Offshore Wind Lease Issuance, Site Characterization, and Site Assessment: Central and Northern California

Biological Assessment
Endangered and Threatened Species
and
Essential Fish Habitat Assessment

Prepared for the National Marine Fisheries Service
and U.S. Fish and Wildlife Service
in Accordance with Section 7(c) of the Endangered Species Act of 1973, and the Magnuson-Stevens Fishery Conservation and Management Act
as Amended

July 2022

Photo credits: D. Pereksta (whales), D. Schroeder (habitat and rockfish), BOEM

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July 2022

Bureau of Ocean Energy Management
Pacific Regional Office

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Table of Contents

List of Tables

Table of Figures

Part I: Proposed Action

Summary

The Bureau of Ocean Energy Management (BOEM) is proposing to issue up to five (5) leases within the Morro Bay and Humboldt WEAs (for a total of up to five leases for both WEAs) and grant rights of way (ROWs) and rights of use and easements (RUEs) in support of wind energy development offshore Central and Northern California. BOEM anticipates that site characterization will employ high-resolution geophysical (HRG) surveys that would be conducted using the following equipment: swath bathymetry system, magnetometer/gradiometer, side-scan sonar, and shallow and medium (seismic) sub-bottom profiler systems. This equipment does not come in contact with the seafloor and is typically towed from a moving survey vessel that does not require anchoring. Geotechnical testing or sampling involves seafloor disturbing activities. Geotechnical investigation may include the use of gravity cores, piston cores, vibracores, deep borings, and cone penetration tests (CPT), among others. Site characterization will inform site assessment plans (SAPs) which are required to deploy and decommission metocean buoys. The proposed Federal action includes project design criteria (PDC) and best management practices (BMPs) for any activities that BOEM has concluded in this BA to have a potentially adverse effect on protected species. BOEM derived these BMPs based on relevant experience on the Pacific OCS, as well as through co-ordination with NMFS Greater Atlantic Regional Office on SAPs submitted to BOEM for the Atlantic OCS. BOEM will implement BMPs through issuance of leases and review of proposed plans through standard operating conditions (SOCs).

In Part II of this document, the Biological Assessment (BA) is focused on federally listed threatened and endangered species that may occur in the project area and potential effects from the proposed site characterization surveys and site assessment activities in and around the Humboldt and Morro Bay WEAs. National Marine Fisheries Office of Protected Resources in Long Beach, CA provided technical input on the species list presented in this biological assessment. Part III of this document contains an Essential Fish Habitat Assessment (EFHA) for all federal fishery management plans under the Pacific Fishery Management Council. This BA and EFHA are consistent with the revised Guidance for Combining EFH Consultations with ESA Section 7 Consultations (Guidance) within NMFS Policy Directive 03-201-05. Accordingly, pursuant to 50 CFR § 920(f)(3), NMFS finds that BOEM Regions 8, 9, 10, and 12, formerly known as the Pacific Region, procedures for ESA consultations can be used to satisfy the EFH consultation requirements of section 305(b)(2) and 305(b)(4) of the MSA (Rumsey 2022).

The primary impact-producing activities associated with the proposed action include geophysical and geotechnical surveys and deployment and decommissioning of metocean buoys. For ESA-listed species, the potential impact-producing factors associated with the proposed action are noise from geophysical and geotechnical surveys and vessel noise, vessel collisions, entanglement, chemical and toxic pollution, and marine debris.

The analysis of potential impacts associated with the proposed action indicate that site characterization surveys and site assessment activities associated with offshore wind energy leases may affect, but are not likely to adversely affect, ESA-listed species and critical habitat (Table 1).

Table 1: Summary analysis of effects from the proposed action on ESA-listed species covered in this BA. NLAA = not likely to affect; NE = no effect.

Activity	Route of Effect	Potential Effect	BMP	Effect Determination		
				Whales	Sea Turtles	Fish
Metocean Buoy Installation						
Installation of metocean buoys, wave gliders, and other data collection devices	Habitat Alteration/Turbidity/	Foraging/prey availability	N	NE	NLAA	NLAA
	Physical presence of moorings/buoys	Entanglement	Y	NLAA	NLAA	NE
Accidental release of pollutants	Onboard generators and fuel storage	Water Quality	N	NLAA	NLAA	NLAA
	Marine Debris	Ingestion, entanglement	Y	NLAA	NLAA	NLAA
High-Resolution Geophysical (HRG) and Geotechnical Surveys						
HRG surveys	Noise	Disturbance	Y	NLAA	NLAA	NLAA
Geotechnical surveys	Habitat Alteration/Turbidity	No effect	N	NE	NE	NLAA
	Noise	Disturbance	Y	NLAA	NLAA	NLAA
	Side-scan sonar (≥200 kHz)	No effect	N	NE	NE	NLAA
Vessel Operations						
Vessel transits and operations	Strikes	Injury	Y	NLAA	NLAA	NE
	Noise	Disturbance	N	NLAA	NLAA	NLAA
Vessel Engines and Thrusters	Noise	Disturbance	Y	NLAA	NLAA	NE
	Impingement	No Effect	N	NE	NE	NE

Purpose

Under Section 7(c) of the Endangered Species Act (ESA), as amended, federal agencies are required to ensure actions they authorize do not jeopardize the existence of any species listed under the ESA. The purpose of this Biological Assessment (BA) is to evaluate the effects survey and data collection activities associated with offshore renewable energy leasing may have on ESA-listed species of whales, sea turtles, fish, and their critical habitats. This analysis anticipates activities will occur in and around the two BOEM designated Wind Energy Areas (WEAs) offshore California, the Humboldt WEA and the Morro Bay WEA, including transit routes to and from Humboldt Bay and Morro Bay (Figure 1). The proposed action is to conduct data collection activities in support of renewable energy development on the OCS. The need for the proposed action is to use the information obtained through data collection activities to make informed business and engineering decisions regarding the development of renewable energy projects. These activities are collectively referred to as site characterization and site assessment activities. Site characterization surveys are conducted from a vessel and may include sonar surveys, geotechnical sampling, magnetometer surveys, biological surveys, and archeological surveys. Site assessment activities are conducted with scientific instrumentation attached to buoys to collect oceanographic, meteorological, and biological data on the lease. Consequently, the proposed action also includes the temporary installation, operation, and decommissioning of site assessment structures fixed to the seafloor.

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 U.S.C. 1801 et seq.) require the identification of essential fish habitat (EFH) for federally managed fish species and the implementation of measures to conserve and enhance such habitat. In addition, the MSFCMA requires federal agencies that are undertaking activities to consult with the National Marine Fisheries Service (NMFS) if those activities may adversely affect EFH (MSFCMA section 305). The EFH regulations at 50 C.F.R. 600.920(f) encourage EFH consultations under the MSA to be consolidated or combined with existing environmental review procedures to satisfy the EFH consultation requirements, provided that NOAA has made a finding that such review procedures can be used for EFH compliance. On April 27, 2022, NMFS communicated to BOEM via email that it made such a finding.

This assessment document describes the proposed action, identifies those threatened and endangered species and essential fish habitat most likely to be affected by the action, identifies potential impact producing factors, and analyzes potential effects, including cumulative effects.

Background

The Energy Policy Act (EPAct) of 2005, Public Law (P.L.). 109-58, added Section 8(p)(1)(C) to the Outer Continental Shelf Lands Act (OCSLA), which grants the Secretary the authority to issue leases, easements, or rights-of-way on the OCS for the purpose of renewable energy development (43 U.S.C. § 1337(p)(1)(C)). DOI announced the final regulations for the OCS Renewable Energy Program in April 2009, which was authorized by the EPAct. The OCSLA, as amended, mandates the Secretary of the Interior (Secretary), through BOEM, to manage the siting and development of OCS of renewable energy facilities. BOEM is delegated the responsibility for overseeing offshore renewable energy development in Federal waters (30 C.F.R. 585). Through these regulations, BOEM oversees responsible offshore renewable energy development.

BOEM does not consider the issuance of a lease to constitute an irreversible and irretrievable commitment of agency resources toward the authorization of a commercial wind power facility. This is primarily because the issuance of a lease only grants the lessee the exclusive right to use the leasehold to: (1) gather resource and site characterization information, (2) develop its plans, and (3) subsequently seek BOEM approval of its plans for the development of the leasehold.[1] The purpose of conducting the surveys and installing meteorological measurement devices is to assess the wind resources in the proposed lease area and to characterize the environmental and socioeconomic resources and conditions. A lessee collects this information to determine whether the site is suitable for commercial development and inform its plan submittals. Additional analyses under the National Environmental Policy Act (NEPA) and consultation under the Endangered Species Act (ESA) would be required before BOEM makes any decisions made regarding construction of wind energy facilities on its leases.

[1] See the proposed renewable energy commercial lease form at 76 FR 55090.

Description of the Action Area

In order to undertake site characterization and site assessment activities, BOEM assumes that a lessee will stage from the closest ports to the respective WEAs, being the Port of Humboldt Bay, which is approximately 32.2 km (20 mi) east of the Humboldt WEA, and the Port of Morro Bay, which is approximately 32.2 km (20 miles) east of the Morro Bay WEA.

However, considering the remoteness of the Port of Humboldt Bay, and since BOEM is not currently in possession of any plans, BOEM is including the closest alternative harbors to the Humboldt WEA as part of the Action Area. These ports include Crescent City (approximately 90 mi to the north), Coos Bay (approximately 349 km (217 mi) to the north), and San Francisco Bay (approximately 368.5 km (229 mi) to the south) (Figure 1).

Site characterization survey activities are anticipated to occur within the Humboldt and Morro Bay WEAs. The boundary of the Humboldt WEA begins 34 kilometers (km, 21 miles (mi)) offshore the city of Eureka, measures 45 km (28 mi) north to south and 23 km (14 mi) east to west, totaling approximately 132,368 acres (ac) (206 square miles (mi^2)). Water depths across the WEA range from approximately 500 to 1,100 meters ((m) 1,640–3,609 feet (ft)) (Figure 1a). The Morro Bay WEA is approximately 240,898 total acres (ac), (376 square miles) and located approximately 20 miles from shore. Water depths across the WEA range from approximately 900 and 1,300 meters (m) (2,953- 4,265 (ft)) (Figure 1b)

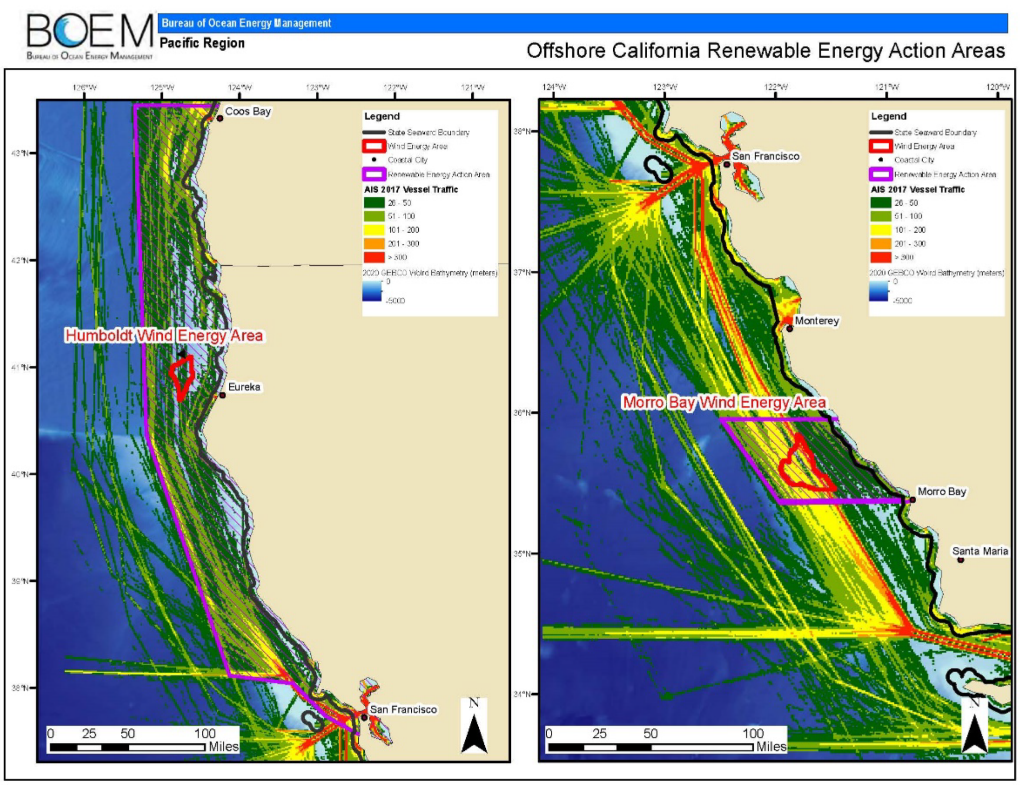

Figure 1: The Action Area consists of Humboldt (a) and Morro Bay (b) Wind Energy Areas, the transit routes to and from the Ports of Humboldt Bay and Morro Bay, as well as transit routes to and from the alternative ports, and cable routes (showing the number of vessel transits in 2017).

Additionally, site characterization activities are anticipated to occur along a corridor(s) that extends from the WEAs to the onshore energy grid. It is assumed that the ROW/RUE route(s) would consist of a minimum 300-meter-wide corridor centered on any anticipated cable location(s). Because any ROW or RUE grants considered as part of this undertaking have not been issued, BOEM is uncertain of the exact location of these cable corridor surveys. However, BOEM can anticipate their geographic extent. Power generated from potential Humboldt and Morro Bay lease area(s) would need to be transmitted to shore directly from the lease area(s) by individual export cables to onshore cable landings. BOEM assumes that cable site characterization activities would occur within a discrete corridor(s) in the region between the Humboldt and Morro Bay WEAs and shore (Figure 1). BOEM does not have regulatory authority to approve any activities in state waters and onshore areas or apply mitigation measures outside of the OCS.

The Action Area therefore incorporates the transit routes to and from the respective and/or alternative harbors to the WEAs, and activities within the WEAs and along the cable routes to shore (Figure 1).

Description of the Proposed Action

The Proposed Action (Action) is the issuance of up to three commercial leases within the Morro Bay WEA and up to two commercial leases within the Humboldt WEA (for a total of up to five leases for both WEAs) and granting of rights of way (ROWs) and rights of use and easements (RUEs) in support of wind energy development. The Proposed Action also considers the execution of associated site characterization and site assessment activities on these leases or grants. A lessee must submit the results of site characterization surveys with their plans (e.g., 30 CFR §§ 585.610, 585.626, and 585.645). Although BOEM does not issue permits or approvals for these site characterization activities, it will not consider approving a lessee's site assessment plan if the required survey information is not included.

