fishing, and foraging, as well as several recreational opportunities (e.g., visiting state parks, diving, windsurfing, kayaking, and surfing). The Chetco, Sixes, and Rogue rivers are tourist attractions for rafting expeditions. The Port of Port Orford and the Port of Brookings Harbor are also in Curry County.

Lincoln County is home to the City and Port of Newport (Yaquina Bay) and includes the Historic Bayfront district and several tourist attractions, such as the Yaquina Head lighthouse, the Yaquina Bay Bridge, Oregon Coast Aquarium, and Underseas Garden.

Most of the total ocean economy jobs in Coos, Curry, Lane, Douglas, and Lincoln counties are in the tourism and recreation sectors (Table 3-15), which include eating and drinking establishments, hotels, marinas, boat dealers and charters, campsites and RV parks, scenic water tours, manufacture of sporting goods, amusement and recreation services, recreational fishing, zoos, and aquariums. The proceeding data and analysis occur at the county level in adherence with various data sources relevant to all tourism and recreational activities, beyond those tied to recreational fishing.

Table 3-15: Ocean Economy by Tourism & Recreation Sector, 2021

Area	Coos County	Curry County	Lane County	Lincoln County	Douglas County	Oregon
Employment (%)	80.4%	89.5%	65.3%	90.1%	36.3%	59.2%

Note: Employment as a percentage of total ocean economy in each corresponding area. For example, total ocean employment in Coo's County, Oregon is 80.4% Tourism and Recreation, and the remaining employment is found in the remaining ocean economy sectors e.g., living resources, Marine Transportation, etc.

Source: The National Ocean Economics Program (NOAA 2022) publishes datasets on ocean economy employment, wages, and sectors by state and county in the U.S.

3.8.1.1 Tourism and Recreation Gross Domestic Product

In 2021, 62.7% of the total ocean economy, when measured by gross domestic product (GDP), brought in $178.8 million, with an average of $53,952 GDP per employee, to Coos County. Curry County had 84.3% of the total ocean economy, when measured by GDP, which brought in $60.8 million, with an average of $53,529 GDP per employee. Lincoln County had 86.3% of the total ocean economy, when measured by GDP, brought in $291 million, with an average of $70,616 GDP per employee. Lane County had 53.9% of the total ocean economy, when measured by GDP, brought in $55 million, with an average of $68,554 GDP per employee. Douglas County had 21.3% of the total ocean economy, when measured by GDP, brought in $12.7 million, with an average of $53,529 GDP per employee. The Ocean Economy Tourism and Recreation GDP for Coos, Curry, Lane, Douglas, and Lincoln counties are summarized in Table 3-16.

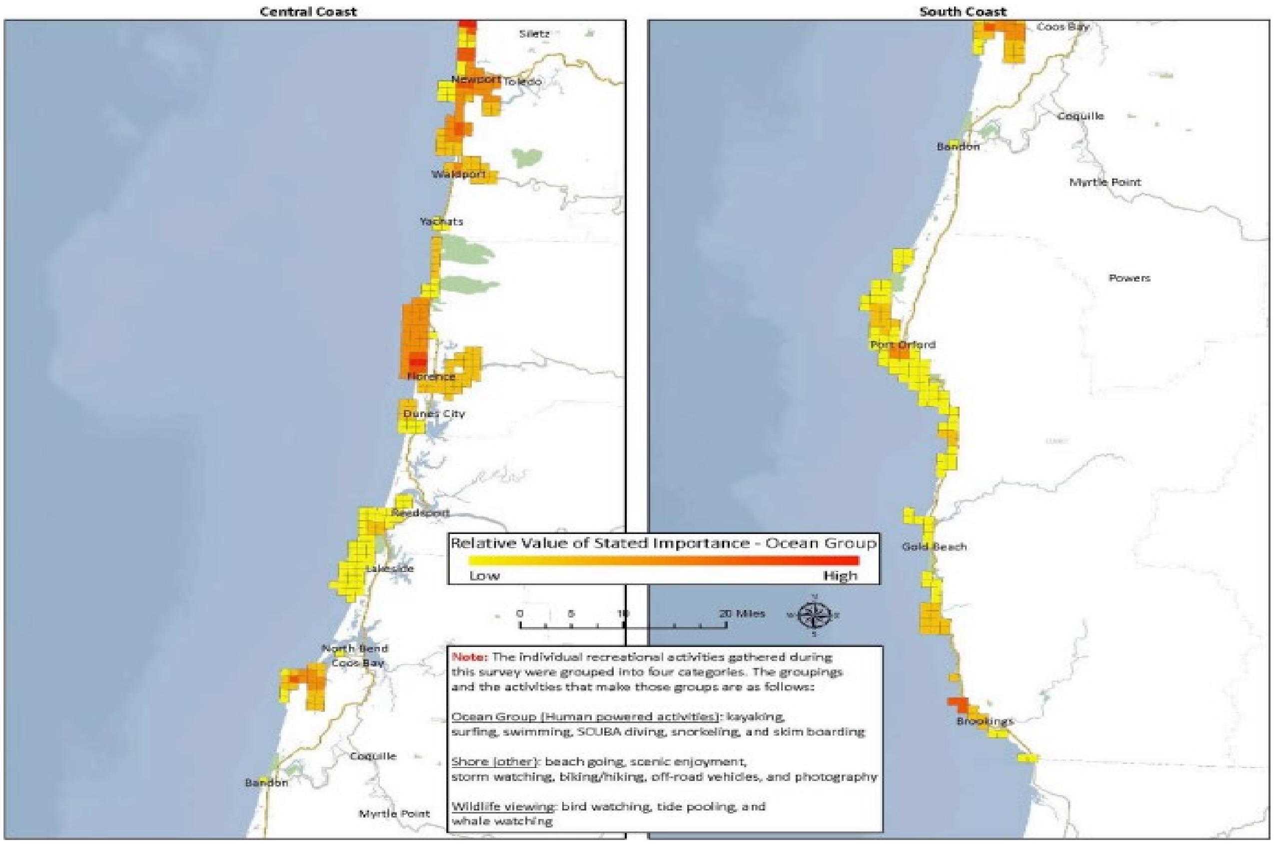
Table 3-16: Tourism and Recreation GDP,2021

Area	% of the Ocean Economy	Total GDP (in Million)	GPD by Employee
Coos County	72.6%	$178.8	$68,414
Curry County	84.3%	$60.8	$53,952
Lane County	53.9%	$55	$68,554
Douglas County	21.3%	$12.7	$53,529
Lincoln County	86.3%	$291	$70,616
Oregon	36.6%	$1,000	$46,500

Source: The National Ocean Economics Program (ENOW Explorer; NOAA 2022) publishes datasets on ocean economy employment, wages, and sectors by state and county in the U.S.

LaFranchi and Daugherty (2011) surveyed Oregonians regarding non-consumptive activities or activities enjoyed on the coast without taking anything out of the ocean or from the beach. They found that the top activities were beach going, sightseeing or scenic enjoyment, wildlife viewing, and/or photography and that $87.72 was the average expenditure per person. Further, visits to Lincoln County made up almost 43% of the total distribution of coastal trips reported (Figure 3-9).

Figure 3-9: Coastal Oregon Recreation Use: Non-Consumptive Ocean-Based Activities



Source: LaFranchi and Daugherty (2011)

3.8.1.2 Recreational Fishing

Recreational fishing refers to non-commercial activities of fishermen who fish for sport or pleasure, regardless of whether the fish are retained or released. In 2022, recreational fishing trips contributed to 890 jobs and $106 million in sales in Oregon (NMFS 2024). Several businesses and industries (e.g., the for-hire fleets, bait and tackle businesses, tournaments) support recreational fisheries (NOAA 2015). Recreational fishing ports and related or supported industries could be impacted by the Proposed Action in Lincoln, Coos, Douglas, Lane, and Curry counties. Annual recreational fishing data for the number, weight, and species caught; target species; number of anglers; number of trips (“effort”); and expenditures are available through angler surveys and charter boat logbooks and the Recreational Fisheries Information Network (RecFIN) that is managed by the PFMC. Recreational fishing activities and seasonal trends in southern and central Oregon are summarized in Table 3-17.

Carlton et al. (2024) identified the most suitable areas for potential WEAs in the Oregon Call Areas using comprehensive spatial analysis to understand and define space-use conflicts between fisheries and the Proposed Action. Their overall suitability analysis showed few interactions or conflicts in the salmon trolling fishery and the charter albacore tuna[6] in the proposed WEAs, but it also revealed low- to moderate- space-use conflict in the Coos Bay Call Area. However, no interactions or space-use conflict

[6] Salmon trolling and albacore fishing are hook-and-line fisheries that use several lures or baited hooks towed from the vessel. The vessel is almost always moving and trying to match speed to the targeted species. Added vessel traffic from the Proposed Action could impede or create space-use conflicts with trolling fisheries.

between fisheries and the Proposed Action was shown for the proposed Brookings Call Area and low- to increasingly measurable space-use conflict occurred in the albacore and salmon fisheries in the Coos Bay Call Area. The overall suitability results for albacore tuna and salmon from Carlton et al. (2024) are shown in **Appendix F**.

Table 3-17: Gear, Location, and Fishing Seasons in Southern and Central Oregon Marine Recreational Fisheries

Species*	Principal Gears	Fishing Area	Season
Tuna (Albacore)	Surface-hook-and line: Troll and bait boat (live bait)	Out to 20–50 nm (within a 70–80-mile radius of port)	July - October
Groundfish (Bottomfish)	Hook-and-line, pots	Bottom fishing very important; within 5 nm or 40 fathoms (within 30-mile radius of port); look for reefs and high spots	All year
Halibut	Hook-and-line	Within 40–100 fathoms; focus on sand or gravel habitat	May - October
Salmon	Hook-and-line, Troll	Breakers to 50 fathoms; usually stay within 20 nm	March – October
Crab	Pots	Often inside of bays and estuaries; in the ocean out to 20–70 fathoms	All year; Mid–October to late November Ocean is closed to all crabbing

Key: *= Species listed on Oregon Department of Fish & Wildlife 2024 Marine Zone Recreation Report
Sources: PFMC 2022a; PFMC 2023a; Oregon Department of Fish & Wildlife 2024 (a-d), Based on Industrial Economics, Inc. 2012, Tables 6-5 and 6-6

3.8.1.3 Industries Supporting Recreational Fisheries

Many businesses, such as restaurants, hotels, boat rental and repair shops, bait and tackle stores, and fishing guides provide goods and services to recreational fishers (“anglers”). In 2021, there were approximately 120,000 boat angler trips and 1.3 million fish caught in southern Oregon (NOAA 2022). In 2017, the average expenditure per angler per day in Oregon ranged from $193.52 for a private boat or boat rental to $485.22 for a charter boat (Lovell et al. 2020). The total recreation-related establishments in Coos, Curry, and Lincoln counties are summarized in Table 3-18.

3.8.2 Proposed Action Impacts

3.8.2.1 Routine Activities

The temporary placement of meteorological buoys could be noticeable for marine viewsheds and beach-going tourism, which is high in Lincoln County, but relatively low for Coos and Curry counties. Ocean sports, such as surfing, diving, and kayaking, rarely occur on the OCS and would not be affected. Increased maritime traffic to conduct geophysical, geotechnical, biological, archaeological, and ocean use surveys could have short-term, minor impacts on recreational fisheries, namely salmon, crab, and albacore fishing in Coos and Lincoln counties, but would not be measurable (negligible) in Curry County.

Table 3-18: Annual Average Recreation-Related Establishments in Coos, Curry, and Lincoln counties, 2023

Industry	Coos	Curry	Douglas	Lane	Lincoln	Oregon
Restaurants	142	82	222	836	194	307
Hotels, motels, and B&Bs	33	32	33	86	88	38
RV parks and campgrounds	-	-	-	14	12	8
Marinas	3	-	-	-		3
Boat dealers	3	-	-	3		3
Scenic and sightseeing water transportation (a)	-	-	-	-	10	10
Recreational goods rental	-	-	-	-	-	8
Sporting and athletic goods manufacturing	-	-	-	6	-	7
All other recreation industries (b)	4	5	9	44	4	21

Key: (a) = Includes party/head and charter boats; (b) = Includes fishing guide services and recreational fishing clubs.
Source: U.S. Bureau of Labor Statistics 2022: Annual averages by NAICS 72251, restaurants and other eating places; 7211, traveler accommodation; 721211, RV parks and campgrounds; 71393, marinas, 441222, boat dealers; 487210, scenic and sightseeing water transportation; 532284, recreational goods rental; 339920, sporting and athletic goods manufacturing; 713990, all other amusement and recreation industries.

Conclusion

Recreation and tourism bring outside money into Coos, Curry, Douglas, Lane, and Lincoln counties' economy when visitors from more than 50 miles away come for recreation, overnight stays, to visit friends and family, and to conduct business. The Proposed Action could increase the amount of people visiting the affected counties and thereby increase economic activities such as restaurants and hotels. The impacts from the Proposed Action on recreation and tourism would likely be short-term, beneficial, and difficult to measure and would be **negligible** to **minor**.