Site characterization activities include both high-resolution geophysical (HRG) surveys, which do not involve seafloor-disturbing activities, and geotechnical investigations and biological surveys, which may include seafloor-disturbing activities. Retrieval of lost equipment may occur, as necessary. The purpose of HRG surveys is to acquire shallow hazards data, identify potential archaeological resources, characterize seafloor conditions, and conduct bathymetric charting. BOEM anticipates that HRG surveys would be conducted using the following equipment: swath bathymetry system, magnetometer/gradiometer, side-scan sonar, and shallow and medium (seismic) sub-bottom profiler systems. This equipment does not come in contact with the seafloor and is typically towed from a moving survey vessel that does not require anchoring.

Geotechnical testing or sampling involves seafloor disturbing activities. Geotechnical testing is conducted to assess the suitability of shallow foundation soils to support anchoring systems or transmission cable under any operational and environmental conditions that might be encountered (including extreme events), and to document soil characteristics necessary for the design and installation of all proposed structures and cables. Geotechnical investigation may include the use of equipment such as gravity cores, piston cores, vibracores, deep borings, and cone penetration tests (CPT), among others.

BOEM also anticipates cases where geotechnical testing methods may be employed as part of the identification of historic properties. In some instances, direct sampling may be the only available method of testing the presence or absence of horizons of archaeological potential within features of interest identified during geophysical survey.

The Proposed Action does not include cable installation or connection to shore-based facilities, or consideration of commercial-scale wind energy facilities. Should a lessee propose to construct and operate a commercial-scale wind energy facility within the Humboldt and Morro Bay WEAs, they would submit a Construction and Operations Plan to BOEM. Consideration of construction and operation of a wind facilities is a separate federal action under the National Environmental Policy Act and BOEM would consider under a separate consultation.

Site Assessment involves the deployment and decommissioning of a metocean buoy(s). BOEM does not receive a Site Assessment Plan (SAP) until after a lease is issued, so the following sections describe assumptions about, and scenarios of, reasonably foreseeable site assessment and site characterization activities based on regulations, relevant experience on the Pacific OCS, and SAPs submitted to BOEM for the Atlantic OCS.

Surveying and Sampling Assumptions

- Lessees would likely survey the entire proposed lease area during the 5-year Site Assessment Term (which includes 3 years of site characterization surveys and 1-5 years of buoy deployment) to collect required information for the siting of up to three metocean buoys and potential commercial wind facilities.
- Site characterization surveys may be conducted before and after the installation of metocean buoys.
- Lessees would perform high-resolution geophysical (HRG) surveys, which do not include the use of air guns.
- Survey vessels would travel at a speed of 4.5 knots.
- Survey vessels would be sourced from within the California Current region

Installation, Decommissioning, and Operations and Maintenance Assumptions

The Pacific Northwest National Laboratory (PNNL) deployed LiDAR (light detection and ranging) buoys off of California in the Humboldt and Morro Bay WEAs (PNNL 2019). A 65-foot tugboat was used to tow the LiDAR buoy, at 5 knots, to the WEAs where they lowered the anchor, mooring line, and attached the buoy and then traveled back to Humboldt/Morro Bay in one day. PNNL planned for 3 vessel trips for a 12-month deployment (deployment, mid-year maintenance, recovery).

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

Vessel Traffic Assumptions

Vessel trips are anticipated for both site assessment and site characterization activities (Table 4). This BA assumes vessel traffic from 2017 is a reasonable level of activity for analysis. Traffic patterns based on 2017 Automatic Identification System (AIS) data are more concentrated further to sea and closer to shore than in the Humboldt and Morro Bay WEAs (Figure 2). Tug and tow vessels do traverse the Morro Bay and Humboldt WEAs; however, they are concentrated in the nearshore tow lane and further offshore. Cargo ships also traverse the WEAs, but use is concentrated further offshore. Tankers did not traverse the WEAs in 2017. Additional vessel traffic assumptions are discussed below.

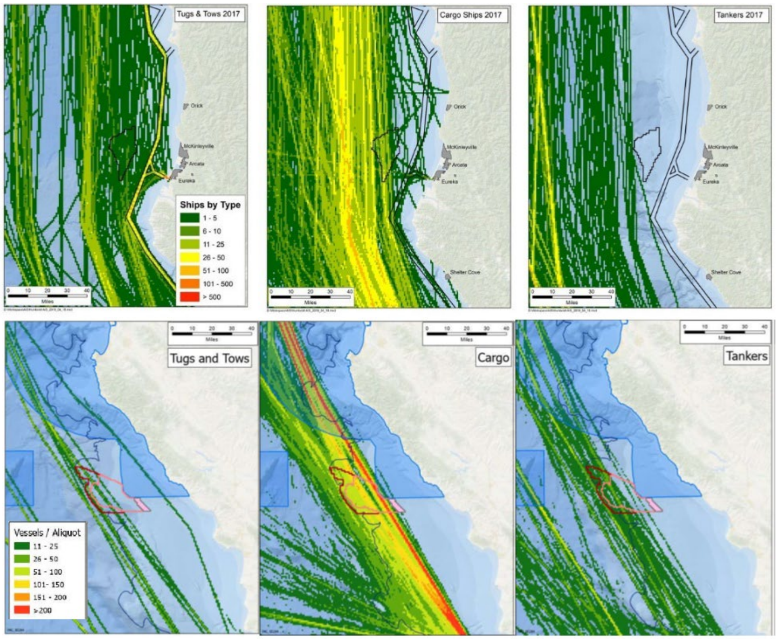

Figure 2: AIS-derived Vessel Traffic From 2017 for Tugs and Tows, Cargo, and Tankers In and Near the Humboldt (top) and Morro Bay (bottom) Wind Energy Areas

Site Characterization Survey 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 look for shallow hazards. These survey methods can also be used for surveying archaeological (i.e., historic property) resources. Biological surveys are also part of site characterization surveys and collect data on potentially affected habitats, marine mammals, birds, sea turtles, and fishes.

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

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

Table 2: Proposed Site Characterization Survey Details

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

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

Collection of Geotechnical/Sub-bottom Information Assumptions

Site characterization activities include geotechnical surveys such as cone penetrometer testing, boring, vibracoring, and other geotechnical exploration methods such as grab samples and benthic videography with ROVs. Geotechnical surveys generally do use active acoustic sources and may have some low-level ancillary sounds associated with them. The G&G Final Programmatic EIS (BOEM, 2014a), which is hereby incorporated by reference, provides an overview of the geotechnical sampling techniques and devices such as bottom-sampling devices, vibracores, deep borings, and cone penetration tests (CPTs). Additional details describing methods common in geophysical and geotechnical investigations are found in Fugro Marine GeoServices Inc. (2017) and is incorporated here by reference. Geotechnical surveys are used to determine whether the seabed can support wind turbine generators and transmission cables, as well as to document the sediment characteristics necessary for design and installation techniques for all structures and cables. The information obtained from these samplings is used to inform future phases of lease development. The information from the G&G Final PEIS is summarized below.

Samples for geotechnical evaluation are collected using shallow-bottom coring and surface sediment sampling devices taken from a small marine drilling vessel. The methods to obtain samples to analyze physical and chemical properties of surface sediments are described in Table 2. CPTs and bore sampling are often used together because they provide different data on sediment characteristics. A CPT provides a fairly precise stratigraphy of the sampled interval, plus other geotechnical data, but does not allow for capture of an undisturbed soil sample. Bore holes can provide undisturbed samples but are most effectively used in conjunction with CPT-based stratigraphy so that sample depths can be pre-determined. A CPT is suitable for use in clay, silt, sand, and granule-sized sediments as well as some consolidated sediment and colluvium. Bore sampling methods can be used in any sediment type and in bedrock. Vibracores are suitable for extracting continuous sediment samples from unconsolidated sand, silt, and clay-sized sediment up to 33 ft (10 m) below the seafloor.

The Humboldt WEA will include up to 2 leases while the Morro Bay WEA will include up to 3 leases. Assumptions for estimates of benthic disturbance from geotechnical/sub-bottom sampling are based on BOEM's 2021 Biological Assessment for the same activities (BOEM 2021): (1) Up to a 75 km (40.5 nmi) cable route to shore for each lease, with one sub-bottom sample every nautical mile of transmission cable corridor, amounting to ~41 samples per lease (2) The area of seabed disturbed by individual sampling events (e.g., collection of a core or grab sample) is estimated to range from 1-10 m^2 (11-108 ft^2).

Up to 3 metocean buoys may be placed in each WEA. Assumptions for estimates of benthic disturbance from metocean buoy anchors are derived from data from PNNL's 2019 LiDAR buoy deployments to the Humboldt and Morro Bay WEAs and modified in BOEM's 2022 Consistency Determination for Leasing Wind Energy Areas Offshore Morro Bay, California (BOEM 2022a) to create conservative estimates of a potential maximal scenario: (1) metocean buoy weight in depths over 1000 m may be distributed over 2 separate anchors, so the proposed action covers 12 potential anchoring events (2) anchor radius is conservatively calculated by doubling the anchor radius of known metocean buoys to increase the area from 2.3 to 9.3 m^2 (3) maximum chain sweep area was estimated by tripling the current 1.8 m (6 ft) of chain used to 5.5 m (18 ft).

Methods for physical biological sampling of benthic communities are described in Table 2 and include the use of grab samples or towed camera sleds, which support visual data collection. Per BOEM's survey guidelines for providing benthic habitat survey information for renewable energy development on the Atlantic outer continental shelf, baseline survey should include an appropriate sample size from the entire area of potential adverse effect, generally not less than one sample per 1-2 km along a proposed line of potential adverse effect or one sample per 1-2 km^2 within a proposed area of potential adverse effect. Since BOEM is not currently in receipt of any survey plans, this assessment assumes this guidance of one sample per 1-2 km^2 within the Humboldt and Morro Bay WEAs to best the best available information, although likely an over-estimate of sampling needs in the CA WEAs. Maximum sampling area for grab sampling, using the largest Van Veen grab currently available (1000 cm^2), is anticipated to be 0.1m^2 per sample.

The maximum area of benthic disturbance from geotechnical and biological sampling, and metocean buoy anchor embedment is anticipated to be between 391 to 3453 m^2 (Table 3).

Collection of Geophysical Information Assumptions

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

Assuming the lessee follows BOEM's guidelines to meet the geophysical data requirements at 30 CFR §§ 585.610–611, BOEM anticipates that the surveys would be undertaken using the equipment to collect the required data as described in Table 2 and Table 3. Vessel traffic assumptions for site characterization are shown in Table 4. Equivalent technologies to those shown in these tables may be used if their potential impacts are similar to those analyzed for the equipment described in the BA and are approved by BOEM prior to conducting surveys.

Table 2A: Estimated Benthic Disturbance from Geotechnical and Biological Sampling, and Metocean Buoy Anchor Embedment Activities in the Action Area

	Humboldt WEA (2 leases)	Morro Bay WEA (3 leases)	California WEAs (5 leases)
Size of WEA (km^2)	536	97	1,511
Number of geotechnical/sub-bottom sampling events (~41 samples per lease)	82	123	205
Affected Area for geotechnical/sub-bottom sampling events (m^2)	82 to 820	123 to 1,230	205 to 2050
Number of biological samples per 1 km^2	536	975	
Maximum area of 1 biological sample disturbance (m^2)	0.1	0.1	
Maximum area of biological survey disturbance (m^2)	53.6	97.5	53.6-151.1
Met buoy anchor radius (m^2)	3 to 55.8	3 to 55.8	6 to 111.6
Chain sweep and/or placement (m^2)	63 to 570	63 to 570	126 to 1140
Total estimated area of benthic disturbance			**391 to 3453 m^2**

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

- For the collection of geophysical data for shallow hazards assessments (including magnetometer, side-scan sonar, and sub-bottom profiler systems), BOEM recommends surveying at a 150-m (492-ft) line spacing over the proposed lease area;
- For the collection of geophysical data for archaeological resources assessments, the lessee would likely use survey methods at a line spacing appropriate for the range of depths expected in the survey area, as long as the sonar system is capable of resolving small, discrete targets 0.5 m (20 inches) in length at maximum range; and
- For bathymetric charting, the lessee would likely use a multi-beam echosounder at a line spacing appropriate to the range of depths expected in the survey area.

Table 3: 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 geophysical data for shallow hazards, archaeological resources, benthic habitats, and bathymetric charting	A depth sounder is a microprocessor-controlled, high-resolution survey-grade system that measures precise water depths in both digital and graphic formats. The system would be used in such a manner as to record with a sweep appropriate to the range of water depths expected in the survey area. This EA assumes the use of multibeam bathymetry systems, which may be more appropriate than other tools for characterizing those lease areas containing complex bathymetric features or sensitive benthic habitats such as hardbottom areas.
Magnetometer	Collection of geophysical data for shallow hazards and archaeological resources assessments	Magnetometer surveys would be used to detect and aid in the identification of ferrous or other objects having a distinct magnetic signature. The magnetometer sensor is typically towed as near as possible to the seafloor and anticipated to be no more than approximately 6 m (20 ft)

		above the seafloor. This methodology will not be used in the WEA since depths are 500 m or greater, but will be used to survey potential cable routes that will occur in depths shallower than 500 m.
Side-scan sonar	Collection of geophysical data for shallow hazards and archaeological resource assessments	This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (MMS 2007). A typical side-scan sonar system consists of a top-side processor, tow cable, and towfish with transducers (or "pingers") located on the sides which generate and record the returning sound that travels through the water column at a known speed. BOEM assumes that the lessee would use a digital dual-frequency side-scan sonar system with 300–500 kHz frequency ranges or greater to record continuous planimetric images of the seafloor.
Shallow and medium penetration sub-bottom profilers	Collection of geophysical data for shallow hazards and archaeological resource assessments and to characterize subsurface sediments	Typically, a high-resolution CHIRP System sub-bottom profiler is used to generate a profile view below the bottom of the seabed, which is interpreted to develop a geologic cross-section of subsurface sediment conditions under the track line surveyed. Another type of sub-bottom profiler that may be employed is a medium penetration system such as a boomer, bubble pulser or impulse-type system. Sub-bottom profilers are capable of penetrating sediment depth ranges of 3 m (10 ft) to greater than 100 m (328 ft), depending on frequency and bottom composition.

CHIRP = Compressed High Intensity Radar Pulse kHz = kilohertz

Table 4: Projected Maximum Vessel Trips for Site Characterization over a 3-Year Period in the Action Area

Survey Task	Number of Survey Days/Round Trips[1]			
	Based on 24-hour Days		Based on 10-hour Days	
	Humboldt	Morro Bay	Humboldt	Morro Bay
HRG surveys of all OCS blocks within lease area(s)	64	64	153	153
Geotechnical sampling	18	18	247	247
Avian surveys	24–48[2]	30-54[2]	24–48[2]	30-54[2]
Fish surveys	8-365[3]	8-365[3]	8-365[3]	8-365[3]
Marine mammal and sea turtle surveys	24–48[2]	30-54[2]	24–48[2]	30-54[2]
Total:	138-543	150-555	456-861	464-873

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.

2 Avian, marine mammal and sea turtle surveys are most likely to occur at the same time, from the same vessel. However, since it is possible that they may occur separately, totals include vessel trips for both.

3 Number of surveys are conservative estimates, meaning the highest possible number of trips is assumed even though it is unlikely this many trips will take place.

Site Assessment Assumptions

Instrumentation and Power Requirements

Metocean buoys would be anchored at fixed locations in potential commercial lease areas in order to conduct site assessment activities to monitor and evaluate the viability of wind as an energy source. The activities may include data gathering on wind velocity, barometric pressure, atmospheric and water temperatures, and current and wave measurements. To obtain these data, scientific measurement devices consisting of anemometers, vanes, barometers, and temperature transmitters would be mounted either directly on a buoy or on a buoy's instrument support arms. In addition to conventional anemometers, floating light detection and ranging (FLiDAR) and sonic detection and ranging equipment may be used to obtain meteorological data. To measure the speed and direction of ocean currents, Acoustic Doppler Current Profilers (ADCPs) would most likely be installed. Buoys could also accommodate environmental monitoring equipment, such as bird and bat monitoring equipment (e.g., radar units, thermal imaging cameras), visual or acoustic monitoring equipment for marine mammals and fishes, data logging computers, power supplies, visibility sensors, water measurement equipment (e.g., temperature, salinity), communications equipment, material hoist, and storage containers. Projected vessel traffic in support of metocean buoy placement is shown in Table 5.

Table 5: Projected Maximum Vessel Trips for Metocean Buoy(s)

Site Assessment Activity	Round Trips	Formula
Metocean buoy installation	6	1 round trip x 6 buoys
Metocean buoy yearly maintenance trips	30	6 buoys x 5 years
Metocean buoy decommissioning	6	1 round trip x 6 buoys
Total buoy trips over 5-year period	42–50	Adds on additional maintenance/weather challenges

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

Buoy Hull Types and Anchoring Systems

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

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

Discus-shaped, boat-shaped, and spar buoys (Figures3-5, respectively) are the buoy types that would most likely be adapted for offshore wind data collection. A large discus-shaped hull buoy has a circular hull ranging between 10 and 12 m (33 and 40 ft) in diameter and is designed for many years of service (NDBC 2012). The boat-shaped hull buoy is an aluminum-hulled buoy that provides long-term survivability in severe seas (NDBC 2012).

Some deep ocean moorings have operated without failure for more than 10 years (NDBC 2012). In 2020, PNNL installed two LiDAR buoys off California that had a boat-shaped hull and were moored with a solid cast iron anchor weighing approximately 4,990 kgs (11,000 lbs.) with a 2.3 square meter (m^2) footprint. The mooring line was comprised of chain, jacketed wire, nylon rope, polypropylene rope and subsurface floats to keep the mooring line taut to semi-taut. The mooring line was approximately 1,200 m long in the Humboldt WEA (PNNL 2019). BOEM anticipates that LiDAR buoys deployed as part of the proposed action will be very similar to the LiDAR buoys deployed by PNNL.

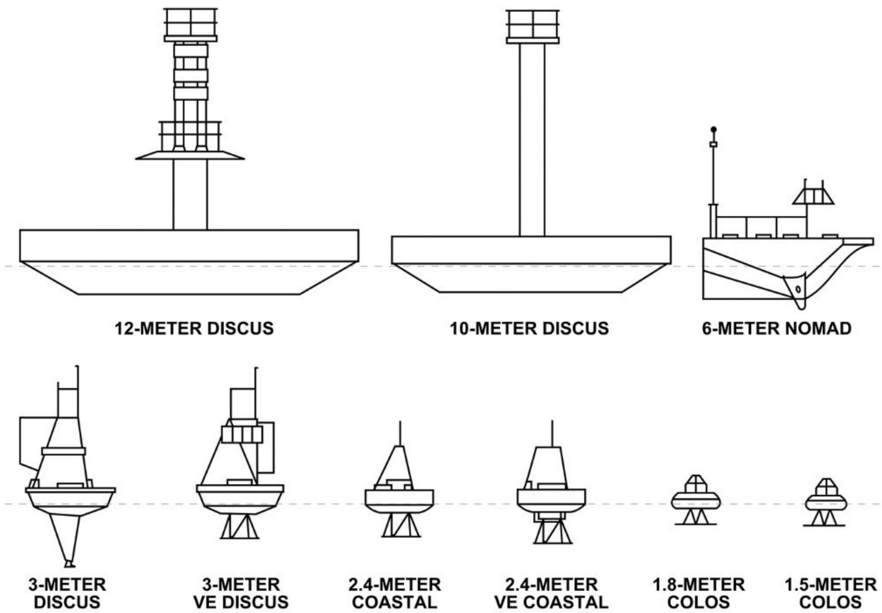

Figure 3: Buoy Schematic
Source: NDBC (2008)

Figure 4: 10-Meter Discus-Shaped Hull Buoy
Source: NDBC (2012)

Figure 5: 6-Meter Boat-Shaped Hull Buoy
Source: NDBC (2012)

Buoy Installation and Operation

Buoys would typically take approximately one day to install.

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

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

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

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

Decommissioning

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

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

Project Design Criteria (PDC) and Best Management Practices (BMPs)

BOEM's primary strategy for minimizing adverse impacts is avoidance of the IPF. For impacts that cannot be entirely avoided, BOEM has developed PDCs to avoid and minimize the potential environmental risks to or conflicts with protected resources (Table 6). The PDCs summarized below, and the associated BMPs that further describe how the PDCs will be implemented (Appendix A) are part of the proposed action to minimize or avoid impacts on threatened and endangered marine mammals, sea turtles, and fishes. These BMPs were developed by BOEM through consultation with NMFS and through coordination and feedback from stakeholders.

BOEM proposes to implement these BMPs through a combination of procedures including lease stipulations, individual plan reviews, and incidental take permit requirements for ESA-listed species under the Marine Mammal Protection Act. Recommended BMPs may be updated in the future through coordination with the NMFS. The following BMPs are proposed to be implemented until any future updates may occur. The current BMPs are fully described in Appendix A and are discussed in the relevant sections of this BA. BOEM's project-specific reviews may result in additional BMPs to clarify these conditions or to further minimize and avoid impacts to threatened or endangered species or their habitats.

Table 6: BOEM's proposed Project Design Criteria for protected species and EFH.

Project Design Criteria	Applicable to	Purpose
Hard Bottom Avoidance and Metocean Buoy Anchoring Plan	Employees and all at-sea contract personnel and vessels	To protect rocky reefs, a Habitat of Particular Concern for Pacific Groundfish EFH which will reduce adverse effects associated with habitat alteration to minimally adverse levels.
Marine Debris Awareness and Elimination	All at-sea and dockside operations	To provide informational training to all employees and contract personnel on the proper storage and disposal practices at-sea to reduce the likelihood of accidental discharge of marine debris that can impact protected species through entanglement or incidental ingestion.
HRG Survey Vessel Constraints	Any survey vessel operating high-resolution geophysical survey equipment to obtain data associated with a lease and operating such equipment at or below 180 kHz	This PDC will avoid injury of ESA-listed species and minimize the likelihood of adverse effects associated with potential disturbance to discountable levels through the establishment of pre-clearance, exclusion zones, shut-downs, PSO monitoring, and other BMPs to avoid and reduce exposure of ESA-listed species to underwater survey noise.
Minimize Vessel Interactions with ESA-listed species	All vessels	To avoid injuring or disturbing ESA-listed species by establishing minimum separation distances between vessels and marine protected species; and operational protocols for vessels when animals are sighted.

Entanglement Avoidance	Mooring and anchoring systems for buoys and metocean data collection devices.	To use the best available mooring systems using anchors, chain, cable, or coated rope systems that prevent or reduce to discountable levels any potential entanglement of marine mammals and sea turtles.
Protected Species Observers	Geophysical Surveys	To require PSO training; to require PSO approval requirements by NMFS prior to deployment on a project.
Reporting Requirements	PSOs and any project-related personnel who observe a dead and/or injured protected species.	To document and record monitoring requirements for geophysical surveys, project-related incidents involving ESA-listed species, and to report any impacts to protected species in a project area whether or not the impact is related to the project.
Prohibition of Trawling for Biological Surveys	Employees and all at-sea contract personnel and vessels	To reduce possibility of bycatch of protected fish species and to protect benthic habitats.

These PDCs are in addition to existing statutory and regulatory requirements, review procedures, and other best management practices that may apply.

Project-Specific Review Process

The data collection activities conducted under the proposed action and the process by which BOEM will regulate such activities will be similar throughout the action area. In addition, the nature of the effects in this BA are conservatively analyzed and we do not expect those effects to meaningfully vary from location to location within the Action Area. All activities that fall within the scope of this proposed action will be covered under this BA and associated ESA consultation. Thus, there is not a need for project specific consultations on every site-specific agency action BOEM and BSEE will take under the umbrella of this proposed action unless certain criteria are met. BOEM will meet its ESA Section 7 responsibilities through second-tier consultation procedures for any activities for which BMPs cannot be implemented or that fall outside the scope of this proposed action. In this section, we describe our proposed coordination procedures.

For each plan that is submitted to BOEM that requires approval, BOEM will initiate a project-specific review to determine sufficiency and adequacy with existing statute, regulations, and consistency with any applicable consultations. BOEM will evaluate the plan to ensure it is found to be within the scope of existing consultations and poses no new effects. BOEM will identify the BMPs that apply and ensure their implementation is included in the plan. If for any reason an activity under the proposed action is not within the scope of the consultation, BOEM will request second-tier or a project specific consultation with NMFS. Through additional consultation, it will be determined if additional conditions are required or if further consultative actions will be needed. If an action is outside the scope of this BA, BOEM will request a separate consultation with NMFS. BOEM has identified the following potential conditions when second-tier consultation with NMFS may be needed:

- New or unusual technologies are proposed that may result in new effects that adversely affect protected species,
- BOEM substantially revises its BMPs, removes BMPs, or changes the effectiveness of the BMPs that are required to minimize or avoid adverse effects identified in the consultation,

- New species are listed or critical habitat is designated that may be adversely affected by the proposed action,
- New information suggests effects may result in take that was not previously considered, and
- Any authorized take levels are exceeded.

Individual Plan Review Procedures

1. BOEM Plan Reviews: BOEM reviews each plan that is submitted to the Pacific Region Office. Any proposed actions described in this BA will be reviewed to ensure they are within the scope of activities covered in the consultation. Upon completion of such reviews, BOEM/BSEE will coordinate with NMFS, as necessary.
2. Project-Specific Review for Out-of-Scope Plans: Any plans determined to be out-of-scope will be submitted by BOEM to NMFS for project-specific review. The plan will be accompanied by an analysis detailing the consistency issues identified for the project being out of scope. BOEM will implement any additional BMPs resulting from streamlined consultation. If the plan cannot be brought into scope, BOEM will return the plan to the lessee with a request for additional information and/or initiate project-specific formal consultation as may be appropriate.
3. Project-Specific Review for BMP Revisions: BOEM will submit substantial BMP revisions or project-specific modifications to NMFS for the opportunity to review. BOEM will review any substantial modifications to ensure the changes will allow future activities to continue to be implemented in accordance with the intended purpose and effectiveness of BMPs.
4. Review and Response: BOEM will transmit project-specific reviews to NMFS via email, identifying the issues requiring project-specific review. NMFS will provide its comments or concurrence with any proposed minor changes, including no changes, via an email response within 15-30 calendar days of receipt of the request. Plans determined to have consistency issues that may be out of scope of ESA requirements will be reviewed by NMFS for any additional actions that may be required including additional conditions or consultation. If this review results in questions or concerns by NMFS, an in-person meeting or conference call will be scheduled with BOEM/BSEE to resolve any protected species or critical habitat issues or engage in additional consultation under Section 7 of the ESA.

Part II: Biological Assessment - Endangered and Threatened Species

Protected Species

There are approximately 39 species of marine mammal species known to occur in California waters including 8 baleen whale, 25 toothed whale and dolphin species, 6 species of seals and sea lions, and the northern and southern sea otter (Table 7). Although beaked whales are rarely sighted in the region, advances in acoustic monitoring have improved our ability to detect and identify some of these species, using echolocation pulse features (McDonald et al. 2009; Zimmer et al. 2008). Recent studies have detected some beaked whale species in and around the Proposed Action Area (Simonis et al. 2020) and they are listed in Table 7. Four ESA-listed species of sea turtles may occur in waters offshore California. Chinook salmon (3 Evolutionarily Separate Units (ESUs)), Coho salmon (2 ESUs), steelhead (5 Distinct Population Segments (DPSs)), green sturgeon, eulachon and black abalone are protected fish and invertebrate species expected to occur in the Action Area.