3.8.3 No Action Alternative Impacts

Under this alternative, commercial leases and grants would not be issued in the Coos Bay or Brookings WEAs. 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 would continue to contribute to climate change and have negative impacts on tourism and recreational activity. Implementing the No Action Alternative would not meaningfully reduce ongoing impacts on tourism and recreational activity.

3.9 ENVIRONMENTAL JUSTICE

Environmental justice (EJ) describes the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other Federal activities that affect human health and the environment so that people:

1. Are fully protected from disproportionate and adverse human health and environmental effects (including risks) and hazards, including those related to climate change, the impacts of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and
2. Have equitable access to a healthy, sustainable, and resilient environment in which to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices (E.O. 14096).

The effects of this Proposed Action on minority, low-income, Tribal, and disabled populations were analyzed in accordance with executive order (E.O.) 14096—*Revitalizing Our Nation's Commitment to Environmental Justice for All* (88 FR 25251); E.O. 13166—*Improving Access to Services for Persons with Limited English Proficiency* (Federal Register 2000); E.O. 14008 – *Tackling the Climate Crisis at Home and Abroad* and M-21-28 – *Interim Implementation Guidance for the Justice40 Initiative*; CEQ's *Environmental Justice Guidance Under NEPA* (CEQ 1997); and EPA's *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis* (EPA 2016).

3.9.1 Affected Environment

This Proposed Action's potential impact areas on the human environment are Coos and Curry counties and possibly (depending on wind velocity and survey activity) portions of Douglas, Lane, and Lincoln counties, which are the corresponding onshore areas with respect to the Coos Bay and Brookings WEAs.

Demographics

Demographic analyses of Curry, Coos, Douglas, Lane, and Lincoln counties show that there are no minority populations exceeding 50% of the total county population, and that the minority population percentages of the individual counties are generally lower than the minority population percentages of Oregon as a whole, with the exception of the population identifying as American Indian and Alaska Native alone (Table 3-19). All five counties surveyed individually have a larger percentage of disabled persons and persons living in poverty than in Oregon as a whole. According to the Justice40 Initiative, these coastal counties contain many communities that are considered disadvantaged because they meet the threshold for at least one of eight designated burdens (i.e., climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, workforce development) in addition to an associated socioeconomic burden. Justice40 investment benefits will be directed towards addressing these burdens to benefit these disadvantaged communities. Of the 26 census tracts that span the coast across the five counties, 15 of them meet at least one burden (CEQ 2022).

Table 3-19: Demographics for Coos, Brookings, Douglas, Lane, and Lincoln Counties

Category	Coos	Curry	Douglas	Lane	Lincoln	Oregon	U.S.
Total population	64,990	23,598	112,297	382,353	50,813	4,240,137	333,287,557
White alone	89.9%	91.2%	92.1%	88.6%	89%	85.9%	75.5%
Black or African American alone	0.7%	0.7%	0.6%	1.3%	1.0%	2.3%	13.6%
American Indian and Alaska Native alone	3.0%	2.7%	2.1%	1.6%	4.1%	1.9%	1.3%
Asian alone	1.4%	1.0%	1.2%	3.2%	1.6%	5.1%	6.3%
Native Hawaiian and Other Pacific Islander alone	0.3%	0.2%	0.2%	0.3%	0.2%	0.5%	0.3%
Hispanic or Latino	7.5%	8.0%	6.8%	10.1%	10.1%	14.4%	19.1%
White alone, not Hispanic or Latino	83.9%	84.8%	86.4%	80.2%	81.1%	73.5%	58.9%
Persons in poverty	17.4%	14.8%	16.5%	14.4%	15.2%	12.1%	11.5%
Language other than English spoken at home age 5+ years	5.2%	6.7%	3.8%	8.4%	7.2%	15.3%	21.7%
With a disability, under age 65 years, 2017–2021	16.6%	15.5%	14.2%	12.8%	15.3%	10.2%	8.7%

Source: U.S. Census Bureau (2023)

EJ-related impacts most often occur on a localized, sub-county scale. Therefore, additional analyses were performed using the EPA's Environmental Justice Screening and Mapping Tool (EPA 2024) to focus on local demographics in select communities with the potential of being impacted (Table 3-19). Demographics were determined for 5-mile radii centered on four schools (Table 3-20) chosen for their potential downwind locations with respect to WEAs and vessel traffic and proximity to port activity. There were no indications of minority or low-income neighborhoods that might be disproportionately, adversely impacted by the Proposed Action.

Table 3-20: Micro-Demographics for Schools in Selected Areas

Category	Adam Middle School, Brookings	Sunset Middle School, Coos Bay	Siuslaw Middle School, Florence	Yaquima View Elementary School, Newport	State Average
Population	12,425	33,224	13,704	12,530	4,240,137
People of Color (see note)	19%	20%	12%	22%	24%
Limited English-Speaking households	1%	1%	1%	1%	2%
Language spoken at home (total non-English)	9%	7%	5%	14%	-
English	91%	93%	95%	86%	-
Spanish	7%	4%	2%	11%	-
Air Toxics Cancer Risk (lifetime risk per million)	16	20	20	17	28
Air toxics respiratory health index	0.24	0.3	.33	.18	0.38
Persons with disabilities	21.9%	23.1%	24.3%	19.3%	14.9%

Note: The term “People of Color” is defined by the EPA as the people in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino.
Source: EPA (2024)

3.9.2 Proposed Action Impacts

This Proposed Action involves marine vessels conducting survey operations and deploying or servicing buoys for each lease. The IPFs, with respect to EJ, are primarily related to air and water pollutant releases.

The air emissions are derived primarily from internal combustion engines used for propulsion of marine vessels, and auxiliary engines used for powered equipment such as cranes and winches. These emissions are primarily NO_2, SO_2, CO, and PM. GHGs are also produced, primarily in the form of CO_2. Other sources are the emissions of hydrocarbons from fuel and lubricants.

Vessel operations during activities would be limited in scope and short in duration. Most of the routine emissions from normal vessel operations would be emitted approximately 20 to 40 mi offshore and be diluted by normal atmospheric mixing action prior to reaching shore. Emissions would be indistinguishable from those of other marine vessels traversing offshore southern Oregon and would not significantly impact the air quality in corresponding counties. As a result, disproportionately adverse impacts on EJ communities are expected to be negligible.

Limited English Proficiency (LEP)

Limited English Proficiency refers to persons who are not fluent in English. Whereas the population identifying as Hispanic or Latino in the five-county area of potential impact (6.8–10.1%) is smaller than those of both Oregon and the U.S. as a whole (Table 320), Spanish could be spoken in more than 11% of households in the area (Table 3-21). Translation of important documents and interpretation of vital information can be provided at BOEM's discretion and in accordance with resource availability.

Conclusion

Due to the limited scope and short duration of the Proposed Action activities, no significant adverse impacts in the corresponding onshore communities are expected. Therefore, no significant disproportionately high adverse human health or environmental effects on minority, low-income, Tribal, or disabled populations are expected, and impact is **negligible**. However, community benefit agreements provided by offshore wind developers should prioritize disadvantaged communities (CEQ 2022).

The majority of the population of the potentially affected area is non-Hispanic white and the minority population is generally smaller than that of Oregon as a whole, with the exception of the American Indian and Alaska Native population. The five counties that could be affected have a larger proportion of disabled persons and persons living in poverty than in Oregon overall (Table 3-19). Two of the basic tenets of EJ are disclosure and public participation in government environmental permitting processes. There is a significant Hispanic population in the five-county study area—these tenets can be facilitated by providing translation and interpretation services to the public, as needed, and as BOEM resources permit.

There appears to be a significant proportion of the population with disabilities—up to 24.3% in the 5-mile radius around Siuslaw Middle School in Florence. This is significantly greater than the Oregon State value of 14.9%. Due to the wide range of disabilities, there may not be a single action or a set of actions that would meet all needs of such a diverse group. BOEM could employ targeted outreach methods such as video conferencing to foster inclusive public participation.

3.9.3 No Action Alternative Impacts

Under the No Action Alternative, leases and grants would not be issued for the two WEAs and there would be no G&G activities pursuant to conducting wind energy activities. Adoption of the No Action Alternative would have no impacts on minority, low-income, Tribal, and disabled populations in the five-county area. Ambient concentrations of air contaminants would remain unchanged, subject to future changes in the economy, regulations, technology, and population.

The absence of site assessment and site characterization activities within the WEAs would lead to no adverse environmental or health effects on minority, low-income, Tribal, or disabled populations.

3.10 TRIBES AND TRIBAL RESOURCES

Federally recognized Tribes are individually and culturally unique from each other. Their inherent rights originate back to the beginning of their creation and are rooted in their ancestral cultures. BOEM recognizes Tribes' inherent rights to exercise their language, cultural beliefs, protection of Tribal resources, sense of place and territory through their existence and inhabitance since time immemorial. Inherent rights means the birth-right of a people instilled in them since the time of creation. These rights are embedded in their right to their language, teachings, culture, territories of land and water, history of stewardship and service, and fiduciary obligation to preserve those rights for future generations. Federally recognized Tribes retain their inherent rights and are, as such, sovereign and operate their own Tribal governments to govern their Tribal citizenship and reservation populations through self-governance and self-determination.

Among Tribes with ancestral ties and current connections to the land and sea in the region of the Proposed Action are the Confederated Tribes of Coos; Lower Umpqua, and Siuslaw Indians (CTCLUSI); Confederated Tribes of Siletz Indians (CTSI); Coquille Indian Tribe; Elk Valley Rancheria, California; and Tolowa Dee-ni` Nation. The Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of Warm Springs, Cow Creek Band of Umpqua Tribe of Indians, Hoh Tribe, Karuk Tribe, Makah Tribe, Quileute Tribe, and Quinault Indian Nation have expressed concerns over potential impacts on anadromous fish and migratory species of cultural, spiritual, and economic importance that could pass through the WEAs. Additionally, Santa Ynez Band of Chumash Indians have also expressed interest and concern over wind energy activities offshore Oregon.

While current models suggest the potential for archaeological findings along the southern Oregon and northern California coast date back 15,000 to 20,000 years (Jenkins et al. 2012, Peltier and Fairbanks 2006, Raghavan et al. 2015), oral histories of many Tribes associate their creation with the ocean or adjacent lands since time immemorial. The abundant natural resources of the coast became vital to the lifeways and cultural identities of the Indigenous Peoples, and these resources remain important today. The ocean and rivers of the region provided food, transportation, opportunities for trade, and the coastal landscapes, seascapes, and viewsheds became sacred cultural elements.

Many Native Americans live near and use areas where BOEM activities are proposed and conducted. The ancestors of today's Tribes occupied vast areas of land and depended on nearby ocean resources, even prior to both sea level rise at the end of the last ice age and interaction with the U.S. Government. Furthermore, it is important to note the impact that the history of Federal law and policy has had on Tribal access to ancestral lands. After many thousands of years of flourishing settlements, the influx of Europeans and Euro-Americans decimated Indigenous populations within a few generations. Policies such as the Indian Removal Act of 1830 enabled mass removal of Native Americans from their lands;

these types of actions continue to have long-lasting impacts on Tribes and their relationship with the Federal government. Jurisdictional boundaries, such as the California/Oregon border, further fragmented Tribes. During the “Termination Era” of the mid-20th Century, the Western Oregon Indian Termination Act ceased Federal recognition of Tribal sovereignty in western Oregon (Public Law 588, 1954). The California Rancheria Act terminated recognition of 44 Tribes in California, including Elk Valley and Smith River (Tolowa) (Public Law 85-671, 1958). Tribal resilience and protests, however, led to Federal restoration acts, particularly in the 1970s and 1980s, as well as recent land restoration acts.

Today, Tribes maintain cultural, spiritual, economic, and customary connections to marine and shoreline resources of the region, including fishing and gathering for cultural and subsistence purposes; these activities and resources are seen as irreplaceable. Some Tribes hold adjudicated rights to marine resources in the region, while other Tribes may have non-adjudicated rights. Ocean viewsheds—unobstructed ocean views—hold important cultural and spiritual significance. Many Tribes provide environmental stewardship of natural resources in southern Oregon and northern California, and they share concerns about ecosystem threats from climate change, habitat degradation, and exploitation of wild plants and animals.

Several Tribes support conservation initiatives and protected status for traditional lands (Tolowa 2016; Coquille Indian Tribe 2024). In September 2023, Tolowa Dee-ni` Nation, along with Resighini Rancheria and Cher-Ae Heights Indian Community of the Trinidad Rancheria, announced the Yurok-Tolowa-Dee-ni` Indigenous Marine Stewardship Area, which extends south from the California/Oregon border (Native News Online 2023); CTCLUSI nominated a large portion of Coos Bay as a Traditional Cultural Property (TCP) (CTCLUSI 2020). Tribes in the region also generate income from ventures tied to coastal and marine resources, including commercial fishing (e.g., Tolowa 2024a).