Table 7: Protected Species that May Occur in the Action Area

Common Name	Scientific Name	Stock (MMPA)/DPS or ESU (ESA)	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	86 FR 21082, April 21, 2021

Common Name	Scientific Name	Stock (MMPA)/DPS or ESU (ESA)	ESA/MMPA Status	Occurrence	Citations for ESA listing	Critical Habitat
					Recovery plan	
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
Toothed and Beaked Whales						
Sperm whale	*Physeter macrocephalus*	California, Oregon, and Washington	Endangered/ Depleted	Year round	35 FR 18319; December 2, 1970. 2010 Recovery plan	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

Common Name	Scientific Name	Stock (MMPA)/DPS or ESU (ESA)	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
Bottlenose dolphin	*Tursiops truncatus*	CA coastal	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
Long-beaked common dolphin	*Delphinus delphis bairdii*	California	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*	Morro Bay stock	N/A	Inshore year round	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 with critical habitat	Year round	N/A	59 FR 0715
California sea lion	*Zalophus californianus*	U.S. Stock	N/A	Year round	N/A	N/A
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
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-Oct; limited sightings	35 FR 8491; June 3, 1970. 1998 Recovery plan	77 FR 4169, January 26, 2012

Common Name	Scientific Name	Stock (MMPA)/DPS or ESU (ESA)	ESA/MMPA Status	Occurrence	Citations for ESA listing	Critical Habitat
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	N/A
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
Salmonid fishes						
Chinook salmon	*Oncorhynchus tshawytscha*	Sacramento River winter-run ESU	Endangered	See description below	70 FR 37160; June 28, 2005; 77 FR 19552, Apr. 2, 2012 (50 CFR § 224.101)	58 FR 33218, June 16, 1993 (50 CFR § 226.204)
Chinook salmon	*Oncorhynchus tshawytscha*	Central Valley spring-run ESU	Threatened	See description below	87 FR 22141; April 14, 2022 (50 CFR § 223.102)	58 FR 33218, June 16, 1993 (50 CFR § 226.204)
Chinook salmon	*Oncorhynchus tshawytscha*	California Coastal ESU	Threatened	See description below	87 FR 22141; April 14, 2022	70 FR 52536, September 2, 2005 (50 CFR § 226.211)
Coho salmon	*Oncorhynchus kisutch*	Southern Oregon/ Northern CA Coast ESU	Threatened	See description below	62 FR 24588, May 6, 1997; 70 FR 37160, June 28, 2005	64 FR 24049, May 5, 1999
Coho salmon	*Oncorhynchus kisutch*	Central CA Coast ESU	Endangered	See description below	70 FR 37160; June 28, 2005; 77 FR 19552, Apr. 2, 2012 (50 CFR § 224.101)	64 FR 24061, May 5, 1999; 69 FR 18803, April 9, 2004 (50 CFR § 226.210)
Steelhead	*Oncorhynchus mykiss irideus*	Northern CA DPS	Threatened	See description below	65 FR 36074, June 7, 2000;	70 FR 52629, September 2, 2005

Common Name	Scientific Name	Stock (MMPA)/DPS or ESU (ESA)	ESA/MMPA Status	Occurrence	Citations for ESA listing	Critical Habitat
					71 FR 833, January 5, 2006; 79 FR 20802, April 14, 2014	
Steelhead	*Oncorhynchus mykiss irideus*	California Central Valley DPS	Threatened	See description below	87 FR 22141; April 14, 2022 (50 CFR § 223.102)	70 FR 52536, September 2, 2005 (50 CFR § 226.211)
Steelhead	*Oncorhynchus mykiss irideus*	Central California Coast DPS	Threatened	See description below	87 FR 22141; April 14, 2022 (50 CFR § 223.102)	70 FR 52536, September 2, 2005 (50 CFR § 226.211)
Steelhead	*Oncorhynchus mykiss irideus*	South-Central California Coast DPS	Threatened	See description below	87 FR 22141; April 14, 2022 (50 CFR § 223.102)	70 FR 52536, September 2, 2005 (50 CFR § 226.211)
Steelhead	*Oncorhynchus mykiss irideus*	Southern California DPS	Endangered	See description below	70 FR 37160; June 28, 2005; 77 FR 19552, Apr. 2, 2012 (50 CFR § 224.101)	70 FR 52536, September 2, 2005 (50 CFR § 226.211)
Non-salmonid fishes						
Green sturgeon	*Acipenser medirostris*	Southern DPS	Threatened	See description below	87 FR 22141; April 14, 2022 (50 CFR § 223.102)	70 FR 52536, October 9, 2009 (50 CFR § 226.219)
Eulachon	*Thaleichthys pacificus*	Southern DPS	Threatened	See description below	87 FR 22141; April 14, 2022 (50 CFR § 223.102)	76 FR 65349, October 20, 2011 (50 CFR § 226.222)
Invertebrates						
Black abalone	*Haliotis cracherodii*	Throughout range	Endangered	See description below	70 FR 37160; June 28, 2005; 77 FR 19552, Apr. 2, 2012 (50 CFR § 224.101)	76 FR 66841, October 27, 2011 (50 CFR § 226.221)

Species Excluded from this Analysis

Black abalone (Haliotis cracherodii)

The black abalone (*Haliotis cracherodii*) was listed as endangered under the ESA in 2009, and critical habitat was designated by NMFS in 2011 (Endangered and Threatened Wildlife and Plants: Final

Rulemaking to Designate Critical Habitat for Black Abalone,76 Federal Register 66806–66844 [October 27, 2011]). The distribution of black abalone ranges from approximately Point Arena, Mendocino County, California, south to Bahia Tortugas and Isla Guadalupe in Mexico (Butler et al. 2009). The majority of black abalone live on rocky substrates in the high to low intertidal zone, and it is rarely found deeper than 6 m of water (Butler et al., 2009). Project activities are not expected to overlap with the species' depth range or its critical habitat and are thus excluded from further analysis.

Marine Mammals

Detailed species descriptions, including state, habitat ranges, population trends, predator/ prey interactions, and species-specific threats are described in Argonne (2019), H.T. Harvey and Associates (2020), and US Navy (2022), and summarized below.

Table 7 above includes the ESA-listed species (and applicable stocks) that are likely to occur in the Action Area. The two sub-species of sea otters (Northern and Southern) fall under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) and will be reviewed separately.

Species likely to occur in the Action Area

Blue whale (Balaenoptera musculus)

Blue whale populations were greatly reduced by commercial whaling in the early 1900s, and the species was federally listed as endangered in 1970 (35 FR 18319). Two blue whale stocks are recognized in the North Pacific Ocean; one is the Eastern North Pacific Stock (ENP) and the other is in the Central North Pacific Stock (CNP) (Carretta et al. 2020).

The seasonal migration of the ENP population has been confirmed by long-term acoustic monitoring (Burtenshaw et al. 2004) and by movements of photo-identified individuals between southern California and the Gulf of Alaska (Calambokidis 2009). Blue whales travel northward as summer progresses in response to northward progressing spring transition, and subsequent increases in primary productivity (Burtenshaw et al. 2004; Calambokidis 2009). Nine feeding biologically important areas (BIAs) have been identified for blue whales off the California coast, only survey vessels that might transit from the Port of San Francisco en route to the Humboldt WEA have the possibility of traveling through the two northern BIAs (Calambokidis et al. 2015), following existing vessel traffic routes. Blue whales identified in the area off northern California are re-sighted most frequently off Point St. George (Calambokidis et al. 2004; Calambokidis 2007). They are most commonly sighted along the continental shelf break but also occur farther inshore, in transit or feeding on surface swarms of krill. Satellite-tagged blue whales provided information on "core areas of use", indicating a high area of overlap for individuals at the western part of the Channel Islands, and near the Gulf of the Farallones, and the northern part of Cape Mendocino (Irvine et al. 2014). Irvine et al. (2014) found that although the satellite tracks were widely distributed, these whales tended to occupy the area off northern California during the latter part of the feeding season in late October–November. Based on a series of aerial and summer/fall shipboard surveys off CA, OR and WA from 1991-2018 sightings blue whale sightings in inshore and offshore waters off California in summer and fall (Becker et al. 2020).

The most current information suggests that the Eastern North Pacific population in the Study Area may have recently recovered from commercial whaling, which ended in 1971, despite the impacts of ship strikes, interactions with fishing gear, and increased levels of ambient sound in the Pacific Ocean (Barlow 1997; 2003; 2016; Calambokidis and Barlow 2013; Campbell et al. 2015; Carretta et al. 2020;

International Whaling Commission 2016; Monnahan et al. 2015; Rockwood et al. 2017; Širović et al. 2015; Valdivia et al. 2019). Findings have suggested that the population of eastern North Pacific blue whales is now near the environment's carrying capacity and that the rate of change of the population size has declined as a result (Carretta et al. 2020; International Whaling Commission 2016; Monnahan et al. 2015). Based on NMFS systematic ship surveys from 1991 to 2014, the abundance of blue whales in the area (the combined Oregon/Washington stratum and the Northern California stratum) is estimated at 1,496 whales (Barlow 2016). The annual entanglement rate of blue whales (observed) during 2013-2017 is the sum of observed annual entanglements (1.35/yr), plus species probability assignments from unidentified whales (0.09/yr), totaling 1.44 blue whales annually (Carretta et al., 2020). Most observed blue whale ship strikes have been in southern California or off San Francisco, CA, where the seasonal distribution of blue whales is in close proximity to shipping ports (Berman-Kowalewski et al. 2010). Using the moderate level of avoidance model from Rockwood et al. (2017), estimated ship strike deaths of blue whales are 18 annually. A comparison of average annual ship strikes observed over the period 2013-2017 (0.4/yr) versus estimated ship strikes (18/yr) indicates that the rate of detection for blue whale vessel strikes is approximately 2%. The observed and assigned annual incidental mortality and injury rate from ship strikes (0.4/yr) and commercial fisheries (≥ 1.44 /yr), totals 1.84 whales annually from 2013-2017. This exceeds the calculated potential biological removal of 1.23 for this stock of blue whales (Carretta et al. 2020).

No critical habitat is designated for blue whales in the North Pacific.

Fin whale *(Balaenoptera physalus)*

Fin whales prefer temperate and polar waters (Jefferson et al. 2015; Reeves et al. 2002). This species has been documented from 60° N in Alaska waters to tropical waters off Hawaii, in Canadian waters both offshore and inland including some fjords, and they have frequently been recorded in waters within the Southern California Bight (Campbell et al. 2015; Jefferson et al. 2014; Mate et al. 2016; 2017; Širović et al. 2016). As demonstrated by satellite tags and discovery tags, fin whales make long-range movements along the entire U.S. West Coast (Falcone et al. 2011; Mate et al. 2015b; 2016; 2017; 2018; Mate et al. 2009). Locations of breeding and calving grounds are largely unknown. The species is highly adaptable, following prey, typically off the continental shelf (Azzellino et al. 2008; Panigada et al. 2008). Survey and acoustic data indicate that fin whale distributions shift both seasonally as well as annually (Burnham et al. 2019; Calambokidis et al. 2015; Douglas et al. 2014; Jefferson et al. 2014).

During aerial surveys conducted within the 2,000 m isobath off southern Washington, Oregon, and Northern California in the spring, summer, and fall of 2011 and 2012, there were six sightings of 13 fin whales during winter and summer 2012 only in offshore waters over the continental slope (Adams et al. 2014). Sightings from systematic ship surveys out to 300 nmi off the U.S. West Coast and satellite tag data, habitat-based density models built with these data indicate that fin whales are more likely to be present seaward of the continental shelf in the offshore portion of the Action Area in late June to early December (Becker et al. 2020a). Because fin whale abundance appears lower in winter/spring in California (Dohl et al. 1983; Forney et al. 1995) and in Oregon (Green et al. 1992), it is likely that the distribution of this stock extends seasonally outside these coastal waters.

The fin whale is listed as endangered under the ESA, but there is no designated critical habitat for this species. Fin whale population structure in the Pacific Ocean is not well known. During the 20th century more fin whales were taken by industrialized whaling than any other species (Rocha et al., 2014). NMFS recognizes three fin whale stocks: (1) the Northeast Pacific stock (Alaska); (2) the California, Oregon, and

Washington stock, and (3) the Hawaii stock, all stocks are considered depleted under the MMPA and endangered under the ESA (Carretta et al. 2020). Analysis of genetic and acoustic data suggests that fin whales in the North Pacific interbreed and are a single population (Archer et al. 2019).

There has been a roughly 5-fold abundance increase between 1991 and 2014. Since 2005, the abundance increase has been driven by increases off northern California, Oregon and Washington, while numbers off Central and Southern California have been stable (Nadeem et al. 2016). The best estimate of fin whale abundance in California, Oregon, and Washington waters out to 300 nmi is 9,029 (CV=0.12) whales, based on a trend analysis of 1991-2014 line-transect data (Nadeem et al. 2016)

Total mean annual fishery-related serious injury and mortality is 0.67 fin whales annually (2014-2018) (Carretta et al. 2020). The average observed annual mortality and serious injury due to ship strikes is 1.6 fin whales per year during 2014-2018. Documented ship strike deaths and serious injuries are derived from direct counts of whale carcasses and represent minimum impacts (Carretta et al. 2020). The most conservative estimate of ship strike deaths from Rockwood et al. (2017) is 43 whales annually. The ratio of documented ship strike deaths (1.8/yr) to estimated annual deaths (43) implies a carcass recovery/documentation rate of 4.1%. There is uncertainty regarding the estimated number of ship strike deaths, however, it is apparent that carcass recovery rates of fin whales are quite low.

Although no fin whale entanglements have been observed 1990-2016 (Carretta et al. 2018a), some gillnet mortality may go unobserved because whales swim away with a portion of the net (Carretta et al. 2020). The average observed annual mortality due to ship strikes is 0.2 sei whales per year for the period 2012-2016. Additional ship strike mortality probably goes unreported because the whales do not strand or, if they do, they may not have obvious signs of trauma.

Sei whale (*Balaenoptera borealis*)

Sei whales have a worldwide distribution and are found primarily in cold temperate to subpolar latitudes across the North Pacific where there is steep bathymetric relief, such as the continental shelf break, canyons, or basins between banks and ledges (Best and Lockyer 2002; Burnham et al. 2019; Gregr and Trites 2001; Horwood 1987; Horwood 2009). Sei whales are migratory, spending the summer months feeding in the subpolar higher latitudes and returning to the lower latitudes to calve in the winter (Rone et al. 2017; Smultea 2014; Fulling et al. 2011; Olsen et al. 2009). In the winter in the Pacific, sei whales have been detected as far south as the Mariana Islands, Hawaii, and Southern California (Fulling et al. 2011; Smultea 2014). Analysis of sei whale genetic samples from around the Pacific suggests a single stock present in the Pacific (Baker et al. 2006; Huijser et al. 2018). For the Marine Mammal Protection Act (MMPA) stock assessment reports, sei whales within the Pacific U.S. EEZ are divided into two discrete areas: (1) California, Oregon and Washington waters and (2) waters around Hawaii. The Eastern North Pacific stock includes animals found within the U.S. west coast EEZ and in adjacent high seas waters; however, because comprehensive data on abundance, distribution, and human-caused impacts are lacking for high seas regions, the status of this stock is evaluated based on data from U.S. EEZ waters of the California Current (NMFS 2005).

Sei whales are rare in the California Current (Dohl et al. 1983; Barlow 2016; Forney et al. 1995; Green et al. 1992) but were the fourth most common whale taken by California coastal whalers in the 1950s-1960s (Rice 1974). Shipboard surveys off California, Oregon, and Washington from 1991-2014 sighted approximately 17 sei whales from 35° N to 45° N (Barlow 2016).

The sei whale is listed as an endangered under the ESA, but there is no designated critical habitat for this species (Carretta et al. 2020). A single Eastern North Pacific stock is recognized in the U.S. EEZ and that stock is considered depleted under the MMPA (Carretta et al. 2020). No data on trends in sei whale abundance exist for the eastern North Pacific. Although the population in the North Pacific is expected to have grown since being given protected status in 1976, the possible effects of continued unauthorized takes (Yablokov 1994), vessel strikes and gillnet mortality make this uncertain. Barlow (2016) noted that an increase in sei whale abundance observed in 2014 in the California Current is partly due to recovery of the population from commercial whaling but may also involve distributional shifts in the population. The best estimate of abundance for California, Oregon, and Washington waters is the unweighted geometric mean of the 2008 and 2014 estimates, or 519 (CV=0.40) sei whales (Barlow 2016).

The California swordfish drift gillnet fishery is the most likely U.S. fishery to interact with sei whales from this stock, but no entanglements have been observed from 8,845 monitored fishing sets from 1990-2016 (Carretta et al. 2018a). The average observed annual mortality due to ship strikes is 0.2 sei whales per year for the period 2012-2016. Increasing levels of anthropogenic sound in the world's oceans is a habitat concern for whales, particularly for baleen whales that may communicate using low-frequency sound (Croll et al. 2002).

Humpback whale *(Megaptera novaeangliae)*

Humpback whales occur throughout the North Pacific, with multiple populations recognized based on low latitude winter breeding areas (Calambokidis et al. 2001; 2008, Barlow et al. 2011). Exchange of animals between breeding areas occurs rarely, based on photo-identification data of individual whales (Calambokidis et al. 2001; 2008). Photo-identification evidence also suggests strong site fidelity to feeding areas, but animals from multiple feeding areas converge on common winter breeding areas (Calambokidis et al. 2008).

Along the U.S. West Coast, NMFS currently recognizes one humpback whale stock that includes two separate feeding groups: (1) a California and Oregon feeding group of whales that includes whales from the endangered Central American and threatened Mexican distinct population segments (DPSs) defined under the ESA (NOAA 2016a), and (2) a northern Washington and southern British Columbia feeding group that primarily includes whales from the threatened Mexican DPS, but also small numbers of whales from the unlisted Hawaii and endangered Central American DPSs (Calambokidis et al. 2008, Barlow et al. 2011, Wade et al. 2016, Wade 2017; 2021). Very few photographic matches between these feeding groups are documented (Calambokidis et al. 2008).

Seven BIAs for humpback whale feeding are identified off the U.S. west coast by Calambokidis et al. (2015), including five in California, one in Oregon, and one in Washington. The Humboldt and Morro Bay WEAs do not overlap with any of the BIAs, however vessels that may transit to and from Coos Bay, Crescent City, San Francisco and Morro Bay to the respective WEAs may transit through portions of the Fort Bragg to Point Arena, Gulf of the Farallones-Monterey Bay; and Morro Bay to Point Sal BIAs, following existing vessel traffic routes. Effective May 21, 2021, NMFS issued an updated final rule to designate critical habitat for the endangered Central America Distinct Population Segment (DPS), and the threatened Mexico DPS of humpback whales (*Megaptera novaeangliae*) (86 FR 21082). Critical habitat for these DPSs serve as feeding habitat and contain the essential biological feature of humpback whale prey. Critical habitat for the Central America DPS of humpback whales contains approximately 48,521 square nautical miles (nmi^2) of marine habitat in the North Pacific Ocean within the portions of the California Current Ecosystem off the coasts of Washington, Oregon, and California. Specific areas designated as critical habitat for the Mexico DPS of humpback whales contain approximately 116,098 nmi^2 of marine habitat in the North Pacific Ocean, including areas within portions of the eastern Bering Sea, Gulf of Alaska, and California Current Ecosystem. The Humboldt and Morro Bay WEAs and associated Action Area overlap with humpback whale critical habitat.

For the Marine Mammal Protection Act (MMPA) stock assessment reports, the California/Oregon/Washington Stock is defined to include humpback whales that feed off the west coast of the United States, including animals from both the California-Oregon and Washington-southern British Columbia feeding groups (Calambokidis et al. 2008, Barlow et al. 2011). Three other stocks are recognized in the Pacific region stock assessment reports: (1) Central North Pacific Stock (with feeding areas from Southeast Alaska to the Alaska Peninsula), (2) Western North Pacific Stock (with feeding areas from the Aleutian Islands, the Bering Sea, and Russia), and (3) American Samoa Stock in the South Pacific (with largely undocumented feeding areas as far south as the Antarctic Peninsula) (Carretta et al. 2020). The relationship of MMPA stocks to ESA distinct population segments (DPSs) is complex. Whales from three different DPSs (Central America, Mexico, and Hawaii) are included in the MMPA stock identified in this report as the "California/Oregon/Washington Stock" (COW). Nearly all Central American whales migrate to California and Oregon to feed, but the California/Oregon feeding area represents a mix of whales from Mexico and Central America (Wade 2021). Humpback whales expected to be present in the Action Area are expected to be part of the COW stock.

The COW stock is estimated to be increasing at 6-7% per year. Combining abundance estimates from both the California/Oregon and Washington/southern British Columbia feeding groups (2,374 + 526) yields an estimate of 2,900 animals (CV=0.048) for the COW stock (Carretta et al. 2020).

From 2013-2017, mortality due to interactions with fisheries amounted to 17.3 whales per year (Carretta et al. 2020). Fourteen humpback whales (totaling eight deaths, 2.8 serious injuries, and two non-serious injuries) were reported struck by vessels between 2013 and 2017 (Carretta et al. 2019a). An encounter theory model estimated the number of annual ship strike deaths to be 22 humpback whales, though this includes only the period July – November when whales are most likely to be present in the U.S. West Coast EEZ and the time of year that overlaps with cetacean habitat models generated from line-transect surveys (Becker et al. 2016, Rockwood et al. 2017). A humpback whale was entangled in a research marine mooring buoy in 2014. The whale is estimated to have been entangled for three weeks and had substantial necrotic tissue around the caudal peduncle. Although the whale was fully disentangled, this animal was categorized as a serious injury because of the necrotic condition of the caudal peduncle and the possibility that the whale would lose its flukes due to the severity of the entanglement (Carretta et al. 2019a). Increasing levels of anthropogenic sound in the world's oceans (Andrew et al. 2002) has also been identified as a threat to humpback whales.

Gray whale (Eschrichtius robustus)

There are two north Pacific stocks of gray whales: the Western stock (WNP)and the Eastern stock (ENP) designated in the Pacific SAR (Carretta et al., 2020). Gray whales of the WNP stock primarily occur in shallow waters over the U.S. West Coast, Russian, and Asian continental shelves, while the ENP stock whales primarily occur in shallow waters over the continental shelf of the U.S. West Coast and Mexico. This species is considered to be one of the most coastal of the great whales (Jefferson et al. 2015; Jones and Swartz 2009). The WNP stock primarily feed in the Okhotsk Sea off Sakhalin Island, Russia, and in the southeastern Kamchatka Peninsula in the southwestern Bering Sea in nearshore waters generally less than 225 ft deep (Jones and Swartz 2009; Weller and Brownell 2012). The breeding grounds consist of subtropical lagoons in Baja California, Mexico, and suspected wintering areas in southeast Asia (Alter et al. 2009; Jones and Swartz, 2009; Mate et al. 2015a; Urban-Ramirez et al. 2003; Weller et al., 2013). The ENP stock also feeds in nearshore waters in the Chukchi Sea, Bering Sea, Gulf of Alaska, the Pacific Northwest, and Northern California (Calambokidis et al. 2017; Lagerquist et al. 2018; Mate et al. 2010; 2013; 2015a; Weller et al., 2013). The main breeding grounds consist of subtropical lagoons in Baja California, Mexico (Alter et al. 2009; Jones and Swartz, 2009; Urban-Ramirez et al. 2003).

Some gray whales make the longest annual migration of any mammal (15,000–20,000 km roundtrip; (Guazzo et al. 2019). Gray whales migrate along the Pacific coast twice a year between October and July (Calambokidis et al. 2015). Although they generally remain mostly over the shelf during migration, some gray whales may be found in more offshore waters to the west of San Clemente Island and the Channel Islands (Calambokidis et al. 2015; Guazzo et al. 2019; Mate and Urban-Ramirez 2003; Schorr et al. 2019; Smultea 2014; Sumich and Show 2011). Recordings from a hydrophone array deployed offshore of central California (near Monterey) show that gray whales are acoustically active while migrating and that this acoustic behavior and their swimming behavior during migration changes on daily and seasonal time scales (Guazzo et al. 2017).

Information from tagging, photo-identification and genetic studies show that some whales identified in the Western North Pacific off Russia have been observed in the eastern North Pacific, including coastal waters of Canada, the U.S. and Mexico (Lang et al. 2014; Weller et al. 2012; Mate et al. 2015, Urbán et al. 2019). The number of whales documented moving between the Western and Eastern North Pacific represents 14% of gray whales identified off Sakhalin Island and Kamchatka according to Urban et al. (2019). Some whales that feed off Sakhalin Island in summer migrate east across the Pacific to the west coast of North America in winter, while others migrate south to waters off Japan and China (Weller et al. 2016). The current stock structure for gray whales in the Pacific has been in the process of being re-examined for a number of years and remains uncertain as of the most recent Pacific SAR (Carretta et al. 2020). Genetic data reveal mixed stock aggregations of gray whales in the North Pacific Ocean and indicate that current population structure is not reflected by the current eastern and western stock or DPS designations based on geography (Brüniche-Olsen et al. 2018; Carretta et al. 2020).

The WNP is endangered, with an estimated population size from photo-ID data for Sakhalin and Kamchatka in 2016 of 290 whales (90% percentile intervals = 271 – 311) (Cooke 2017, Cooke et al. 2018). Their main wintering areas are in waters off Russia and Asia (Mate et al. 2015a; Moore and Weller, 2013; Weller et al., 2012; 2013). Recent analysis of the data available for 2005 through 2016 estimates the combined Sakhalin Island and Kamchatka populations are increasing (Cooke 2019).

The ENP has recovered from whaling exploitation, is not considered depleted, and was delisted under the ESA in 1994 (Carretta et al. 2020; Swartz et al. 2006). The most recent estimate of abundance for the ENP population is from the 2015/2016 southbound survey and is 26,960 (CV=0.05) whales (Durban et al. 2017).

A few hundred gray whales that feed along the Pacific coast between southeastern Alaska and Northern California throughout the summer and fall are known as the Pacific Coast Feeding Group (PCFG) (Calambokidis et al. 2017; Carretta et al., 2017; Mate et al. 2013; Weller et al. 2013). The group has been identified as far north as Kodiak Island, Alaska (Gosho et al. 2011), and has generated uncertainty regarding the stock structure of the ENP (Carretta et al., 2017; Weller et al., 2012; 2013). Photo-identification, telemetry, and genetic studies suggest that the PCFG is demographically distinct from the

ENP (Calambokidis et al. 2017; Frasier et al. 2011; Lagerquist et al. 2018; Mate et al. 2010). In 2012–2013, the Navy funded a satellite tracking study of PCFG gray whales (Mate 2013). Tags were attached to 11 gray whales near Crescent City, California in fall 2012. Good track histories were received from 9 of the 11 tags, which confirmed an exclusive nearshore (< 19 km) distribution and movement along the Northern California, Oregon, and Washington coasts (Mate 2013). Although the duration of the tags was limited, none of the PCFG whales moved south beyond Northern California.

Both stocks could be present in the Action Area during their northward and southward migration (Calambokidis et al. 2015; Carretta et al. 2019c; Cooke et al. 2015; Moore and Weller 2018; Sumich and Show 2011; Weller et al. 2012; 2013). During surveys of the northern feeding grounds, the largest number of WNP gray whales was observed in late-August and early-September (Meier et al. 2007), suggesting those few gray whales that may migrate down the U.S. west coast will not be in California waters in general during those months.

Six gray whale coastal, inshore feeding, and 3 migratory BIAs are identified by Calambokidis et al (2015) along the U.S. West Coast. Vessels transiting from Coos Bay and Crescent City en route to the Humboldt WEA may intersect with the Point St. George feeding BIA. Additionally, vessels transiting from Coos Bay, Crescent City, San Francisco Bay and Morro Bay are likely to intersect with gray whale migratory BIAs. Vessels surveying potential cable routes are also likely to intersect with small portions of the migratory BIAs. The migration corridors used by the majority of gray whales are within 10 km of the U.S. West Coast (Calambokidis et al. 2015). However, some gray whales may take a migration path farther offshore, so an additional buffer extending 47 km from the coastline was added to the BIAs. Approximately half of the Morro Bay WEA (East to West) overlaps with the gray whale migratory buffer.

There has been no critical habitat designated for this species.

Sperm whale (Physeter macrocephalus)

Sperm whales consume a variety of squid and fish; females feed mostly on deep-living species of squid, whereas males often forage for bottom-dwelling fish (Whitehead 2003; Whitehead et al. 2008). Based on habitat models derived from line-transect survey data collected between 1991 and 2008 off the U.S. West Coast, sperm whales show an apparent preference for deep waters (Barlow et al. 2009; Becker et al. 2012; Becker et al. 2010; Forney et al. 2012). Sperm whales are distributed across the entire North Pacific and into the southern Bering Sea in summer, but the majority are thought to be south of 40°N in winter (Rice 1974; 1989; Miyashita et al. 1995). Sperm whales are found year-round in California waters (Dohl et al. 1983; Barlow 1995; Forney et al. 1995), but they reach peak abundance from April through mid-June and from the end of August through mid-November (Rice 1974). Sperm whales are seen off Washington and Oregon in every season except winter (Green et al. 1992). Of 176 sperm whales that were marked with Discovery tags off southern California in winter between 1962 and 1970, only three were recovered by whalers: one off northern California in June, one off Washington in June, and another far off British Columbia in April (Rice 1974).

Since 1978, there have been accounts of at least three other stranded sperm whales, including two in 2008, recorded by the Humboldt State University Vertebrate Museum. No sperm whales were reported from 30 surveys conducted off Eureka in fall 1991–2007 (Calambokidis 2009). Only two sperm whales were observed in low-elevation aerial surveys, both at depths of 656–6,561 ft (200–2,000 m) (Adams et al. 2014); satellite tracking has indicated their migration occurs along the continental shelf break, and passive acoustic monitoring has detected them in the Eel River Canyon.