The United States has a unique legal relationship with Indian Tribal governments as set forth in the Constitution of the United States, treaties, statutes, E.O.s, and court decisions. Further, the Federal government has enacted numerous statutes and regulations that establish and define a trust relationship and fiduciary obligation with Indian Tribes, recognizing the right of self-governance and supporting Tribal sovereignty and self-determination. Tribes exercise inherent sovereign powers over their members and territory. The Federal government continues to work with Indian Tribes on a government-to-government basis to address issues concerning Indian Tribal self-government, Tribal trust resources, and Indian Tribal treaty and other rights (E.O. 13175).

Due to the importance of the California Current Ecosystem to multiple West Coast Tribes, BOEM invited consultation and engagement with more than 80 federally recognized Tribes along the West Coast and will continue to invite engagement and consultation with Tribal Nations at each decision point in BOEM’s wind energy process. Additionally, all nine federally recognized Tribes within Oregon, as well as coastal Washington Treaty Tribes and Tribes in northwestern California, have been invited to participate as members of the BOEM Oregon Intergovernmental Renewable Energy Task Force. Given the limitations of this EA, this section briefly highlights some important connections to the resources in the region.

Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians

The CTCLUSI is a confederation of three coastal Tribes: Coos (including Hanis Coos and Miluk Coos), Lower Umpqua Tribe, and Siuslaw Tribe (CTCLUSI 2024). The CTCLUSI claim a direct interest in land and waters in Coos, Curry, Lincoln, Douglas, and Lane counties, and inland to high points in the Coastal Range (CTCLUSI 2024, Tiller 2015). The CTCLUSI also claim a direct interest in the ocean from shore to at least 12 nm past the continental shelf.

In 1855, CTCLUSI signed the Oregon Coast Treaty, but it was never ratified by Congress. In 1954, the Western Oregon Termination Act was passed by Congress severing relations with 43 Tribes and bands of Indians in Western Oregon, including CTCLUSI. In 1984, after years of hard work, Public Law 98-481 restored Federal recognition to CTCLUSI.

CTCLUSI has worked toward the restoration and protection of its lands and the surrounding environment. On January 8, 2018, the Western Oregon Tribal Fairness Act (Public Law 115-103) was signed into law. This law provides for approximately 14,700 acres of Bureau of Land Management-administered lands in western Oregon to be held in trust on behalf of CTCLUSI. In 2019, CTCLUSI nominated a large portion of the lands and waters of Coos Bay (Q'alya Ta Kukwis Shichdii Me) as a TCP pursuant to the NHPA. Federal agencies have acknowledged and recognized the TCP as eligible for listing on the National Register of Historic Places.

CTCLUSI have been actively engaged with BOEM and the State of Oregon in offshore wind planning and have provided extensive comments throughout the process. The Tribe has shared its concerns about potential impacts on ocean viewsheds, submerged pre-contact landforms, traditional cultural properties, commercial fisheries, resident and migratory species of importance to the Tribe, and BOEM's renewable energy leasing process described at 30 CFR part 585 and Nation-to-Nation consultation. CTCLUSI is a member of the BOEM Oregon Intergovernmental Renewable Energy Task Force and entered into a co-management agreement with ODFW in 2023 to protect, restore, and enhance fish and wildlife populations and habitat in southwest Oregon. On October 25, 2023, CTCLUSI Council passed a resolution (23-153), *Opposing Offshore Wind Energy Development to Protect Tribal Resources*.

Coquille Indian Tribe

The Coquille Indian Tribe had permanent settlements on Lower Coos Bay and the Coquille River and has historical connections to the land in the current counties of Coos, Curry, Douglas, Jackson, Josephine, and Lane (comment letter from Coquille Indian Tribe on June 21, 2024; Tiller 2015). As stated in a letter from the Coquille Indian Tribe on April 4, 2022, Coquille people have lived in southwestern Oregon for thousands of years and have a connection to the land and the sea that sustained the Tribe for many generations. Today, the Tribe manages the Coquille Forest in Coos County, Oregon, and has a co-management agreement with ODFW to protect, restore, and enhance fish and wildlife populations and habitat in southwestern Oregon.

The Coquille Indian Tribe is a member of the BOEM Oregon Intergovernmental Renewable Energy Task Force and has been engaged with BOEM and the State of Oregon in offshore wind planning, providing input throughout the process. The Tribe has expressed concerns about potential impacts on sustainable ecosystems, ocean viewsheds, submerged pre-contact landforms, as well as potential impacts on the local economy, fisheries, and treaty rights and BOEM's renewable energy leasing process described at 30 CFR part 585 and Nation-to-Nation consultation.

Tolowa Dee-ni` Nation

The Tolowa Dee-ni` Nation claim ancestral lands along the coastline in northern California (including parts of Del Norte and Humboldt counties) and southern Oregon (including parts of Curry, Coos, and Josephine counties), and inland to the Coastal Range (Tolowa 2024b; Tiller 2015). Today, Tolowa people mainly live at the former Smith River Rancheria. In September 2023, Tolowa Dee-ni` Nation, Resighini Rancheria, and Cher-Ae Heights Indian Community of the Trinidad Rancheria announced the Yurok-Tolowa-Dee-ni` Indigenous Marine Stewardship Area, an ocean-protected area extending offshore 3 nm from the California/Oregon border south to Little River (Native News Online 2023).

BOEM has invited government-to-government consultation with Tolowa Dee-ni` Nation throughout its planning process and will continue to do so. On November 9, 2023, Tolowa Dee-ni’ Nation Council passed a resolution (2023-47) in opposition to offshore wind energy; the Tribe has raised concern regarding BOEM’s renewable energy leasing process described at 30 CFR part 585 and Nation-to-Nation consultation. The Tribe has been invited to join the BOEM Oregon Intergovernmental Renewable Energy Task Force and participated as an observer in the May 2024 meeting.

Elk Valley Rancheria, California

Elk Valley Rancheria, California, located in Crescent City, California, is comprised of the modern-day descendants of the Tolowa people. Like Tolowa Dee-ni` Nation, Elk Valley Rancheria, California claim ancestral lands along parts of northern California (Del Norte and Humboldt counties) and southern Oregon (Curry and Coos counties) (comment letter from Elk Valley Rancheria, California, dated June 5, 2024; Tiller 2015).

BOEM has invited government-to-government consultation and engagement with Elk Valley Rancheria, California throughout the planning process and the Tribe has been actively engaged since BOEM published draft WEAs in August 2023; Elk Valley Rancheria, California, is participating as a Cooperating Tribal Nation under NEPA for this EA. Through consultations and the Tribe’s comment letter (June 5, 2024), Elk Valley Rancheria, California identified its interests primarily in site characterization activities that could occur within the Brookings WEA.

Confederated Tribes of Siletz Indians

The CTSI includes descendants of more than 30 Tribal bands with ancestral lands from southern Washington to northern California. Treaties between 1851 and 1855 led to the development of the Coast (Siletz) Reservation, established by E.O. in 1855, and extending along the coast from the Siltcoos River to Cape Lookout. In 1954, Federal recognition of CTSI was terminated by Public Law 588. In 1977, CTSI was the second Tribe in the country restored to Federal recognition (CTSI 2024, Tiller 2015). To date, the Tribe has declined invitations for government-to-government consultation on the Oregon WEAs but has participated as a member of the BOEM Oregon Intergovernmental Renewable Energy Task Force; BOEM will continue to invite government-to-government consultation and engagement with CTSI.

Makah Tribe

Based on letters to BOEM from the Makah Tribe dated April 19, 2024, and May 31, 2024, and on Tiller (2015): The ancestral homeland of the Makah Tribe is at the northwestern point of the Olympic Peninsula in Washington State and the Tribe’s usual and accustomed Treaty fishing area extends approximately 40 miles offshore. The 1855 Treaty of Neah Bay reserves the Tribe’s right to retain and exercise inherent sovereign authority over its treaty-protected area, and the Tribe’s relationship to the ocean continues today, in part, through its treaty fisheries. The Makah Tribe has been engaged and consulted with BOEM on wind energy activities offshore the West Coast, including offshore Oregon, and has stated that large-scale offshore wind development on the West Coast will have an impact on Makah culture, economy, nutritional security, and community wellbeing.

The Tribe has been invited to join the BOEM Oregon Intergovernmental Renewable Energy Task Force and participated as an observer in recent meetings.

Other Interested Tribes

Through BOEM’s engagement efforts with West Coast Tribes, the Confederated Tribes of the Grand Ronde Community of Oregon, Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Confederated Tribes of Warm Springs, Cow Creek Band of Umpqua Tribe of Indians, Hoh Tribe, Karuk Tribe, Quileute Tribe, and Quinault Indian Nation have each expressed concerns over migratory species of cultural, spiritual, and economic importance that could pass through the WEAs. The Umatilla, Cow Creek, and Karuk Tribes, among others, have shared concerns about impacts that offshore wind energy development could have on salmon and other anadromous species.

Additionally, as stated in a comment letter from CTUIR dated June 14, 2024, the Confederated Tribes and Bands of the Yakama, Nez Perce Tribe, Umatilla, and Warm Springs Tribes, through the Columbia River Inter-Tribal Fish Commission, developed an Energy Vision to address these concerns. In addition to the Makah Tribe, the Hoh Tribe, Quileute Tribe, and Quinault Indian Nation also have adjudicated treaty-reserved rights extending onto the OCS offshore Washington and have concerns over potential impacts on migratory species of cultural, spiritual, and economic importance, as well as concerns over displacement of commercial fishers into their adjudicated treaty areas.

As of June 2024, comment letters on the Draft EA were received from Confederated Tribes of the Grand Ronde; CTCLUSI; CTSI; CTUIR; Confederated Tribes of Warm Springs; Coquille Indian Tribe; Elk Valley Rancheria, California; the Makah Tribe; the Santa Ynez Band of Chumash Indians; and a combined letter from the CTCLUSI, CTSI, Coquille, Cow Creek Band of Umpqua Indians, and the Confederated Tribes of the Grand Ronde. Quinault Indian Nation and other Tribes requested a government-to-government consultation that that are being scheduled.

3.10.1 Affected Environment

This analysis considers Tribes and Tribal resources in the affected environment that could be impacted from issuance of lease(s), site assessment activities, and site characterization. It does not consider impacts from construction of wind turbines, which cannot be undertaken until BOEM receives for review a COP. Issuance of a wind lease only provides the ability to submit a COP, and BOEM will invite further government-to-government consultation if and when a COP is received. Tribal governments have expressed concerns about impacts from offshore wind energy development to submerged archaeological sites, ocean viewsheds, traditional cultural properties, fisheries, treaty-reserved rights, resident and migratory species, and associated ecosystems. Tribal representatives have expressed to BOEM that Tribes identify themselves as part of their interconnected coastal ecosystems and that they often consider impacts on elements of the ecosystem to be impacts on the Tribe. Tribal governments have also stated they do not have sufficient workforce and technical capacity to adequately review activities related to offshore wind planning and development.

3.10.2 Proposed Action Impacts

The assessment of potential impacts on Tribes and Tribal resources is informed by communications between Tribes and BOEM, including informational and formal consultation meetings relating to offshore energy development in Oregon and northern California. Given the concerns shared by several Tribes over potential impacts within the California Current Ecosystem, BOEM invited government-to-government consultations with more than 80 West Coast Tribes, including all Tribes identified above. As of June 2024, BOEM held consultations with CTCLUSI; the Coquille Indian Tribe; Elk Valley Rancheria, California; the Karuk Tribe; the Makah Tribe; and Tolowa Dee-ni’ Nation. The IPFs in Section 2.6 apply to Tribes and Tribal resources. This section discusses the IPFs of noise, bottom disturbance, entanglements, vessels, and economics, and altered viewsheds. Air emissions, which are analyzed in Sections 3.2 and 3.9, and lighting, analyzed in Sections 3.5and 3.7, are not covered in this section, because the potential impacts are the same.

3.10.2.1 Noise

Tribes could identify impacts on Tribal resources if fish, marine mammals, and other marine organisms are affected by noise produced during HRG surveys. Impacts on fish and EFH from HRG surveys and vessels are expected to be minimal or minor and temporary in duration (Section 3.3). Noise impacts on marine mammals from HRG surveys and vessels could have short, intermittent behavioral effects on individual animals. However, impacts of noise on marine species are expected to be negligible to minimal (Section 3.4). 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.

3.10.2.2 Bottom Disturbance and Entanglements

Impacts on archaeological resources from seafloor disturbance would be avoided or reduced by the requirement for an archaeological survey prior to the occurrence of any seafloor-disturbing activities within the lease area (Section 3.11); BOEM will require lessees to develop a Native American Tribes Communications Plan with interested Tribes to provide opportunities for direct engagement between Tribes and lessees. Impacts from bottom disturbance or entanglements on marine habitats (Section 3.3) and wildlife (Section 3.4) would be limited and are discussed further in the referenced sections.