The sperm whale has been listed as endangered since 1970 under the precursor to the ESA (NMFS, 2009), but there is no designated critical habitat for this species in the North Pacific. Sperm whales within the Pacific US EEZ are divided into three discrete, non-contiguous areas: California, Oregon and Washington (COW) waters, waters around Hawaii, and Alaska waters (Carretta et al. 2020). Sperm whales in the California Current have been identified as demographically independent from animals in Hawaii and the Eastern Tropical Pacific (Mesnick et al. 2011). The best estimate of sperm whale abundance in the California Current is the trend-based estimate corresponding to the most recent 2014 survey, or 1,997 (CV= 0.57) whales (Moore and Barlow 2014).

The fishery most likely to injure or kill sperm whales from this stock is the California thresher shark/swordfish drift gillnet fishery (Julian and Beeson 1998, Carretta et al. 2019a, 2019b), although sablefish hook and line fishery, entanglements in unknown fisheries, ingestion of marine debris and vessel strikes are also threats to this species (Carretta et al. 2020). For the 1991-2014 study period, conclusions about whether the population has increased or decreased are uncertain (Moore and Barlow 2017).

Southern resident killer whale (Orcinus orca)

The Eastern North Pacific Southern Resident stock of killer whales are composed of three matrilineal pods named J, K, and L (Bigg et al. 1990) and occur in the inland waterways of Puget Sound, Strait of Juan de Fuca, and southern Georgia Strait in spring, summer, and fall. Little is known about their fall, winter, and spring movements, but they have been reported in coastal waters off Oregon and Washington, especially in the area between Grays Harbor and the Columbia River (Ford et al. 2000, Hanson et al. 2017), and travel as far south as central California and as far north as the Southeast Alaska. Although less is known about the whales' movements in outer coastal waters, satellite tagging, opportunistic sighting, and acoustic recording data suggest that Southern Residents spend nearly all of their time on the continental shelf, within 34 km (21.1 mi) of shore in water less than 200 m (656.2 ft) deep (Hanson et al. 2017). Details of their winter range from satellite-tagging reveal whales use the entire Salish Sea (northern end of the Strait of Georgia and Puget Sound) in addition to coastal waters from the central west coast of Vancouver Island, British Columbia to Pt. Reyes in northern California (Carretta et al. 2020). Of the three pods comprising this stock, one (J) is commonly sighted in inshore waters in winter, while the other two (K and L) apparently spend more time offshore (Ford et al. 2000). Krahn et al. (2009) described sample pollutant ratios from K and L pod whales that were consistent with a hypothesis of time spent foraging in California waters, which is consistent with sightings of K and L pods as far south as Monterey Bay. On the basis of available information, it is likely that pods K and L of will travel by and perhaps through the nearshore portions of the action area (e.g., to depths of 656 ft [200 m] at infrequent intervals in winter or spring). They could forage for migrating Chinook salmon at the Klamath River mouth because of the abundance of prey. The two rivers closest to the Humboldt WEA, the Mad and Eel, have very few Chinook salmon in comparison, although Chinook salmon from the Sacramento River are regularly caught in nearshore fisheries in the action area (Bellinger et al. 2015).

Following the peak census count of 99 animals in 1995, the population size has declined approximately 1% annually and currently stands at 73 animals as of the 2019 census (Ford et al. 2000; Center for Whale Research 2019; 2020). A population viability analysis identified several risk factors to this population, including limitation of preferred Chinook salmon prey, anthropogenic noise and disturbance resulting in decreased foraging efficiency, vessel strikes and high levels of contaminants, including PCBs and DDT (Erbe 2002, Clark et al. 2009, Krahn et al. 2007; 2009, Lacy et al. 2017; Carretta et al. 2020).

The Southern Resident distinct population segment (DPS) was federally listed as endangered in 2005 (70 FR 69903). Critical habitat for this DPS was designated in the summer core area in Haro Strait and waters around the San Juan Islands, Puget Sound, and the Strait of Juan de Fuca (79 FR 69054). In August 2021, additional critical habitat was designated along the U.S. West Coast from the Canadian border to Point Sur, California, including offshore of Humboldt County between depths of 6.1–200 m (20–656 ft) (86 FR 41668). Critical habitat does not overlap with the Humboldt and Morro Bay WEAs, however vessels transiting from Coos Bay, Crescent City, or San Francisco Bay would intersect critical habitat en route to the Humboldt WEA.

Steller sea lion (Eumetopias jubatus)

Steller sea lions' range along the north Pacific from northern Japan to California (Perrin et al. 2009), with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands (Muto et al. 2019). The Steller sea lion is a colonial breeder. They feed on a variety of fishes, bivalves, cephalopods, and gastropods. They may disperse long distances to find prey but are not known to migrate. Haul outs and rookeries usually consist of beaches, ledges, and rocky reefs (NMFS 2019). Steller sea lions do not dive deep and they forage over the continental shelf at night, usually within 12 miles of the colony (Loughlin 2008). Individuals rarely come ashore on the mainland but haul out on islands and offshore rocks and even remain at sea during stormy weather (Kenyon and Rice 1961). Steller sea lions breed along the Humboldt County coast and their presence in the marine and coastal portions of the action area varies throughout the year. Two of the three largest breeding colonies in the region are on Sugarloaf Island off Cape Mendocino and on St. George Reef off Crescent City.

The Steller sea lion was federally listed as threatened in 1990 (NMFS 1990). In 1997, the eastern population (i.e., east of 144° W longitude) was listed as threatened, and the western population (i.e., west of 144° W longitude) was listed as endangered (NMFS 1997). The eastern DPS has since recovered and is no longer listed (78 FR 66139, 11/04/2013), increasing at the maximum theoretical net productivity rate for pinnipeds of 12 % (Muto et al. 2020b). The western DPS remains endangered. There is an exchange of sea lions across the stock boundary (144°W), especially due to the wide-ranging seasonal movements of juveniles and adult males (Baker et al. 2005; Jemison et al. 2013; 2018). The total count estimate of pups and non-pups for the U.S. portion of the eastern stock of Steller sea lions (excluding Canada) in 2017 is 43,201 and is considered to be a minimum population estimate (Johnson and Fritz 2014).

Critical habitat was designated in 1993, and includes Sugarloaf Island, Cape Mendocino, Southeast Farallon Island, and Año Nuevo Island in California (NMFS 1993). . The closest critical habitat areas are on/around Sugarloaf Island offshore Cape Mendocino, approximately 40 km (25 mi) to the southeast of the Humboldt WEA and Año Nuevo Island off Central California (Muto et al., 2019), and 48 km (92 mi) north of the Morro Bay WEA. Although vessels transiting from San Francisco Bay and Crescent City might transit through waters around Southeast Farrallon Island and Sugarloaf Island, the proposed action is not anticipated to overlap with Steller sea lion critical habitat.

Mortality and serious injuries from commercial and recreational fisheries, marine debris, vessel strike, illegal shooting, explosives, disturbance at rookeries, Native subsistence harvest and incidental mortality currently impact Eastern U.S. Steller sea lions (Muto et al. 2020). A changing ocean environment, particularly warmer temperatures, may be resulting in increased California sea lion over Steller sea lion in the southern portion of the Steller sea lion's range (NMFS 2008).

Guadalupe fur seal (Arctocephalus townsendii)

The Guadalupe fur seal is a pelagic species for most of the year, occurring in the subtropical waters of southern California and Mexico. Breeding occurs almost entirely on Isla de Guadalupe, Mexico, from May to July (CMLPAI 2009; NMFS, 2019a). In recent years, several Guadalupe fur seals have been consistently observed at San Miguel Island. In 1997, a pup was observed there but no other pups were observed until 2008. Breeding colonies may occur on San Miguel and San Nicolas Islands (Seal Conservation Society, 2011). Guadalupe fur seals are solitary, non-social animals, but males may mate with up to 12 females during the breeding season (NMFS, 2019a). They feed in deep waters on krill, squid, and small schooling fish (CMLPAI, 2009). Unusual mortality events (UME), in the form of increased strandings of Guadalupe fur seals, have occurred along the entire coast of California, beginning in January 2015 at eight times higher than the historical average. Strandings have continued since 2015 at well above average rates in California. Additionally, Guadalupe fur seal strandings in Oregon and Washington became elevated in 2019. Along the U.S. West Coast, strandings occur almost annually in California waters and animals are increasingly observed in Oregon and Washington waters (Carretta et al. 2020). Most stranded animals were less than 2 years old, malnourished with secondary bacterial and parasitic infections (NMFS, 2019b; Carretta et al. 2020). Guadalupe fur seals that stranded in central California and treated at rehabilitation centers were fitted with satellite tags and documented to travel as far north as Graham Island and Vancouver Island, British Columbia, Canada (Norris et al. 2015). Some satellite-tagged animals traveled far offshore outside the U.S. EEZ to areas 700 nmi west of the California / Oregon border. The population is considered to be a single stock because all are recent descendants from one breeding colony at Isla Guadalupe, Mexico (Carretta et al. 2020).

Current threats include incidental mortality and serious injury in commercial and unidentified fisheries, entanglement in marine debris and shootings (Carretta et al. 2020).

The Guadalupe fur seal was federally listed as endangered in 1967 and then re-listed as threatened in 1985 (NOAA 1985). The main reason for listing was a severe population decline due to hunting. No critical habitat has been designated for the Guadalupe fur seal. Since their listing, Guadalupe fur seals have significantly increased in numbers with an estimated annual rate of increase of 5.9% (range 4.1–7.7%) (García-Aguilar et al. 2018). The minimum population size of 31,019 animals is taken as the lower bound of the estimate provided by García-Aguilar et al. (2018) in Muto et al. (2020).

Species Unlikely to Occur in the Action Area

North Pacific right whale (Balaena japonica)

The likelihood of a North Pacific right whale being present in the Action Area is extremely low, as in recent years this species has only been routinely observed or acoustically detected in the Bering Sea (Brownell et al. 2001; Filatova et al. 2019; NMFS 2017; Shelden et al. 2005; Wade et al. 2011; 2010; Wright et al. 2019; 2018; Zerbini et al. 2015; 2010), with occasional sightings of individuals in the Gulf of Alaska (Matsuoka et al. 2014; Širović et al. 2015b; Wade et al., 2011), waters off British Columbia and the border with Washington State (Ford et al 2016; Širović et al 2015a; U.S. Department of the Navy 2015), and Southern California (Muto et al. 2018; WorldNow 2017). The most recent estimated population for the eastern North Pacific right whale is between 26 and 31 individuals (Muto et al. 2020b). Although this estimate may be reflective of a Bering Sea subpopulation, the total eastern North Pacific population is unlikely to be much larger (Wade et al. 2010). There have been only four sightings, each of a single right whale, in Southern California waters over approximately the last 30 years (in 1988, 1990, 1992, and 2017) (Brownell et al. 2001; Carretta et al. 1994; NMFS 2017; WorldNow 2017).

Sightings off California are rare, and there is no evidence that the western coast of the United States was ever highly frequented by this species (Brownell et al. 2001; NMFS 2017; Scammon, 1874). Historically, even during the period of U.S. West Coast whaling through the 1800s, right whales were considered uncommon to rare off California (Reeves & Smith, 2010; Scammon, 1874). For the reasons presented above, North Pacific right whales are not expected to be present during any proposed activities in the action area and as a result are considered extralimital for purposes of the analysis.

Sea Turtles

Detailed species descriptions, including state, habitat ranges, population trends, predator/ prey interactions, and species-specific threats are described in Argonne (2019), H.T. Harvey and Associates (2020), and US Navy (2022), and are included by reference and summarized below.

Four ESA-listed species of sea turtles may occur in waters offshore California: leatherback sea turtle *(Dermochelys coriacea),* green sea turtle *(Chelonia mydas),* loggerhead sea turtle *(Caretta caretta)*, and olive ridley sea turtle *(Lepidochelys olivacea)*. Two species are federally endangered: leatherback and loggerhead sea turtle (North Pacific Ocean Distinct Population Segment [DPS]); and two species are federally threatened: the green sea turtle (East Pacific DPS) and olive ridley sea turtle (*Lepidochelys olivacea*). Of these species, only leatherbacks and loggerheads are likely to occur in waters offshore Central and Northern California, and thus in the Action Area. No known nesting habitat for any of these turtles occurs in the Action Area. Threats to sea turtles include climate change, incidental capture, entanglement, and injury/death from fishing gear; marine debris; environmental contamination; disease, loss, or degradation of nesting habitat; beach armoring; artificial lighting; non-native vegetation; and directed harvest (NMFS, 2014).

Species Likely to Occur in the Action Area

Leatherback sea turtle (Dermochelys coriacea)

Leatherbacks may be the most common species of sea turtle in the Action Area, but they continue to be rarely seen. About 150 to 170 leatherback sea turtles occur annually off the California coast between Point Conception and Point Arena during the summer and fall (June and stay until mid-October) whereafter they move to waters off Hawaii. Diet is primarily jellyfish, but they also consume other invertebrates, small fish, and plant material (NMFS 2016a; Nafis, 2018). They are typically observed in deeper waters over the continental slope, and while mostly pelagic, the leatherback sea turtle occasionally enters shallower waters of bays and estuaries (NMFS, 2016b).

They are the most pelagic of the four sea turtle species that may occur along the California coast. In the fall of 1990 to 2003, aerial line-transect surveys for marine mammals and sea turtles were conducted in waters less than 302 ft (92 m) depth, and within 21 mi (34 km) of the central and northern California shore, from Point Conception to the Oregon border (Benson et al. 2007). Two to 28 leatherback sea turtles per year were reported, for a total of 100 individuals during the 13-year survey period. The lowest densities were in south-central California and the northern coast (including Humboldt County), and the highest was along the central coast (Figure 6). None of the individuals reported from the northern coast were north of Cape Mendocino in Mendocino County. However, tagged leatherback sea turtles have been observed offshore of the northern California coast (Benson et al. 2011; TOPP 2019). In addition, recreational and commercial fishermen have reported sightings in the area and several sightings off Humboldt County, including Shelter Cove and Humboldt Bay, were reported in the 1970s.