3.10.2.3 Vessel Trips

Vessels associated with site assessment and characterization (Section 2.3.3) have potential to impact Tribes through interference with Tribal uses of the ocean for cultural activities and commercial and customary fishing activities. BOEM assumes vessels supporting surveys and meteorological buoy installation would launch from existing port facilities. Survey vessels could be visible to Tribes in coastal and nearshore areas when vessels traverse from ports to the WEAs. However, over the 5-year period of site assessment and characterization, BOEM expects the types of vessels and the level of vessel activity to mostly be indistinguishable from the existing level of vessel activity.

Survey vessels transiting from ports to the WEA lease areas could coincide with Tribal fishing activities. 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 standard vessel safety measures, as described for commercial fishing (Section 3.7). Overall, impacts from nearshore 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 region.

3.10.2.4 Economic Impacts

Considering the temporary nature and limited economic effects of site assessment and characterization activities, economic impacts from these activities (as described in Section 3.6) is expected to be temporary and with limited change, if any, from existing conditions. However, Tribal governments on numerous occasions have voiced concern about capacity and the administrative burden associated with government-to-government consultation and engagement related to offshore wind activities. In response to requests from Tribal governments to build their capacity for review of offshore wind-related documents, BOEM contracted with an Indian-owned business to facilitate reviews from interested Tribal Nations. Several Tribes, in response to this opportunity, have indicated that they prefer direct funding for staff time and for additional training to better understand technologies associated with offshore wind activities. The burden of consultation and engagement on Tribal governments is expected to continue intermittently throughout the duration of the Proposed Action, which will cause Tribes to continue to have to adjust priorities to respond to requests for engagement.

Overall, economic impacts on Tribes from the Proposed Action are expected to be minor and cease when the surveys and activities are completed. Economic impacts of commercial wind development in the WEAs, including economic impacts on Tribes, would be analyzed for any COPs submitted, and BOEM would invite further consultation at that time.

3.10.2.5 Altered Viewsheds

While the impact of turbine construction on ocean viewsheds is concerning to Tribes, the Proposed Action does not include significant or long-term alteration of viewsheds. Survey vessels could be within the viewshed of onshore historic properties, but such effects would be limited and temporary. The amount of regular existing ocean vessel traffic is much greater than temporary, short-term vessel activity for site surveys, and boats regularly in the area for other purposes include vessels much larger than survey vessels. Meteorological buoys are not expected to be noticeably visible from the shore or inland areas. The potential visual impact of wind turbines in the WEAs was simulated for various day and night conditions at key observation points in Oregon (BOEM 2023b), and a visual resource impact assessment of installed wind turbines would be included in the analyses of specific COPs and BOEM would invite further consultation at that time.

Conclusion

Potential impacts on Tribes and Tribal resources from effects of noise, bottom disturbance, and entanglements on resources important to Tribes are expected to be temporary and difficult to detect, meaning negligible, based on the impact assessment of these factors on fish, marine mammals, and historic properties. No impacts from changes in ocean and coastal viewsheds are anticipated for site assessment and characterization activities. 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. Tribes would continue to have to adjust priorities to respond to requests for engagement. Overall, economic impacts on Tribes from site assessment and characterization activities are expected to be **minor**.

3.10.3 No Action Alternative Impacts

Under the No Action Alternative, BOEM would not hold a lease sale within the WEAs, 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 during the timeframe considered in this EA.

Ongoing and expected future activities under the No Action Alternative 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. Implementing the No Action Alternative would not meaningfully reduce ongoing impacts on Tribes and Tribal resources when compared to the Proposed Action.

3.11 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 U.S.C. § 300308). This can also include properties of traditional religious and cultural importance to a Tribe that meet criteria for inclusion in the NRHP (54 U.S.C. § 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.

3.11.1 Affected Environment

Historic properties within or nearby the two WEAs include potential submerged pre-contact sites dating back at least 15,000 years and shipwrecks dating from at least the 16th through mid-20th 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 shoreward of the 130 m (427 ft) bathymetric contour line (Clark et al. 2014; ICF International et al. 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 WEAs range from approximately 567–1,531 m (1,860–5,023 ft), therefore, the potential for submerged pre-contact period sites is non-existent within the WEAs. There is, however, the potential for historic properties, including submerged pre-contact sites, to exist within a yet-to-be-determined transmission cable corridor extending from the two WEAs toward shore.

According to the BOEM Pacific Shipwreck database, there are no reported shipwreck losses within or near the Brookings WEA. The current database does not indicate any losses within the Coos Bay WEA, but there are two potential locations for the same vessel, *C.A. Klose*, immediately east of the WEA. Though the database lists *C.A. Klose*'s possible location in this area, it is not likely to be there considering there are sources that identify the vessel as having been wrecked and salvaged in 1906 off Ocean Park, WA (Gibbs 1991).

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 WEAs have 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 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 is in the BOEM-funded report *Inventory and Analysis of Coastal* *and Submerged Archaeological Site Occurrence on the Pacific Outer Continental Shelf* (ICF International et al. 2013).

3.11.2 Proposed Action Impacts

3.11.2.1 Site Characterization

As described in Section 2.3.2, site characterization activities include shallow hazards assessments, and geological, geotechnical, archaeological, and biological surveys, and could include installation, operation, and decommissioning of meteorological buoys. See **Appendix E** for Best Management Practices to Minimize Potential Adverse Impacts on Historic Properties.

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 could avoid impacts on historic properties by relocating the sampling activities away from potential cultural resources. Therefore, BOEM requires lessees to conduct HRG surveys prior to conducting geotechnical/sediment sampling, and, when a potentially eligible cultural resource, a historic property, or sensitive benthic habitat is identified, the lessee will avoid it.

BOEM recommends lessees incorporate BMPs into their plans. These practices are typical measures developed through years of conventional energy operations and refined through BOEM's renewable energy program and consultations under Section 106 of the National Historic Preservation Act (NHPA). These measures minimize or eliminate potential effects from site assessment and site characterization activities and protect historic properties. BOEM intends to include the following elements in the lease(s) to 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 should follow the recommendations in BOEM's 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 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 (seabed and subsurface) sampling activities must avoid potential archaeological resources by a minimum of 50 m (164 ft). This distance is dependent on the type of archaeological resources and the analysis of HRG data surrounding the potential archaeological resource. 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 observes the unanticipated finds requirements stipulated in 30 CFR § 585.702. 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 and any activity related to the actual impact 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 could adversely affect the resource until BOEM has made an evaluation and instructed the lessee on how to proceed. Written notification of the discovery will follow the State of Oregon's Inadvertent Discovery Plan with notification to Oregon SHPO.

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.

3.11.2.2 Site Assessment

As described above, site assessment activities consist of construction, operation, and decommissioning of up to six meteorological buoys per lease area. These buoys fall under the regulatory review of the USACE's Nationwide Permitting process.

BOEM anticipates that bottom disturbance associated with the installation of meteorological buoys would disturb the seafloor up to an estimated 10 m^2, although the maximum disturbance is likely 2.3-m^2 footprint (PNNL 2019). Impacts on archaeological resources to an estimated 10 m^2 of each meteorological buoy could result in direct destruction or removal of archaeological resources from their primary context. Prior to any site assessment activities, all areas impacted from geotechnical exploration will be reviewed and analyzed by a qualified marine archaeologist to avoid potential archaeological resources. Should contact between the activities associated with site assessment and an historic property occur, BOEM will follow the regulations for unexpected discoveries (30 CFR § 585.702) with written notification provided using the State of Oregon's Inadvertent Discovery Plan template.

Should the surveys reveal the possible presence of an archaeological resource in an area that could 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 § 585.702(b)). 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 analysis by a qualified marine archaeologist 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 (current industry standard buoys rise 12 to 15 ft above the sea surface); distance from shore; and earth curvature, waves, and atmosphere. Visual impacts on 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 would also 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 effects 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.

3.11.3 No Action Alternative Impacts

Under the No Action Alternative, no leases or grants would be issued in the Oregon WEAs 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 on historic resources.

3.12 CUMULATIVE IMPACTS

"Cumulative impact" is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacting factors (IPFs) can result from individually minor but collectively significant actions taking place over time. Cumulative impacts are considered for the action alternative. They were determined by considering the impacts of the action alternative proposed in this document considering the impacts of other past, present, and reasonably foreseeable future actions (see **Appendix D**).

3.12.1 Geology

The cumulative impacts under the Proposed Action resulting from activities performed as part of site characterization activities would be **negligible** for subsea geology, in addition to the existing local activity. The estimated area of disturbance from a small amount of bottom sampling would be spread out across the larger areas of the leases within the WEAs and along the potential offshore export cable corridors. Therefore, impacts from the collection of bottom samples are expected to be negligible.

3.12.2 Air Quality

Any additional emissions resulting from this Proposed Action would be additive to the existing environmental load, including emissions from nearby projects such as wind energy-associated activities in the Humboldt Harbor area. However, cumulative impacts from the additional marine vessel and other emissions associated with the Proposed Action would be relatively small compared with the existing and projected future vessel traffic in the area and would not represent a substantive incremental contribution to cumulative impacts on air quality. Cumulative impacts are expected to be **negligible**.

3.12.3 Marine and Coastal Habitats and Associated Biotic Assemblages

The incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor for marine and coastal habitats and associated biotic assemblages (including EFH). The cumulative impacting factors, analyzed under the No Action Alternative, include effects from urban development, mariculture, shipping and vessel discharges, and dredging. Local climate change-induced impacts on marine and coastal habitats and associated biotic assemblages, such as sea level rise or physiological stress from ocean acidification, are likely to be incremental and could be difficult to discern at time scales of less than 5 years from effects of other actions such as urban development, fishing, mariculture, shipping, and vessel discharges, point and non-point sources of pollution, and dredging. BOEM estimates that the Proposed Action, combined with ongoing and reasonably foreseeable planned actions, would not meaningfully change habitats and associated biotic assemblages and therefore, consistent with Section 3.3, would be expected to have a **minor** cumulative impact.

3.12.4 Marine Mammals and Sea Turtles

BOEM anticipates that the cumulative impacts, including the environmental baseline described in the No Action Alternative and combined with the incremental impacts associated with the Proposed Action, would be **moderate** for marine mammals and sea turtles. The impacts of the Proposed Action are unavoidable, the viability of the resource is not threatened, and affected marine mammal and sea turtle populations would recover completely when BMPs are implemented. The main impact drivers stem from site characterization surveys, and construction, presence, and decommissioning of buoys; both of which result in increases in vessel traffic and noise.

3.12.5 Coastal and Marine Birds

The incremental impacts under the Proposed Action resulting from individual IPFs are expected to be minor for birds and impacts from ongoing and planned actions are expected to be several times greater than the incremental impacts of the Proposed Action alone. BOEM anticipates that the impacts associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions would represent **moderate** impacts for birds in the geographic analysis area because the impacts are unavoidable, the viability of the resource is not threatened, and affected birds would recover completely when BMPs are implemented. The main impact drivers stem from site characterization surveys, and construction, presence, and decommissioning of buoys; both of which result in increases in vessel traffic, noise, and artificial lighting.

3.12.6 Socioeconomics

Considering all the IPFs together, BOEM anticipates the overall impacts on the social and economic characteristics in Coos County and Lincoln counties from planned activities, including the Proposed Action and other offshore wind projects under BOEM's regulatory purview, to be short-term, beneficial, and difficult to measure. In Curry County, BOEM anticipates no cumulative impacts on social and economic characteristics.

Considering all the cumulative actions and activities, IPFs, impacts, and resources together, BOEM anticipates no cumulative impacts on social and economic characteristics of the ports in Curry County, smaller ports in southern Oregon, and the Port in Crescent City. These ports' staffing, physical infrastructure, and navigation channels are not suitable to support the planned activities, including the Proposed Action, and other offshore wind projects.

Impacts from urban development and increasing air, vessel, and onshore traffic contribute to climate change and regional and port economies. The Proposed Action would not meaningfully affect ongoing impacts on economic activities from existing and potential future actions and so, like Section 3.6.2, would cumulatively have a **minor** impact*.* The Port of Humboldt Bay could be most impacted due to its proximity to two California leases, which could increase its use and attractiveness to vessels conducting surveying and buoy fabrication, and other activities needed to carry out the Proposed Action. California and Oregon lease activities could overlap temporally, and the Port of Humboldt Bay currently lacks sufficient human capital to support additional vessels coming in and out of that port.

3.12.7 Commercial Fishing

The incremental impacts under the Proposed Action, because of the above-mentioned individual IPFs, would result in negligible impacts for commercial fisheries and would not add significantly to impacts from ongoing and planned actions, including other offshore wind projects under BOEM's regulatory purview. See **Appendix D** for a brief description of the role PFMC plays in managing commercial fishing. BOEM anticipates that the potential cumulative impacts on commercial fisheries associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions as well as the environmental baseline would be expected to be **minor** and temporary in duration (5 years or less).

3.12.8 Recreation and Tourism

Considering all the IPFs together, BOEM anticipates the overall impacts on recreation and tourism from planned activities, including the Proposed Action, and other offshore wind projects under BOEM's regulatory purview, in Curry and Lincoln counties to be beneficial, short-term, and difficult to measure. The cumulative impacts on recreational fishing, specifically the albacore and tuna fisheries, in Coos County or near the Coos Bay WEA could be impacted. The overall impact on the recreational fishing activities from the Proposed Action in combination with other cumulative impacts on recreational fishing would be negligible with a potential short-term impact expected to completely recover. Recreational fishing distributions could shift spatially and are not documented well, and so this uncertainty accounts for a potentially **minor** impact determination.

3.12.9 Environmental Justice

Cumulative impacts from the additional marine vessel emissions associated with the Proposed Action would be relatively small compared with the existing and projected future vessel traffic in the area. This would not represent a substantive incremental contribution to cumulative impacts on minority populations or those who have disabilities and is therefore expected to be **negligible**.

4 Cooperating Agencies, Consultation and Coordination, and Stakeholder Comments

4.1 COOPERATING AGENCIES AND COOPERATING TRIBAL NATIONS

As part of the NOI to prepare this EA, BOEM invited Tribal governments to consider becoming Cooperating Tribal Nations, and Federal, state, and local government agencies to consider becoming Cooperating Agencies. CEQ regulations implementing the procedural provisions of NEPA define Cooperating Agencies/Nations as those with "jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) that has been designated by the lead agency" (40 CFR § 1508.1(g)). USCG, USACE, USFWS, and Elk Valley Rancheria, California, cooperated in the development of this EA.

4.1.1 USCG

The Secretary of Homeland Security is required to provide safe access routes for the movement of vessel traffic proceeding to or from ports subject to the jurisdiction of the United States, and the Secretary shall designate necessary fairways and TSS for vessels transiting to and from such ports. In carrying out these statutory responsibilities, the USCG is delegated the authority to undertake a study prior to establishing or adjusting fairways or TSS, and to the extent practicable, reconcile the need for safe access routes with the needs of other reasonable uses of the area, such as offshore renewable energy development. To meet this requirement, the USCG conducts Port Access Route Studies, which can serve as justification for regulatory projects to safeguard navigation.

The USCG is a cooperating agency for proposed offshore renewable energy activities. As a cooperating agency, the USCG's role is limited to providing the lead agency (BOEM) with an evaluation of the potential impacts a proposed activity could have on maritime safety, maritime security, maritime mobility (management of maritime traffic, commerce, and navigation), national defense, protection of the marine environment, and other activities identified by the lead agency. The USCG does not have the authority to approve, disapprove, permit, nor in any way authorize the issuance of a lease or associated plans.

4.1.2 USACE

The USACE possesses jurisdiction by Federal law pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403); 33 CFR § 320.2(b), Section 10 of the Rivers and Harbors Act, prohibits the unauthorized obstruction or alteration of any navigable waters of the United States. The construction of any structure in or over any navigable water of the United States, the excavating from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The instrument of authorization is designated a permit. The authority of the Secretary of the Army to prevent obstructions to navigation in navigable waters of the United States was extended to artificial islands, installations, and other devices on the seabed, to the seaward limit of the OCS, by Section 4(f) of the OCSLA of 1953 as amended (43 U.S.C. § 1333(e)). Department of the Army permits are required for the construction of artificial islands, installations, and other devices on the seabed, to the seaward limit of the OCS, pursuant to Section 4(f) of the OCSLA as amended pursuant to 33 CFR § 322.3(b).

Activities BOEM lease holders intend to undertake within the Coos Bay and Brookings WEAs, which involve installing devices on the seabed, require Section 10 Rivers and Harbors Act authorization from the USACE. The USACE anticipates these structures may be permitted by Nationwide Permit No. 5 (Scientific Measurement Devices) or another form of Department of the Army permit authorization.

4.1.3 USFWS

Pursuant to the Fish and Wildlife Coordination Act (FWCA; 16 U.S.C. § 661 *et seq.*), the ESA of 1973, as amended (16 U.S.C. § 1531 *et seq.*), the MBTA (16 U.S.C. §§ 703–712), Bald and Golden Eagle Protection Act (16 U.S.C. § 668), Clean Water Act of 1977 (CWA; 33 U.S.C. § 1251 *et seq.*; 48 Stat. 401), the U.S. Fish and Wildlife Service's (USFWS) principal responsibility is to protect and conserve migratory birds, threatened and endangered species along with their habitat, certain marine mammals, inter-jurisdictional fishes, wetlands, and forests.

Section 7 of the ESA (16 U.S.C. § 1537) requires that Federal agencies shall both "…utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species…" and, "…ensure that any action authorized, funded, or carried out… is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species...which is determined…to be critical…". Federal agencies must consult with the USFWS on projects that could affect any listed species.

Further, the MBTA prohibits the taking, killing, possession, and transportation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Secretary of the Interior. The USFWS provides technical assistance on projects potentially affecting freshwater or marine resources and water quality. In accordance with Section 404(b)(1) of the CWA, the USFWS provides advisory review for wetland protection. The USFWS also provides technical and biological information for use in the NEPA review process. Through these efforts, the USFWS seeks to ensure that impacts on fish and wildlife resources are adequately described, and through NEPA and other governing laws, some of which are noted above, measures are sought to avoid, minimize, or mitigate impacts.

4.1.4 ELK VALLEY RANCHERIA

Consistent with the purposes and intent of NEPA and CEQ regulations (40 CFR Parts 1500-1508), BOEM recognizes the special expertise that federally recognized Tribes posses with respect to potential environmental consequences that could occur as a result of this Proposed Action. BOEM provided notice, via letter dated February 12, 2024, to more than 80 West Coast Tribes of the agency's intent to develop an EA for the Brookings and Coos Bay WEAs. The letter also invited government-to-government consultation, and an invitation to participate as a Cooperating Tribal Nation in development of this EA. Elk Valley Rancheria, California, accepted BOEM's invitation and participated as a Cooperating Tribal Nation.

4.2 PUBLIC INVOLVEMENT

BOEM worked in partnership with the State of Oregon to outreach and involve the public in wind energy planning offshore Oregon starting in 2021. See Section 2.2 for links to previous comment dockets and summary reports.

4.3 CONSULTATION

4.3.1 Endangered Species Act and Marine Mammal Protection 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 on listed species and designated critical habitat under the jurisdiction of the Services.

BOEM concluded ESA consultation with NFMS on the Proposed Action. If the lessee intends to design and conduct biological or other surveys to support offshore renewable energy plans that could interact with ESA-listed species, the surveys must be within the scope of activities described in forthcoming ESA consultations, or the lessee must consult further with BOEM and the Services (NMFS and USFWS). Additional time should be allowed for consultation and/or permits authorizing proposed activities which are outside of the scope of existing consultations/authorizations.

To ensure compliance with the MMPA, per BOEM regulation 30 CFR§ 585.701(b), BOEM requires that lease holders must not conduct any activity under their lease that could result in an incidental taking of marine mammals until the appropriate authorization has been issued under the MMPA of 1972 as amended (16 U.S.C. § 1361 et seq.).

In line with BOEM's regulatory authorities, BMPs apply in Federal waters of the OCS and are intended to minimize or eliminate potential impacts on resources considered in the EA, which include threatened and endangered species and essential fish habitat (**Appendix E**). The wording of these BMPs was modified and additional measures are required for the lessee to comply with the Letter of Concurrence from NFMS. These measures may be updated in the future due to statutory, regulatory, or other consultation processes, including but not limited to consultation under the ESA or the MMPA. BOEM will provide up-to-date information at the pre-survey meeting, during survey plan review, or at another time prior to survey activities as requested by the lessee. At the lessee's option, the lessee, its operators, personnel, and contractors could satisfy these survey requirements related to protected species by complying with the NMFS-approved measures to safeguard protected species that are most current at the time an activity is undertaken, including but not limited to new or updated versions of the ESA consultation, or through new or activity-specific consultations.

4.3.2 Essential Fish Habitat Consultation

The Magnuson-Stevens Fishery Conservation and Management Act (as amended) requires Federal agencies to consult with NMFS regarding actions that could adversely affect designated EFH, and this consultation is complete. The assessment herein relied on formal EFH descriptions for managed species provided by the PFMC (PFMC 2022b; 2022c; 2023b; 2023c). BOEM combined the consultation for fishes and invertebrates listed under the ESA with the EFH consultation and communicated with the NMFS Oregon Coastal Office regarding ESA-listed species.

4.3.3 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, surveys, and site assessment activities (including the construction/installation, operation, maintenance, and decommissioning of wind energy research buoys) in the Oregon WEAs is consistent to the maximum extent practicable with the provisions identified as enforceable by the Coastal Zone Management Program of the State of Oregon.

Concurrence is needed prior to lease issuance and is issued by the Oregon Coastal Management Program (OCMP), which follows a networked model that consists of multiple agencies with authority in the coastal zone. The OCMP is led by the Oregon Department of Land Conservation and Development (DLCD) and comprised of several Federal agencies, 10 state agencies, 33 cities, and 7 counties that have enforceable policies that complete the program, plus four coastal Tribes that are critical partners. In preparation of the CD and to facilitate the Federal consistency review process, BOEM consulted regularly with OCMP agencies, including working directly with Oregon DLCD, and working through DLCD, to collaborate with other agencies such as the ODFW.

A Letter of Concurrence with Conditions was sent from DLCD to the BOEM Pacific Regional Director on July 17, 2024. BMPs described in this EA apply on (or above) the OCS and are intended to minimize or eliminate potential impacts on resources considered in the EA (**Appendix E**), which included some resources under consideration for coastal consistency. The wording of these BMPs was modified and additional measures are listed in this Letter of Concurrence with Conditions from DLCD.

4.3.4 National Historic Preservation Act

Section 106 of the NHPA (16 U.S.C. § 470f) 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 (ACHP) an opportunity to comment. BOEM determined that issuing commercial leases within the Oregon WEAs and granting ROWs and RUEs constitutes an undertaking subject to Section 106 of the NHPA (54 U.S.C. § 306108) and its implementing regulations (36 CFR § 800).

A letter was sent to 14 federally recognized Tribes on February 12, 2024, that provided advanced notice of the Oregon EA and invited them to be Cooperating Tribal Nations on the EA and as a consulting party for Section 106 of the NHPA. BOEM further identified potential consulting parties pursuant to 36 CFR § 800.3(f), shared the list of parties with Oregon State Historic Preservation Office (SHPO) on February 7, 2024, and sent invitations to be a consulting party on February 15, 2024. The letter to these parties, which included certified local governments, historical preservation societies, and museums, 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 drafted a *Finding of No Historic Properties Affected for the Issuance of a Commercial Lease for Coos Bay and Brookings WEAs on the Outer Continental Shelf Offshore Oregon* (Finding) and shared it with consulting parties for a 45-day preliminary review from April 30 to June 14, 2024. After revising the Area of Potential Effect (APE) based on comments received from Coquille Indian Tribe, BOEM re-shared the Finding for a standard 30-day review from June 21 to July 21, 2024. BOEM received concurrence on the Finding from Oregon SHPO in a letter dated July 23, 2024. The Finding with appendices can be found on BOEM's website for the Oregon EA.

In addition, BOEM is consulting on a draft Programmatic Agreement (PA) 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 Oregon. The PA is still under consultation and BOEM returned the latest revised draft to the consulting parties for their review on June 27, 2024.

4.3.5 Tribal Coordination and Government-to-Government Consultations with Federally Recognized Tribal Nations

BOEM recognizes the unique legal relationship of the United States with Tribal Nations. BOEM has a Trust responsibility and is required to consult with federally recognized Tribes if a BOEM action has Tribal implications, which are defined as any departmental regulation, rulemaking, policy, guidance, legislative proposal, grant funding formula changes, or operational activity that could have substantial direct effect on a federally recognized Tribe. Federal agencies are directed to consult with Tribes through multiple laws and E.O.s. The NHPA requires Federal agencies to consult with any Indian Tribe that attaches religious and cultural significance to historic properties that could be affected by a Federal undertaking and take those potential effects into account in their decision making. Several E.O.s direct action: Federal Agencies for Tribal Coordination, E.O. 3007 (1996) directs Federal agencies to accommodate access to and avoid damage to sacred sites. E.O. 13175 (2009) emphasizes the importance of strengthening government-to-government relationships with Native American Tribes. In 2010, the United States announced support for the United Nations Declaration on the Rights of Indigenous Peoples, which addresses Indigenous Peoples' rights to maintain culture, traditions, ceremonies, and to maintain spiritual connections to traditionally owned lands.