Hazen et al. (2018) developed a habitat suitability model to predict leatherback occurrence in the California Current Ecosystem. The model incorporated satellite tracking data from 20 tagged leatherbacks to aid in characterizing the type of habitat coincident with leatherback occurrence. The bathymetry (i.e., water depth and seafloor features) and sea surface temperature were the most informative habitat features in predicting the occurrence of leatherbacks in the California Current Ecosystem and seems to align where persistent upwelling occurs. Although leatherback sea turtles are rarely sighted during surveys, and tend to occur in pelagic waters, of all four of the sea turtle species, the leatherback sea turtle is most likely to occur in the Action Area.

The leatherback sea turtle is currently listed as a single population and is classified as endangered under the ESA (35 Federal Register 8491). However, USFWS and NMFS completed a review of the status of the leatherback in 2020 and have identified seven leatherback DPSs based on nesting locations and foraging distribution: Northwest Atlantic, Southwest Atlantic, Southeast Atlantic, Southwest Indian, Northeast Indian, West Pacific, and East Pacific (NMFS and USFWS 2020a). While USFWS and NMFS have identified and defined the seven DPSs, the population has not been established and listed as DPSs under the ESA, which requires official rulemaking and publication in the Federal Register (16 United States Code 1533(a)(1)), and no effort to this extent is anticipated. Recent information on population structure (through genetic studies) and distribution (through telemetry, tagging, and genetic studies) have led to an increased understanding and refinement of the global population structure and supported the separation of the population into DPSs (NMFS and USFWS 2020a; Wallace et al. 2010). Only leatherbacks from the West Pacific DPS could occur in the Action Area.

Most leatherback nesting populations in the Pacific Ocean are faring poorly and have declined by more than 80 percent since the 1980s. Because the threats to smaller subpopulations have not been eliminated, the International Union for Conservation of Nature has predicted a decline of 96 percent for the western Pacific subpopulation and a decline of nearly 100 percent for the eastern Pacific subpopulation by 2040 (NMFS 2016a; Sarti-Martinez et al. 1996). Along the U.S. West Coast, which serves as a major foraging ground for leatherbacks, a recent study concluded that the number of leatherbacks foraging off the coast declined by 5.6 percent annually between 1990 and 2017, representing an 80 percent decline in the foraging population over that time period (Benson et al. 2020). From 1990 to 2003, Benson et al. (2020) estimated that an average of 128 leatherbacks foraged in Central California waters, whereas from 2004 to 2017, the number declined to an average of 55 leatherbacks. The decline in the number of foraging leatherbacks off California continued despite favorable foraging conditions and the availability of prey (brown sea nettle), suggesting other factors are perpetuating the long-term decline (Benson et al. 2020).

Causes for the decline in the Pacific include the intensive egg harvest at leatherback rookeries and high levels of mortality through the 1980s associated with bycatch in the gill net fisheries (NMFS and USFWS, 2020a). The trend in the foraging population off Central California is similar to declines of about 6 percent annually in the nesting population on Indonesian beaches (Benson et al. 2020).

Critical habitat has been designated to include the waters from Cape Flattery, Washington to Winchester Bay, Oregon, out to the 2,000 m isobath (NMFS 2012). In California, critical habitat extends from Point Arena to Point Arguello, inshore of the 3000 m depth contour (NMFS 2012), which overlaps with the entire Morro Bay WEA and associated Action Area (Figure 6). Critical habitat was not designated off Humboldt County (NMFS 2012) and does not overlap with the Humboldt WEA, however vessels transiting from San Francisco Bay would transit through the northern extent of leatherback critical habitat.

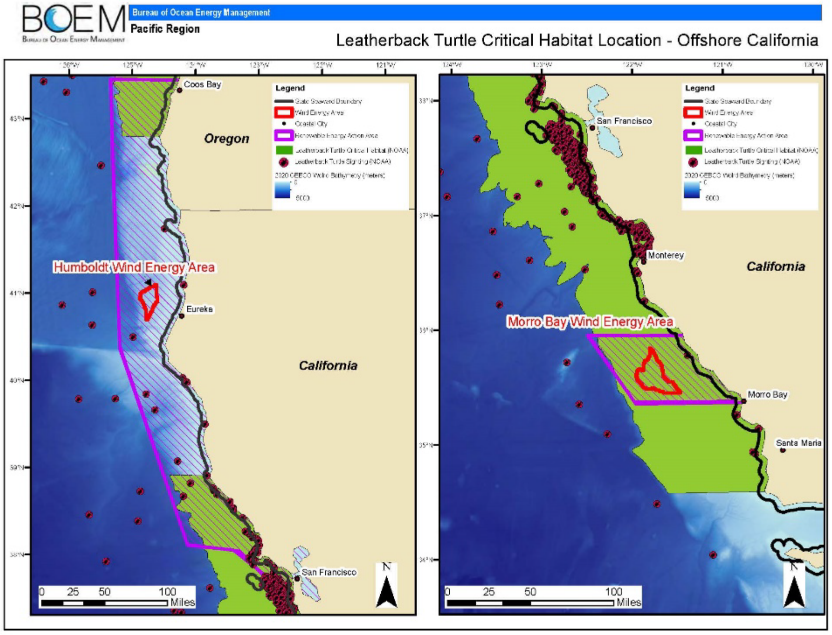

Figure 6: Sightings of leatherback sea turtles along the U.S. West Coast (1980-2012) in relation to the Action Area and leatherback critical habitat (NMFS, 2012).

Loggerhead sea turtle (Caretta caretta)

In the eastern Pacific, loggerhead sea turtles are reported from Chile to Alaska. They are occasionally sited from the coasts of Washington and Oregon, but most records are of juveniles off the coast of California. The most important development habitats for juveniles along the eastern Pacific are off the west coast of Mexico, including the Baja Peninsula. The only known nesting areas in the North Pacific are found in southern Japan (NMFS 2017b). Sightings in California tend to occur from July to September but can occur over most of the year during El Niño years when ocean temperatures rise. The loggerhead sea turtle is primarily pelagic, but occasionally enters coastal bays, lagoons, salt marshes, estuaries, creeks, and mouths of large rivers (NMFS and USFWS 2020). Loggerhead sea turtles consume whelks and conchs, but also sponges, crustaceans, jellyfish, worms, squid, barnacles, fish, and plants (NMFS 2017b; NMFS and USFWS 2020). Loggerhead sea turtles have been observed at scattered locations from Point Conception to the U.S./Mexico border (NMFS and USFWS 2020).

In 2015, Eguchi et al. (2018) conducted an aerial survey of the southern California Bight extending approximately from Pt. Conception to south of the U.S.-Mexico border and offshore as far as 123 N. Over 200 loggerheads were encountered during the survey, which coincided with anomalously high sea surface temperatures and a strong El Niño. El Niño conditions in the eastern North Pacific coupled with other largescale ocean-atmosphere circulations in the western tropical Pacific resulted in anomalously warm sea surface temperatures in the region and affected the ranges of numerous marine species (Bond et al. 2015).

A previous survey in the same region conducted in 2011 during a La Niña (anomalously cold) year encountered no loggerheads. Eguchi et al. (2018) estimated an offshore density of 0.24 loggerheads per km^2, which is comparable to the density estimated off the Baja Peninsula (Seminoff et al. 2014) and suggests that loggerheads that typically forage off the Baja Peninsula may take advantage of productive foraging habitat to the north when anomalously warm water temperatures persist. It is also possible that loggerheads foraging off southern California are part of the Central Pacific foraging group, which may follow warmer waters eastward into the California Current Ecosystem (Abecassis et al. 2013; Allen et al. 2013; Eguchi et al. 2018). Increasing ocean temperatures associated with climate change may, over time, allow foraging loggerheads to expand their range north on a more regular basis (Eguchi et al. 2018).

While loggerheads, primarily juveniles, are known to occur at sea off central and southern California, they do not nest on California beaches. Based on multiple studies conducted in the North Pacific, loggerhead sea turtles are known to occur in areas where sea surface temperature ranges between 10 and 28.7°C; however, mean sea surface temperatures, which are more indicative of preferred habitat, ranged between 16.3 and 24°C (Eguchi et al. 2018). Below 15°C, loggerheads become lethargic and inactive, and when temperatures fall to 10°C, they become cold-stunned (Mrosovsky 1980). Sea surface temperatures in the Action Area are generally cooler than temperatures preferred by loggerhead sea turtles, except for periods (e.g., during El Niño conditions) when water temperatures can be as much as 4 to 5°C warmer than during “normal” conditions. Occurrence of loggerheads would only be expected during summer and fall when water temperatures are more likely to be within their preferred range.

In waters off of the U.S. West Coast, most records of loggerhead sightings, stranding events, and incidental bycatch have been of juveniles documented from the nearshore waters (Eguchi et al. 2018). In general, sea turtle sightings increase during the summer, peaking from July to September off Southern California and southwestern Baja California, with fewer loggerheads expected farther north in the Action Area (Eguchi et al. 2018). No loggerhead nesting occurs within the Action Area.

Despite historic long-term declines at nesting beaches in Japan of 50–90 percent since the year 2000 nesting populations in Japan appear to be gradually increasing or remaining stable (Chapman and Seminoff 2016; NMFS and USFWS 2007).

In 2009, a status review conducted for the loggerhead (the first turtle species subjected to a complete stock analysis) identified nine DPSs within the global population (Conant et al. 2009). In a September 2011 rulemaking, the NMFS and USFWS listed five of these DPSs as endangered and kept four as threatened under the ESA, effective as of October 24, 2011 (76 Federal Register 58868). The North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea DPSs of the loggerhead sea turtle are classified as endangered under the ESA, and the Southeast Indo-Pacific Ocean, Southwest Indian Ocean, Northwest Atlantic Ocean, and South Atlantic Ocean DPSs are classified as threatened. Only the North Pacific Ocean DPS occurs within the Action Area; however, mixing is known to occur between other populations in the Pacific and Indian Oceans, enabling a limited amount of gene flow with other DPSs (Gaos 2011). A 5-year review was conducted on the North Pacific DPS, and no changes were made to the listing status (NMFS and USFWS, 2020b)

There is no critical habitat designated for loggerhead sea turtles within the Action Area.

Species Unlikely to Occur in the Action Area

Green sea turtle (Chelonia mydas)

The green sea turtle occurs worldwide in surface waters that remain above 22°C (Van Houtan et al. 2015). In the eastern North Pacific, green sea turtles have been sighted as far north as Alaska, but most commonly occur from southern California to northwestern Mexico (NMFS 2016c). Green sea turtles occur year-round off the Southern California coast with highest concentrations occurring duly July through September (BSEE 2011). The green sea turtle is usually seen in El Niño years when ocean temperatures are warmer than normal. Climate change and ocean warming trends may impact the habitat and range of this species over time (Fuentes et al. 2013). It inhabits shallow waters of lagoons, bays, estuaries, mangroves, eelgrass, and seaweed beds; it prefers areas with abundant vegetation in shallow, protected water. Green sea turtles are herbivorous, feeding primarily on algae and seagrasses (NMFS 2016c).

The green sea turtle was first listed under the ESA in 1978. In 2016, NMFS and USFWS reclassified the species into 11 “distinct population segments” (DPSs), which maintains federal protections while providing a more tailored approach for managers to address specific threats facing different populations (81 FR 20057). The geographic areas that include these DPSs are (1) North Atlantic Ocean, (2) Mediterranean Sea, (3) South Atlantic Ocean, (4) Southwest Indian Ocean, (5) North Indian Ocean, (6) East Indian Ocean – West Pacific Ocean, (7) Central West Pacific Ocean, (8) Southwest Pacific Ocean, (9) Central South Pacific Ocean, (10) Central North Pacific Ocean, and (11) East Pacific Ocean.

Only the East Pacific Ocean DPS could potentially overlap with the Action Area but is considered extralimital and unlikely. This segment is listed as threatened under the ESA; however, it should be noted that minimal mixing may occur (gene flow) with other population segments (Seminoff et al. 2015). Counts of adult females at nesting sites in Mexico, Costa Rica, and Ecuador used by the East Pacific DPS were used to estimate an abundance of over 20,000 nesters (Seminoff et al. 2015).

Ocean waters off central and Southern California are considered areas of occurrence because of the presence of nearshore rocky ridges and channels and floating kelp habitats suitable for green sea turtle foraging and resting (Stinson 1984); however, these waters are often at temperatures below the thermal preferences of this primarily tropical species, and turtles found in these waters are likely transiting to warmer waters (Crear et al. 2016).

There is no critical habitat designated for the green sea turtle in the Action Area.

Olive ridley sea turtle (Lepidochelys olivacea)

The olive ridley has a global tropical distribution, occurring in the Atlantic, Pacific, and Indian oceans (National Marine Fisheries Service and U.S. Fish and Wildlife Service 2014). In the eastern Pacific, olive ridley typically occur in tropical and subtropical waters, as far south as Peru and as far north as California, but occasionally have been documented as far north as Alaska. The number of olive ridley sea turtles occurring in U.S. territorial waters is believed to be small (NMFS and USFWS 1998; 2014).

Studies from different populations of olive ridley sea turtles show a strong preference for neritic waters (shallow, nearshore waters overlying the continental shelf) (Plot et al. 2015; Polovina et al. 2004; Rees et al. 2018). However, deep water foraging has been documented in the North Pacific, where prey items are scattered and less predictable and migrate widely from nesting locations (Polovina et al. 2004). Comparing olive ridley habitat use in different regions, Plot et al. (2015) suggest that the differing migration patterns observed (i.e., oceanic migrations versus neritic movements) may be attributed to specific environmental conditions of the areas in close proximity to nesting sites. There are no known nesting sites within U.S. territory.

Olive ridley sea turtles primarily occupy areas where the sea surface temperature is between 23 and 28°C (Polovina et al. 2004) and most frequently around 27°C (Eguchi et al. 2007). Between 10 and

13.5°C, olive ridleys become cold stunned (Mrosovsky 1980). Sea surface temperatures in the Action Area are expected to be cooler than temperatures preferred by olive ridley sea turtles, and the occurrence of olive ridleys would only be expected during unusually warm temperatures, such as during an El Niño event (Spotila 2004).

Olive ridley sea turtles that nest along the Pacific coast of Mexico are listed as endangered under the ESA, while all other populations are listed under the ESA as threatened (43 FR 32800). Based on genetic data, the worldwide olive ridley population is composed of four main lineages: east India, Indo-Western Pacific, Atlantic, and eastern Pacific Ocean (NMFS and USFWS 2014; Shankar et al. 2004). Off of California, olive ridleys are thought to be within the eastern Pacific Ocean lineage (NMFS and USFWS 2014).

There is no critical habitat designated for olive ridley sea turtles in the Action Area.

Fishes

Twelve fish taxa are listed under the ESA as either threaten or endangered.