In recognition of this special relationship, BOEM extended invitations to more than 80 West Coast Tribal Nations for government-to-government consultation and invited those Tribes to participate as Cooperating Tribal Nations (cooperating agencies) in this EA. BOEM responded to consultation requests from Tribes regarding offshore wind energy with in-person, government-to-government meetings in April and July 2024. April meetings were held in northern California with four federally recognized Tribes. Discussion topics in northern California included the process of lease planning, NEPA updates on the Oregon EA, opposition to offshore wind, continued engagement, and other concerns. July consultations were held in Oregon following the public comment period on the Draft EA. Oregon discussions focused on wind lease planning and concerns about the Oregon EA and included a meeting with five tribes together as well as individual consultations with four Tribes. Eight Tribes sent comment letters to BOEM about the Draft EA, and these comments were considered for the Final EA as they apply to the current Proposed Action (see Appendix B).

5 List of Preparers and Reviewers

Name	Role
David Ball, Erin Boydston, Abigail Ryder	Tribes and Tribal Resources
Desray Reeb, Ingrid Biedron	Marine Mammals and Sea Turtles
Donna Schroeder, Deanna Meier	Marine and Coastal Habitats and Associated Biotic Assemblages
David Pereksta	Coastal and Marine Birds and Bats
Ingrid Biedron, Marina Chaji	Commercial Fishing
Stephanie Webb, Marina Chaji	Socioeconomics, Recreation, and Tourism
Erick Huchzermeyer	Geology, Geophysical, Geotechnical
Katsumi Keeler, Alice Kojima-Clarke	Air Quality, Environmental Justice
Bert Ho, Jeneva Wright	Historic Properties
Linette Makua, Melanie Hunter	NEPA Coordination
Abigail Ryder	Public Outreach Coordination
Lisa Gilbane	Project Supervisor
Matt Blazek	Vessel Traffic, Navigation
Erin Boydston, Natalie Dayal, Jennifer Rose	Technical Editing

6 References

Allen LG, Pondella II DJ, Horn MH, editors. 2006. The ecology of marine fishes: California and adjacent waters. 1st ed. Berkeley (CA): University of California Press. 660 p.

Baker K, Howson U. 2021. Data collection and site survey activities for renewable energy on the Atlantic Outer Continental Shelf: biological assessment. U.S. Department of the Interior. 152 p.

Bang J, Ma C, Tarantino E, Vela A, Yamane D. 2019. Life cycle assessment of greenhouse gas emissions for floating offshore wind energy in California. University of California Santa Barbara Bren School of Environmental Science & Management. p. 68. [accessed 2024 Jul 2]. https://tethys.pnnl.gov/sites/default/files/publications/Bang-2019-Floating-Wind-LCA.pdf.

Bartol SM, Ketten DR. 2006. Turtle and tuna hearing. In: Swimmer Y, Brill R, editors. Sea turtle and pelagic fish sensory biology: developing techniques to reduce sea turtle bycatch in longline fisheries. Report No.: NOAA-TM-NMFS-PIFSC-7. ed. Honolulu (HI): U.S. Department of Commerce, National Oceanographic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center. p. 98–105.

Bartol SM, Musick JA, Lenhardt ML. 1999. Auditory evoked potentials of the loggerhead sea turtle (*Caretta caretta*). Copeia. 1999(3):836–840. doi:10.2307/1447625.

Benjamins S, Harnois V, Smith H, Johanning L, Greenhill L, Carter C, Wilson B. 2014. Understanding the potential for marine megafauna entanglement risk from renewable marine energy developments. Perth (United Kingdom): Scottish Natural Heritage. 95 p. Report No.: 791.

Black A. 2005. Light induced seabird mortality on vessels operating in the Southern Ocean: incidents and mitigation measures. Antarctic Science. 17(1):67-68.

BLM. 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. Los Angeles (CA): U.S. Department of the Interior, Bureau of Land Management, Pacific Outer Continental Shelf Office. 750 p.

BOEM. 2014. Atlantic OCS proposed geological and geophysical activities Mid-Atlantic and South Atlantic planning areas: Final programmatic environmental impact statement. New Orleans (LA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 3 vols. 788 p.

BOEM. 2015. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina: Revised Environmental Assessment. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 353 p. Report No.: OCS EIS/EA BOEM 2015-038.

BOEM. 2020. Guidelines for providing geophysical, geotechnical, and geohazard information pursuant to 30 CFR Part 585. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 32 p.

BOEM. 2022a. Commercial wind lease and grant issuance, and site assessment activities on the Pacific Outer Continental Shelf Humboldt Wind Energy Area, California. Environmental Assessment. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 90 p. Report No.: OCS EIS/EA BOEM 2022-026.

BOEM. 2022b. Commercial wind lease and grant issuance, and site assessment activities on the Pacific Outer Continental Shelf Morro Bay Wind Energy Area, California. Environmental Assessment. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 101 p. Report No.: OCS EIS/EA BOEM 2022-024.

BOEM. 2022c. Offshore Wind Lease Issuance, Site Characterization, and Site Assessment: Central and Northern California. Biological Assessment, Endangered and Threatened Species, and Essential Fish Habitat Assessment. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 113 p.

BOEM. 2023a. Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585. Washington (DC): Bureau of Ocean Energy Management, Renewable Energy Programs. 30 p.

BOEM. 2023b. Oregon offshore wind visual simulation. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management; [accessed 2024 Jul 15]. https://www.boem.gov/renewable-energy/state-activities/oregon-offshore-wind-visual-simulation.

Brown CA, Nelson WG. 2015. A method to identify estuarine water quality exceedances associated with ocean conditions. Environmental Monitoring and Assessment. 187(3). doi:10.1007/s10661-015-4347-3.

Bureau of Economic Analysis. 2024. Bureau of Economic Analysis. U.S. Department of Commerce, Bureau of Economic Analysis; [accessed 2024 Jul 8].

Calambokidis J, Kratofil MA, Palacios DM, Lagerquist BA, Schorr GS, Hanson MB, Baird RW, Forney KA, Becker EA, Rockwood RC, Hazen EL. 2024. Biologically Important Areas II for cetaceans within U.S. and adjacent waters - West Coast Region. Frontiers in Marine Science. 11:1283231. doi:10.3389/fmars.2024.1283231.

Carlson P, Nelson C. 1969. Sediments and sedimentary structures of Astoria Canyon-Fan system. Journal of Sedimentary Petrology. 39(4):1269–1282.

Carlton J, Jossart JA, Pendleton F, Sumait N, Miller J, Thurston-Keller J, Reeb D, Gilbane L, Pereksta D, Schroeder D, Morris Jr JA. 2024. A wind energy area siting analysis for the Oregon Call Areas. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 237 p. Report No.: BOEM 2024-015.

Carretta JV, Oleson EM, Forney KA, Weller DW, Lang AR, Baker J, Orr AJ, Hanson B, Barlow J, Moore JE, Wallen M, et al. 2023. U.S. Pacific marine mammal stock assessments: 2022. La Jolla (CA): U.S. Department of Commerce. Report No.: NMFS-SWFSC-684.

CEQ. 1997. Environmental justice guidance under the National Environmental Policy Act. Washington (DC): 40 p.

CEQ. 2022. Climate and Economic Justice Screening Tool, version 1.0. Council on Environmental Quality. [accessed 2024 Jul 3]. https://screeningtool.geoplatform.gov/.

Chaji M, Werner S. 2023. Economic impacts of offshore wind farms on fishing industries: perspectives, methods, and knowledge gaps. Marine and Coastal Fisheries. 15(3). doi:10.1002/mcf2.10237.

Clark J, Mitrovica J, Alder J. 2014. Coastal paleogeography of the California—Oregon—Washington and Bering Sea continental shelves during the latest Pleistocene and Holocene: Implications for the Archaeological Record. Journal of Archaeological Science. 52:12–23.

Cochrane GR, Hemery LG, Henkel SK. 2017. Oregon OCS seafloor mapping: Selected lease blocks relevant to renewable energy. 51 p. Report No.: U.S. Geological Survey Open-File Report 2017-1045 and Bureau of Ocean Energy Management OCS Study BOEM 2017-018.

Conrad JE, Rudebusch JA. 2023. Methane seeps derived from water-column acoustic backscatter data collected along Cascadia margin offshore Oregon and Northern California, 2018-2021. U.S. Geological Survey Data Release. doi:10.5066/P9TW2X7Y.

Coquille Indian Tribe. 2024. Our Lands. North Bend (OR): Coquille Indian Tribe; [accessed 2024 Jul 17]. https://www.coquilletribe.org/our-lands/.

Crescent City Harbor District. 2018. Crescent City Harbor District Strategic Plan 2018-2028. Crescent City (CA): 21 p.

Crocker SE, Fratantonio FD. 2016. Characteristics of sounds emitted during high-resolution marine geophysical surveys. Herndon (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 266 p. Report No.: OCS Study BOEM 2016-044, NUWC-NPT Technical Report 12,203.

CTCLUSI. 2020. Confederated Tribes of Coos, Lower Umpqua & Siuslaw Indians *Q'alya Ta Kukwis Shichdii Me* Our Traditional Cultural Property application to the National Register of Historic Places FAQ's. Coos Bay (OR): Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians; [accessed 2024 Jul 7]. https://ctclusi.org/wp-content/uploads/2020/11/CTCLUSI-FAQs.pdf.

CTCLUSI. 2024. History--A Brief History of the Coos, Lower Umpqua & Siuslaw Indians. Coos Bay (OR): Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians; [accessed 2024 Jul 10]. https://ctclusi.org/history/.

CTSI. 2024. Our Heritage. Siletz (OR): Confederated Tribes of Siletz Indians. https://ctsi.nsn.us/heritage/.

Dooling RJ, Lohr B, Dent ML. 2000. Hearing in birds and reptiles. In: Dooling R, Fay RR, Popper AN, editors. Comparative hearing: birds and reptiles. Springer Handbook of Auditory Research, vol. 13. New York (NY): Springer. p. 308-359.

eBird. 2024. Oregon. [accessed 2024 Jul 10]. https://ebird.org/region/US-OR/partners/marine.

Efroymson RA, Rose WH, Nemeth S, Suter II GW. 2000. Ecological risk assessment framework for low-altitude overflights by fixed-wing and rotary-wing military aircraft. Oak Ridge (TN): Oak Ridge National Laboratory. 116 p. Report No.: ORNL/TM-2000/289.

EPA. 2016. Technical guidance for assessing environmental justice in regulatory analysis. Washington (DC): 120 p.

EPA. 2022. Global greenhouse gas overview. Environmental Protection Agency; [accessed 2023 Mar 26]. https://www.epa.gov/ghgemissions/global-greenhouse-gas-overview.

EPA. 2024. EJScreen. U.S. Environmental Protection Agency. [accessed 2024 Jul 2]. https://ejscreen.epa.gov/mapper/.

Erbe C, McPherson C. 2017. Underwater noise from geotechnical drilling and standard penetration testing. Journal of the Acoustical Society of America. 142(3):EL281. doi:10.1121/1.5003328.

Frawley T, Muhling B, Brodie S, Fisher M, Tommasi D, Le Fol G, Hazen E, Stohs S, Finkbeiner E, Jacox M. 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.

Gibbs J. 1991. Pacific Graveyard. Hillsboro (OR): Binford and Mort Publishing.

Goldfinger C, Henkel SK, Romsos C, Havron A, Black B. 2014. Benthic habitat characterization offshore the Pacific Northwest, vol. 1: Evaluation of continental shelf geology. Pacific OCS Region: U.S. Department of the Interior, Bureau of Ocean Energy Management. 161 p.

Hansen KA, Hernandez A, Mooney TA, Rasmussen MH, Sorensen K, Wahlberg M. 2020. The common murre (*Uria aalge*), an auk seabird, reacts to underwater sound. Journal of the Acoustical Society of America. 147(6):4069. doi:10.1121/10.0001400.

Hansen KA, Maxwell A, Siebert U, Larsen ON, Wahlberg M. 2017. Great cormorants (*Phalacrocorax carbo*) can detect auditory cues while diving. The Science of Nature. 104(5-6):45. doi:10.1007/s00114-017-1467-3.

Harnois V, Smith HCM, Benjamins S, Johanning L. 2015. Assessment of entanglement risk to marine megafauna due to offshore renewable energy mooring systems. International Journal of Marine Energy. 11:27-49. doi:10.1016/j.ijome.2015.04.001.

Henkel S, Gilbane L, Phillips A, Gillett D. 2020. Cross-shelf habitat suitability modeling for benthic macrofauna. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific Outer Continental Shelf Region. 71 p. Report No.: OCS Study BOEM 2020-008.

Hill JC, Watt JT, Brothers DS. 2022. Mass wasting along the Cascadia subduction zone: Implications for abyssal turbidite sources and the earthquake record. Earth and Planetary Science Letters. 597. doi:10.1016/j.epsl.2022.117797.

Hogan F, Hooker B, Jensen B, Johnston L, Lipsky A, Methratta E, Sliva A, Hawkins A. 2023. Fisheries and offshore wind interactions: synthesis of science. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 382 p. Report No.: NOAA Technical Memorandum NMFS-NE-291.

Humboldt Bay Harbor. 2023. Notice of Preparation of Draft Environmental Impact Report. Humboldt Bay Harbor, Recreation and Conservation District.

ICF International, Southeastern Archaeological Research, Davis Geoarchaeological Research. 2013. Inventory and analysis of coastal and submerged archaeological site occurrence on the Pacific Outer Continental Shelf. : U.S. Department of the Interior, Bureau of Ocean Energy Management. 366 p. Report No.: OCS Study BOEM 2013-0115. . Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 366 p. Report No.: OCS Study BOEM 2013-0115.

Industrial Economics, Inc. 2012. Identification of Outer Continental Shelf renewable energy space-use conflicts and analysis of potential mitigation measures. Herndon (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 414 p.

International Whaling Commission. 2016. Report of the Working Group on non-deliberate human-induced mortality of cetaceans. Journal of Cetacean Research and Management. 17:1-92.

Jenkins DL, Davis LG, Stafford TW, Campos PF, Hockett B, Jones GT, Cummings LS, Yost C, Connolly TJ, Yohe RM, Gibbons SC, et al. 2012. Clovis Age western stemmed projectile points and human coprolites at the Paisley Caves. Science. 337(6091):223-228. doi:doi:10.1126/science.1218443.

Kaplan B, Beegle-Krause C, French McCay D, Copping A, Geerlofs S. 2010. Updated summary of knowledge: selected areas of the Pacific Coast. Camarillo (CA): U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific Outer Continental Shelf Region. 939 p. Report No.: OCS Study BOEMRE 2010-014.

Kennicutt MC, Brooks JM, Bidigare RR, McDonald SJ, Adkison DL, Macko SA. 1989. An upper slope “cold” seep community: Northern California. Limnology and Oceanography. 34(3):635-640.

Komenda-Zehnder S, Cevallos M, Bruderer B. 2003. Effects of disturbance by aircraft overflight on waterbirds–an experimental approach. In: Proceedings International Bird Strike Committee May; May 5–9, 2003; Warsaw (Poland).

Kushlan JA, Steinkamp MJ, Parsons KC, Capp J, Cruz MA, Coulter M, Davidson I, Dickson L, Edelson N, Elliot R, Erwin M, et al. 2002. Waterbird conservation for the Americas: The North American waterbird conservation plan, version 1. Waterbird conservation for the Americas. Washington (DC): Waterbird Conservation for the Americas. 78 p.

Lacroix DL, Lanctot RB, Reed JA, McDonald TL. 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.

Laist DW. 1987. Overview of the biological effects of lost and discarded plastic debris in the marine environment. Marine Pollution Bulletin. 18(6):319-326.

Lenhardt M. 2002. Sea turtle auditory behavior. The Journal of the Acoustical Society of America. 112(5):2314–2319. doi:10.1121/1.1526585.

Lenhardt ML. 1994. Seismic and very low frequency sound induced behaviors in captive loggerhead marine turtles (*Caretta caretta*). In: Fourteenth Annual Symposium on Sea Turtle Biology and Conservation; 1994 Mar 1–5; Hilton Head (SC). p 238–241.

Lenz BL, Sawyer DE, Phrampus B, Davenport K, Long A. 2018. Seismic imaging of seafloor deformation induced by impact from large submarine landslide blocks, offshore Oregon. Geosciences. 9(1):10.

Love GW. 2013. Whales pulled my chain. [accessed 2023 Sep 16]. https://www.youtube.com/watch?v=MtnK3DHJOaI.

Lovell S, Hilger J, Rollins E, Olsen N, Steinback S. 2020. The economic contribution of marine angler expenditures on fishing trips in the United States, 2017. U.S. Department of Commerce, NOAA Technical Memorandum. 80 p. Report No.: NMFS-F/SPO-201.

MacDonald M. 2022. Coos Bay offshore wind port infrastructure study. Final Report to TotalEnergies SBE US. Beaverton (OR): TotalEnergies SBE US. 51 p.

McAdoo B, Pratson L, Orange D. 2000. Submarine landslide geomorphology, US continental slope. Marine Geology. 169(1-2):103-136.

Merle SG, Embley RW, Johnson HP, Lau TK, Phrampus BJ, Raineault NA, Gee LJ. 2021. Distribution of methane plumes on Cascadia Margin and implications for the landward limit of methane hydrate stability. Frontiers in Earth Science. 9. doi:10.3389/feart.2021.531714.

Meyer-Gutbrod EL, Greene CH, Davies KTA, Johns DG. 2021. Ocean regime shift is driving collapse of the North Atlantic right whale population. Oceanography. 34(3):22–31. doi:10.5670/oceanog.2021.308.

MMS. 2007a. Programmatic Environmental Impact Statement for alternative energy development and production and alternate use of facilities on the Outer Continental Shelf, Final Environmental Impact Statement. 4 vols. Washington (DC): U.S. Department of the Interior, Minerals Management Service. Report No.: OCS EIS/EA MMS 2007-046.

MMS. 2007b. Gulf of Mexico OCS oil and gas lease sales: 2007-2012. Western Planning Area sales 204, 207, 210, 215, and 218; Central Planning Area sales 205, 206, 208, 213, 216, and 222. Final environmental impact statement. New Orleans (LA): U.S. Department of the Interior, Minerals Management Service. 1095 p. Report No.: OCS EIS/EA MMS 2007-018.

Montevecchi WA. 2006. Influences of artificial light on marine birds. In: Rich C, Longcore T, editors. Ecological consequences of artificial night lighting. Island Press. p. 94-113.

Montevecchi WA, Wiese F, Davoren G, Diamond A, Huettmann F, Linke J. 1999. Seabird attraction to offshore platforms and seabird monitoring from offshore support vessels and other ships: literature review and monitoring designs. Calgary (Canada): 56 p. Report No.: 138.

Musial W, Spitsen P, Duffy P, Beiter P, Shields M, Mulas Hernando D, Hammond R, Marquis M, King J, Sathish S. 2023. Offshore wind market report: 2023 edition. Golden (CO): U.S. Department of Energy, National Renewable Energy Laboratory. 121 p. Report No.: NREL/TP-5000-87232.

National Data Buoy Center. 2008. Moored buoy program. Stennis Space Center (MS): National Oceanic and Atmospheric Administration; [accessed 2022 Aug 1]. https://webarchive.library.unt.edu/web/20130214041406/http://www.ndbc.noaa.gov/mooredbuoy.shtml.

National Data Buoy Center. 2012. Moored buoy program. Stennis Space Center (MS): National Oceanic and Atmospheric Administration; [accessed 2022 Aug 3]. https://www.ndbc.noaa.gov/faq/hull.shtml.

Native News Online. 2023. Three California Tribal Nations Declare First U.S. Indigenous Marine Stewardship Area. Indian Country Media LLC (ICM). https://nativenewsonline.net/environment/three-california-tribal-nations-declare-first-u-s-indigenous-marine-stewardship-area.

NMFS. 2012. Endangered and threatened wildlife and plants: final rule to revise the critical habitat designation for the endangered leatherback sea turtle. Federal Register. 77(4170):4170-4201.

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. Silver Spring (MD): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 189 p. Report No.: NOAA Technical Memorandum NMFS-OPR-55.

NMFS. 2017. Fishing gear: fish aggregating devices. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service; [accessed 2024 Jul 1].

NMFS. 2018. 2018 revision 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. Silver Spring (MD): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. 178 p. Report No.: NOAA Technical Memorandum NMFS-OPR-59.

NMFS. 2021. Endangered and threatened wildlife and plants: designating critical habitat for the Central America, Mexico, and Western North Pacific distinct population segments of humpback whales. Federal Register. 86(21082):21082-21157.

NMFS. 2024. Fisheries economics of the United States 2022. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 28 p. Report No.: NOAA Technical Memorandum NMFS-F/SPO-248.

NMFS, USFWS. 2020a. Endangered Species Act status review of the leatherback turtle (*Dermochelys coriacea*). Silver Springs (MD): National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources; U.S. Fish and Wildlife Service. 396 p.

NMFS, USFWS. 2020b. Loggerhead Sea Turtle (*Caretta caretta*) 5-Year Review: Summary and Evaluation. Silver Spring (MD): National Oceanic and Atmospheric Administration, National Marine Fisheries Service; U.S. Fish and Wildlife Service. 65 p.

NOAA. 2015. National Saltwater Recreational Fisheries Policy. [accessed 2023 September 13]. https://www.fisheries.noaa.gov/national/recreational-fishing/national-saltwater-recreational-fisheries-policy.

NOAA. 2022. ENOW Explorer. Silver Spring (MD): National Oceanic and Atmospheric Administration, Office for Coastal Management; [accessed 2024 Jul 15]. https://coast.noaa.gov/enowexplorer/.

NOAA Fisheries. 2023. Marine mammal stock assessments. Silver Spring (MD): National Oceanic and Atmospheric Administration, National Marine Fisheries Service; [accessed 2024 Jul 17]. https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments.

NOAA Fisheries. 2024a. Oregon Dungeness Crab Pot Fishery—MMPA List of Fisheries. Silver Spring (MD): National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources; [accessed 2024 Jun 27]. https://www.fisheries.noaa.gov/national/marine-mammal-protection/oregon-dungeness-crab-pot-fishery-mmpa-list-fisheries.

NOAA Fisheries. 2024b. WA Coastal Dungeness Crab Pot Fishery—MMPA List of Fisheries. Silver Spring (MD): National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources; [accessed 2024 Jun 27]. https://www.fisheries.noaa.gov/national/marine-mammal-protection/wa-coastal-dungeness-crab-pot-fishery-mmpa-list-fisheries.

NOAA Fisheries. 2024c. Pacific whiting. Silver Spring (MD): National Oceanic and Atmospheric Administration, National Marine Fisheries Service; [accessed 2024 Jul 1]. https://www.fisheries.noaa.gov/species/pacific-whiting.

NOAA Fisheries Office of Science and Technology. 2024. Commercial landings query. Silver Spring (MD): National Oceanic and Atmospheric Administration, National Marine Fisheries Service. [accessed 2024 Jul 1]. https://www.fisheries.noaa.gov/foss/f?p=215:7:3400363546327.

Oregon Department of Fish & Wildlife. 2024. Fishing report - marine zone. [accessed 2024 Jul 2]. https://myodfw.com/recreation-report/fishing-report/marine-zone#Bottomfish-%E2%80%8C.

Oregon State Marine Board. 2024. Boater info: opportunities and access report. Salem (OR): State of Oregon, Oregon State Marine Board; [accessed 2024 Jul 11]. https://www.oregon.gov/osmb/boater-info/pages/opportunities-and-access.aspx.

OSU (Oregon State University). c2024. Port Orford Field Station. [accessed 2024 Jul 7]. https://portorfordfieldstation.oregonstate.edu/about.

PacFIN (Pacific Fisheries Information Network). 2024. ALL001 - Species Report: Commercial Landed Catch: Metric-Tons (mt), Revenue, and Price-per-pound (Price/lbs). [accessed 2024 Jul 2]. https://reports.psmfc.org/pacfin/f?p=501:1:11100457674544:INITIAL.

Peltier WR, Fairbanks RG. 2006. Global glacial ice volume and Last Glacial Maximum duration from an extended Barbados sea level record. Quaternary Science Reviews. 25(23-24):3322-3337.

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. Portland (OR): 90 p.

PFMC. 2020. Pacific Coast Groundfish Fishery management plan for the California Oregon, and Washington groundfish fishery. Portland (OR): 147 p.

PFMC. 2022a. Status of the U.S. West Coast Fisheries for Highly Migratory Species through 2021. Portland (OR): Pacific Fisheries Management Council.

PFMC. 2022b. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington groundfish fishery Portland (OR): Pacific Fisheries Management Council. 147 p.

PFMC. 2022c. Pacific Coast Salmon Fishery Management Plan for commercial and recreational salmon fisheries off the Coasts of Washington, Oregon, and California as revised through Amendment 23. Portland (OR): Pacific Fisheries Management Council. 84 p.

PFMC. 2023a. Review of 2022 Ocean Salmon Fisheries: Stock assessment and fishery evaluation document for the Pacific Coast Salmon Fishery Management Plan. 356 p.

PFMC. 2023b. Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species as amended through Amendment 7. 86 p.

PFMC. 2023c. Coastal Pelagic Species Fishery Management Plan as amended through Amendment 20. 53 p.

Pierce KE, Harris RJ, Larned LS, Pokras MA. 2004. Obstruction and starvation associated with plastic ingestion in a Northern Gannet *Morus bassanus* and a Greater Shearwater *Puffinus gravis*. Marine Ornithology. 32:187-189.

PNNL. 2019. California LiDAR buoy deployment: Biological Assessment / Essential Fish Habitat Assessment. Richland (WA): U.S. Department of Energy, Pacific Northwest Site Office. 39 p.

Port of Alsea. 2024. Port of Alsea. [accessed 2024 Jul 10]. https://www.portofalsea.com/.

Port of Bandon. 2024. Welcome to the Port of Bandon. [accessed 2024 Jul 10]. https://www.portofbandon.com/welcome-to-the-port-of-bandon.

Port of Brookings Harbor. 2024. Port of Brookings Harbor. [accessed 2024 Jul 9]. https://www.portofbrookingsharbor.com/about-us.html.

Port of Coos Bay. 2024. Port of Coos Bay. “Our Crew". [accessed 2024 Jul 9]. https://www.portofcoosbay.com/our-crew.

Port of Newport. 2024. Port of Newport. [accessed 2024 Jul 9]. https://www.portofnewport.com/port-of-newport.

Port of Port Orford. 2024. Port of Port Orford. [accessed 2024 Jul 9]. https://portofportorford.org/.

Raghavan M, Steinrücken M, Harris K, Schiffels S, Rasmussen S, DeGiorgio M, Albrechtsen A, Valdiosera C, Ávila-Arcos M, Malaspinas A, Eriksson A. 2015. Genomic evidence for the Pleistocene and recent population history of Native Americans. Science. 349(6250):aab3884. doi:10.1126/science.aab3884.

RecFIN (Recreational Fisheries Information Network). 2024. Report CEE001 effort estimates. Reports dashboard.

Richards S. 2012. Whale in a tangle with visiting yacht's mooring. [accessed September 16, 2023].

Richardson WJ, Greene Jr. CR, Malme CI, Thomson DH. 1995. Marine mammals and noise. San Diego (CA): Academic Press Inc. 576 p.

Ridgway SH, Wever EG, McCormick JG, Palin J, Anderson JH. 1969. Hearing in the giant sea turtle, *Chelonia mydas*. PNAS. 64(3):884–890. doi:10.1073/pnas.64.3.884.

Rockwood RC, Calambokidis J, Jahncke J. 2017. High mortality of blue, humpback and fin whales from modeling of vessel collisions on the U.S. West Coast suggests population impacts and insufficient protection. PLOS ONE. 12(8):e0183052. doi:10.1371/journal.pone.0183052.

Romsos CG, Goldfinger C, Robison R, Milstein RL, Chaytor JD, Wakefield WW. 2007. Development of a regional seafloor surficial geologic habitat map for the continental margins of Oregon and Washington, USA. In: Todd B, Greene H, editors. Mapping the seafloor for habitat characterization. Geological Association of Canada. Special Paper 47; p. 219-243.

Ruppel CD, Weber TC, Staaterman ER, Labak SJ, Hart PE. 2022. Categorizing active marine acoustic sources based on their potential to affect marine animals. Journal of Marine Science and Engineering. 10(9):1278. doi:10.3390/jmse10091278.

Ryan JP, Fischer AM, Kudela RM, Gower JFR, King SA, Marin R, Chavez FP. 2009. Influences of upwelling and downwelling winds on red tide bloom dynamics in Monterey Bay, California. Continental Shelf Research. 29(5-6):785-795. doi:10.1016/j.csr.2008.11.006.

Saez L, Lawson D, DeAngelis M. 2021. Large whale entanglements off the U.S. West Coast, from 1982-2017. Silver Spring (MD): National Oceanic and Atmospheric Administration, U.S. Office of Protected Resources. 50 p. Report No.: NOAA-TM-NMFS-OPR-63A.

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

Seminoff JA, C.D. Allen, G.H. Balazs, P.H. Dutton, T. Eguchi, H.L. Hass, S.A. Hargrove, M. Jensen, D.L. Klemm, A.M. Lauritsen, S.L. MacPherson, P. Opay, E.E. Possardt, S. Pultz, E. Seney, K.S. Van Houtan, and R.S. Waples. 2015. Status review of the green turtle (*Chelonia mydas*) under the U.S. Endangered Species Act. Report No.: NOAA-TM-NMFS-SWFSC-539.

Shipley TH, Houston MH, Buffler RT, Shaub FJ, Mcmillen KJ, LAOD JW, Worzel JL. 1979. Seismic evidence for widespread possible gas hydrate horizons on continental slopes and rises. AAPG bulletin. 63(12):2204-2213.

Smith T, Masterson S. 2013. Bridging the gaps – community food assessment, Coos County. Portland (OR): Oregon Food Bank; [accessed 2023 Sep 11]. https://ofbportals.oregonfoodbank.org/home/partner_support/partner_support/community_food_systems/communityfoodassessments.

Southall BL. 2005. Final Report of the 2004 NOAA International Symposium: Shipping noise and marine mammals. Arlington (VA): National Oceanic and Atmospheric Administration. 40 p.

State of Oregon Employment Department. 2022. Oregon labor force participation rates by county, 2021. Salem (OR): State of Oregon, Employment Department; [accessed 2023 Sep 12]. https://www.qualityinfo.org/-/oregon-labor-force-participation-rates-by-county-2021.

State of Oregon Employment Department. 2024. Southwestern Oregon. Salem (OR): State of Oregon, Employment Department; [accessed 2024 Jul 12]. https://www.qualityinfo.org/southwestern-oregon.

Stemp R. 1985. Observations on the effects of seismic exploration on seabirds. In: Greene G, Englehardt F, Paterson R, editors. Workshop on the Effects of Explosives Use in the Marine Environment; 1985 Jan 26–31; Halifax (Canada). Canadian Oil and Gas Lands Administration Environmental Protection Branch. 16 p.

Sydeman WJ, Poloczanska E, Reed TE, Thompson SA. 2015. Climate change and marine vertebrates. Science: Oceans and Climate. 350(6262):772-777.

Tajalli Bakhsh T, Monim M, Simpson K, Lapierre T, Dahl J, Rowe J, Spaulding M, Group] R. 2020. Potential Earthquake, landsilde, tsunami and geohazards for the U.S. Offshore Pacific Wind Farms Camarillo (CA): U.S. Department of the Interior, Bureau of Safety and Environmental Enforcement (BSEE), and Bureau of Ocean Energy Management. Report No.: BOEM/BSEE E17PS00128.

Tetra Tech EC Inc. 2010. Garden State offshore energy project plan for the deployment and operation of a meteorological data collection buoy within interim lease site, Block 7033. Prepared for Deepwater Wind, LLC.

Tetra Tech EC Inc. 2015. USCG final environmental impact statement for the Port Ambrose Project deepwater port application, vol I and II. Washington (DC): U.S. Coast Guard, Vessel and Facility Operating Standards. 549 p. Report No.: USCG-2013-0363.

The White House. 2021. Fact sheet: Biden Administration jumpstarts offshore wind energy projects to create jobs. Washington (DC): [accessed 2024 Jul 8]. https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/29/fact-sheet-biden-administration-jumpstarts-offshore-wind-energy-projects-to-create-jobs/.

Tiller VEV. 2015. Tiller's Guide to Indian Country, 3rd Edition Albuquerque (NM): BowArrow Publishing Company.

Tissot BN, Wakefield WW, Hixon MA, Clemons JE. 2008. Twenty years of fish-habitat studies on Heceta Bank, Oregon. In: Reynolds JR, Greene HG, editors. Marine Habitat Mapping Technology for Alaska. Fairbanks (AK): Alaska Sea Grant College Program, University of Alaska Fairbanks. p. 203-217.

Tolowa. 2016. The Acquisition of Xaa-wan'-k'wvt. Tolowa Dee-ni` Nation (CA): The Tolowa Dee-ni` Nation; [accessed 2024 Jul 15]. https://www.tolowa-nsn.gov/247/The-Acquisition-of-Xaa-wan-kwvt.

Tolowa. 2024a. Enterprises. Tolowa Dee-ni` Nation (CA): The Tolowa Dee-ni` Nation; [accessed 2024 Jul 15]. https://www.tolowa-nsn.gov/101/Enterprises.

Tolowa. 2024b. Our Lands. Tolowa Dee-ni` Nation (CA): The Tolowa Dee-ni` Nation; [accessed 2024 Jul 8]. https://www.tolowa-nsn.gov/246/OUR-LANDS.

Travel Curry Coast. 2024. Welcome to the Southern Oregon Coast. Gold Beach (OR): Travel Curry Coast Tourism; [accessed 2024 Jul 15]. https://www.travelcurrycoast.com/.

Trowbridge M, Lim J, Phillips S. 2022. Port of Coos Bay Port, port infrastructure assessment for offshore wind development. U.S. Department of the Interior, Bureau of Ocean Energy Management. 91 p. Report No.: OCS Study BOEM 2022-073.

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

U.S. Bureau of Labor Statistics. 2022. Quarterly Census of Employment and Wages: Employment and Wages Data Viewer. Data Tools. Washington (DC): U.S. Bureau of Labor Statistics; [accessed 2024 Jul 8]. https://data.bls.gov/cew/apps/data_views/data_views.htm#tab=Tables.

U.S. Census Bureau. 2022. All sectors: Nonemployer statistics by legal form of organization and receipts size class for the U.S., states, and selected geographies: 2019. Economic Surveys.

U.S. Census Bureau. 2023. Quick facts, Oregon, United States. Washington (DC): U.S. Department of Commerce, U.S. Census Bureau; [updated 2022 Jul 01; accessed 2023 Sep 15]. https://www.census.gov/quickfacts/fact/table/OR,US/PST045222.

U.S. Navy. 2017. Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis (Phase III). U.S. Department of the Navy, SPAWAR Systems Center Pacific. 183 p.

USACE. 1987. Confined disposal of dredged material. Washington (DC): U.S. Army Corps of Engineers. 243 p. Report No.: Engineer Manual EM 1110-2-5027.

USACE. 2024a. Port Orford. Portland (OR): U.S. Army Corps of Engineers, Portland District; [accessed 2024 Jul 2]. https://www.nwp.usace.army.mil/Locations/Navigation-Projects/Port-Orford/.

USACE. 2024b. Building Strong® at the Chetco River. Portland (OR): U.S. Army Corps of Engineers, Portland District; [accessed 2024 Jul 2]. https://www.nwp.usace.army.mil/Locations/Navigation-Projects/Chetco-River/.

USACE. 2024c. Building Strong® at the Coquille River. Portland (OR): U.S. Army Corps of Engineers, Portland District; [accessed 2024 Jul 2]. https://www.nwp.usace.army.mil/Locations/Navigation-Projects/Coquille-River/.

USACE. 2024d. Coos Bay. Portland (OR): U.S. Army Corps of Engineers, Portland District; [accessed 2024 Jul 2]. https://www.nwp.usace.army.mil/Locations/Navigation-Projects/Coos-Bay/.

USACE. 2024e. Building Strong® at Yaquina Bay. Portland (OR): U.S. Army Corps of Engineers, Portland District; [accessed 2024 Jul 2]. https://www.nwp.usace.army.mil/Locations/Navigation-Projects/Yaquina-Bay/.

USACE. 2024f. Crescent City Harbor. San Francisco (CA): U.S. Army Corps of Engineers, San Francisco District; [accessed 2024 Jul 7]. https://www.spn.usace.army.mil/Missions/Projects-and-Programs/Current-Projects/Crescent-City-Harbor-/.

USACE. 2024g. Humboldt Harbor and Bay. San Francisco (CA): U.S. Army Corps of Engineers, San Francisco District; [accessed 2024 Jul 7]. https://www.spn.usace.army.mil/Missions/Projects-and-Programs/Current-Projects/Humboldt-Harbor-Bay--/.

USCG. 2011. Pollution incidents in and around U.S. waters, a spill/release compendium: 1969–2004 and 2004–2009. U.S. Coast Guard, Marine Information for Safety and Law Enforcement (MISLE) System.

Watt JT, Brothers DS. 2021. Systematic characterization of morphotectonic variability along the Cascadia convergent margin: Implications for shallow megathrust behavior and tsunami hazards. Geosphere. 17(1):95-117.

Western Regional Climate Center. 2023a. Station Wind Rose Coos Bay, Oregon. Reno (NV): Western Regional Climate Center; [accessed 2023 Sep 15]. https://wrcc.dri.edu/cgi-bin/rawMAIN.pl?orOCOO.

Western Regional Climate Center. 2023b. Station Wind Rose Red Mound, Oregon. Reno (NV): Western Regional Climate Center; [accessed 2023 Sep 15]. https://wrcc.dri.edu/cgi-bin/rawMAIN.pl?orOREM.

Wiese FK, Montevecchi W, Davoren G, Huettmann F, Diamond A, Linke J. 2001. Seabirds at risk around offshore oil platforms in the North-west Atlantic. Marine Pollution Bulletin. 42(12):1285-1290.

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