Chinook Salmon (*Oncorhynchus tshawytscha*)

Chinook salmon are an anadromous fish species that are found in along the Pacific coast and inland from Ventura River in California to Point Hope, Alaska and in northeast Asia. On occasion they have been found further south. Like other Pacific salmon species, they are semelparous and spawning occurs in freshwater from August through February. Chinook salmon can spend up to a year in freshwater before migrating downstream to the ocean. They spend 2 to 8 years in the ocean before migrating back to natal freshwater rivers and streams to spawn.

Given this widespread geographic distribution, Chinook salmon have developed diverse and complex life history strategies. Chinook salmon can be categorized as either "stream-type" or "ocean-type" strategists. Stream-type Chinook salmon reside in freshwater for a year or more following emergence, whereas "ocean-type" Chinook salmon migrate to the ocean predominantly within their first year. In addition to differences in freshwater life histories, there appears to be differing ocean use patterns between these stream-type and ocean-type Chinook salmon. Stream-type populations appear to undertake extensive offshore ocean migrations while ocean-type Chinook salmon undertake distinct, coastally oriented, ocean migrations (Good et al. 2005).

Juvenile Chinook salmon exhibit a patchy distribution in U.S. West Coast waters; in pelagic trawl surveys conducted in summer and fall along Oregon and Washington, half of all juvenile salmonids were collected in about 5 percent of the surveys, and none were collected in about 40 percent of the surveys (Peterson et al. 2010). In general, salmonids are low in abundance in U.S. West Coast waters when compared to other fish, as evidenced by: (1) the low numbers of juvenile salmonids captured in directed pelagic surface/ subsurface research trawls relative to other nekton (Brodeur et al. 2004, Brodeur et al. 2005, Fisher et al. 2014, Peterson et al. 2010, Trudel et al. 2009), and (2) the low numbers of adult and subadult salmonids captured as bycatch in midwater trawls (e.g., commercial trawls for whiting, see Lomeli and Wakefield 2014).

Juvenile salmonids are pelagic and typically surface-oriented, most often found in the upper 20 m of the water column (Emmett et al. 2004, Walker et al. 2007, Beamish et al. 2000). Adult coho salmon tend to occur at shallower depths (< 40 m) than adult Chinook salmon (Walker et al. 2007). Juvenile Chinook salmon tend to occur closer inshore than other juvenile salmonid species, generally within the 100-meter isobath (Brodeur et al. 2004, Peterson et al. 2010), and occasionally being found in the surf zone (Marin Jarrin et al. 2009). Once in the ocean, Chinook salmon feed upon small crustaceans, other invertebrates as juveniles, and larval and juvenile fish as adults (Love 1996).

Within the action area three evolutionary significant units (ESUs) may occur that are either threatened or endangered under the ESA.

Sacramento River Winter-Run ESU (Endangered). The listing status for this Chinook salmon ESU was determined to be endangered on January 4, 1994, (59 FR 440). Critical habitat was designated on June 16, 1993 and does not overlap with the action area. This ESU includes winter-run Chinook salmon spawning naturally in the Sacramento River and its tributaries, as well as winter-run Chinook salmon that are part of the conservation hatchery program at the Livingston Stone National Fish Hatchery.

Central Valley Spring-Run ESU (Threatened). The listing status for this Chinook salmon ESU was determined to be endangered on September 16, 1999 (FR 64 50394). Critical habitat was designated on September 2, 2005 (70 FR 52488) and does not overlap with the action area. This ESU includes naturally spawned spring-run Chinook salmon originating from the Sacramento River and its tributaries, and also spring-run Chinook salmon from the Feather River Hatchery Spring-run Chinook Salmon Program.

California Coastal ESU (Threatened). The listing status for this Chinook salmon ESU was determined to be threatened on September 16, 1999 (FR 64 50394). Critical habitat was designated on September 2, 2005 (70 FR 52488) and does not overlap with the action area. On June 28, 2005, NMFS confirmed the listing of California Coastal Chinook salmon as threatened under the ESA and also added seven artificially propagated populations from the following hatcheries or programs to the listing. This ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River (Humboldt County, CA.) to the Russian River (Sonoma County, CA).

Coho Salmon (Oncorhynchus kisutch)

Coho salmon are found in the North Pacific Ocean and inland from Monterey Bay, California to Point Hope, Alaska and north Asia. They are semelparous and spawning takes place in freshwater from September through late January. Coho salmon typically exhibit a three-year life history, divided between 18 months in freshwater and 18 months in saltwater phases. In freshwater, coho salmon spawn and rear in small streams with stable gravels and complex habitat features, such as backwater pools, beaver dams, and side channels. Marine survival and growth of coho salmon are linked to food availability, environmental conditions, and stressors present in the nearshore environment. Juvenile coho salmon disperse from their natal streams to coastal waters; their ocean distribution changes with time, with juveniles typically moving northward or farther offshore (Brodeur et al. 2004). Ocean dispersal rates for yearling Columbia River coho salmon averaged between 3.2 and 6.6 km/d (Fisher et al. 2014). Juvenile salmonids are pelagic and typically surface-oriented, most often found in the upper 20 meters of the water column (Emmett et al. 2004, Walker et al. 2007, Beamish et al. 2000). Adult coho salmon tend to occur at shallower depths (< 40 meters) than adult Chinook salmon (Walker et al. 2007).

In general, juvenile salmonids are low in abundance in U.S. West Coast waters when compared to other fish, as evidenced by the low numbers of juvenile salmonids captured in directed pelagic surface/subsurface research trawls relative to other nekton (Brodeur et al. 2004, Brodeur et al. 2005, Fisher et al. 2014, Peterson et al. 2010). Juvenile coho salmon exhibit a patchy distribution in U.S. West Coast waters; in pelagic trawl surveys conducted in summer and fall along Oregon and Washington, half of all juvenile salmonids were collected in about 5 percent of the surveys, and none were collected in about 40 percent of the surveys (Peterson et al. 2010). Juvenile coho salmon occur in coastal waters, usually further offshore than juvenile Chinook salmon (Brodeur et al. 2004, Peterson et al. 2010). While in the ocean, coho salmon primarily feed upon fish and planktonic invertebrates (Love, 1996).

Within the action area two ESUs may occur that are either threatened or endangered under the ESA.

> *Central California Coast ESU (Endangered).* The listing status for this coho salmon ESU was determined to be threatened under the ESA on October 31, 1996 (64 FR 56138); NMFS re-classified the ESU as endangered on June 28, 2005 (70 FR 37160). Critical habitat was designated on May 5, 1999 (64 FR 24049) and does not overlap with the action area. This ESU includes naturally spawned coho salmon originating from rivers south of Punta Gorda, California, up to and including Aptos Creek, as well as such coho salmon originating from tributaries to San Francisco Bay. Coho salmon from three artificial propagation programs are included in this ESU.

> *Southern Oregon/Northern CA Coast ESU (Threatened).* The listing status for this coho salmon ESU was determined to be threatened under the ESA on May 6, 1997 (62 FR 24588). The listing was revisited and confirmed as threatened on June 28, 2005. Critical habitat was designated on May 5, 1999 (64 FR 24049) and does not overlap with the action area. This ESU includes naturally spawned coho salmon originating from coastal streams and rivers between Cape Blanco, Oregon, and Punta Gorda, California. Coho salmon that originate from three artificial propagation programs are also included.

Steelhead (Oncorhynchus mykiss irideus)

Steelhead originally ranged from northern Mexico to southeastern Alaska and inland. (They are iteroparous and spawning takes place in the spring. Juveniles typically spend 2 years in freshwater before migrating downstream the ocean. While in the ocean, steelhead feed upon insects, mollusks, crustaceans, fish eggs, and other small fishes (Love, 1996).

Steelhead are rainbow trout that exhibit an anadromous life history pattern. By migrating to the ocean, steelhead grow to much larger sizes than their resident rainbow trout cohorts. Anadromous steelhead and resident rainbow trout can be considered to be from the same population, as anadromous parents can produce resident offspring and resident parents can produce anadromous offspring. This adaptive life history makes steelhead flexible to changing habitat conditions. Also, unlike other Pacific salmonids, they can spawn more than one time.

After emergence, young steelhead rear in freshwater streams for 1 to 4 years before out migrating to the ocean. After reaching the ocean in the spring, juvenile steelhead tend to move offshore quickly rather than use nearshore waters like other salmon. For example, Daly et al. (2014) captured tagged juvenile steelhead that migrated greater than 55 km offshore of the Columbia River within 3 days. While as sea, steelhead are found in pelagic waters of the Gulf of Alaska principally within 10 meters from the surface, though they sometimes travel to greater depths (Light et al. 1989).

Within the action area five distinct population segments (DPSs) may occur that are either threatened or endangered under the ESA.

Southern California Coastal DPS (Endangered). The listing status for this steelhead DPS was determined to be endangered on August 18, 1997 (62 FR 43937) and January 5, 2006 (71 FR 833); range extension on May 1, 2002 (67 FR 21586); updated April 14, 2014 (79 FR 20802). Critical habitat was designated on September 2, 2005 and does not overlap with the action area. The Southern California Coast Steelhead DPS is comprised of a suite of anadromous steelhead populations that inhabit coastal stream networks from the Santa Maria River system south to the U.S. border with Mexico.

Northern California DPS (Threatened). The ESA listing status for this steelhead DPS was threatened on June 07, 2000 (65 FR 36074) and January 5, 2006 (71 FR 833); updated April 14, 2014 (79 FR 20802). Critical habitat was designated on September 2, 2005 and does not overlap with the action area. This DPS includes naturally spawned anadromous steelhead originating below natural and manmade impassable barriers in California coastal river basins from Redwood Creek to and including the Gualala River.

California Central Valley DPS (Threatened). The ESA listing status for this steelhead DPS was threatened on March 19, 1998 (63 FR 13347); reaffirmed January 5, 2006 (71 FR 833). Critical habitat was designated September 2, 2005 and does not overlap with the action area. This DPS includes naturally spawned anadromous populations originating below natural and manmade impassable barriers from the Sacramento and San Joaquin Rivers and their tributaries; excludes such fish originating from San Francisco and San Pablo Bays and their tributaries. Steelhead from the following artificial propagation programs are also included within the DPS: Coleman National Fish Hatchery Program, Feather River Fish Hatchery Program, and Mokelumne River Hatchery Program.

Central California Coast DPS (Threatened). The ESA listing status for this steelhead DPS was threatened on August 18, 1997 (62 FR 43937) and January 5, 2006 (71 FR 834); updated April 14, 2014 (79 FR 20802). Critical habitat was designated September 2, 2005 and does not overlap with the action area. This DPS includes naturally spawned anadromous populations originating below natural and manmade impassable barriers from the Russian River to and including Aptos Creek, and all drainages of San Francisco and San Pablo Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers. Steelhead from the following artificial propagation programs are also included within the DPS: Don Clausen Fish Hatchery Program and Kingfisher Flat Hatchery Program (Monterey Bay Salmon and Trout Project).

South-Central California Coast DPS (Threatened). The ESA listing status for this steelhead DPS was threatened on August 18, 1997 (62 FR 43937) and January 5, 2006 (71 FR 833); updated April 14, 2014 (79 FR 20802). Critical habitat was designated September 2, 2005 and does not occur withing the action area. This DPS includes naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from the Pajaro River to (but not including) the Santa Maria River.

Green Sturgeon (Acipenser medirostris), Southern DPS (Threatened).

The North American green sturgeon is an anadromous fish that occurs in the nearshore Eastern Pacific Ocean from Alaska to Mexico (Huff et al., 2012). Green sturgeons are long-lived, late-maturing, iteroparous, anadromous species that spawn infrequently in natal streams, and spend substantial portions of their lives in marine waters. NMFS has identified two distinct population segments (DPS) of green sturgeon: northern and southern (Israel et al. 2009). In 2006, NMFS determined that the Southern

DPS of green sturgeon warranted listing as a threatened species under the ESA (71 FR 17757). Green sturgeon have been observed in large concentrations in the summer and autumn within coastal bays and estuaries along the west coast of the US, including the Columbia River estuary, Willapa Bay, Grays Harbor, San Francisco Bay and Monterey Bay (Huff et al. 2012; Lindley et al. 2011; Lindley et al. 2008; Moser and Lindley 2007).

On October 9, 2009, NMFS designated critical habitat for the Southern DPS of green sturgeon (74 FR 52300). Critical habitat is designated in coastal U.S. marine waters within 110 m (60 fathoms) depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary; the Sacramento River, lower Feather River, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; the lower Columbia River estuary; and certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor). The portion of the critical habitat that lies within marine coastal zone overlaps with the action area associated with the Humboldt WEA but not the Morro Bay WEA.

Eulachon (Thaleichthys pacificus) Southern DPS (Threatened).

The eulachon is a small, cold-water species of anadromous fish, occupying the eastern Pacific Ocean in nearshore waters to depths of about 300 m (1,000 ft) from California to the Bering Sea. Eulachon will return to their natal river spawn. The Southern DPS was first listed as threatened by NMFS on March 18, 2010 (75 FR 13012). On October 20, 2011, NMFS designated critical habitat for Southern DPS eulachon (76 FR 65324), which does not overlap with the action area. Southern DPS eulachon are those that spawn in rivers south of the Nass River in British Columbia to the Mad River in California (NMFS, 2016).

Potential Impact Sources

Noise

High Resolution Geophysical surveys

In order for a sound to be potentially disturbing, it must be able to be heard by the animal. Effects on hearing ability or disturbance can result in disturbance of important biological behaviors such as migration, feeding, resting, communication, and breeding. Baleen whales hear lower frequencies; sperm whales, beaked whales and dolphins hear mid-frequencies; porpoise hear high frequencies; seals from 50 hertz (Hz) to 86 kHz, and sea lions from 60 Hz to 39 kHz (Table 8; NMFS 2016d; 2018). Sea turtles are low frequency hearing specialists with a range of maximum sensitivity between 100 to 800 Hz (Table 8; Bartol et al. 1999; Bartol and Ketten 2006; Lenhardt 1994; Lenhardt 2002; Ridgway et al. 1969). Cartilaginous fish are known to be sensitive to low frequency sounds up to 1.5 kHz, peaking between 200 and 600 Hz, depending on the species (Chapuis et al. 2019).

The assessment of potential hearing effects in marine mammals and fish is based on NMFS' technical guidance for assessing acoustic impacts, defined as Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) (NMFS 2018) (Table 8). The methodology developed by the U.S. Navy is currently thought to be the best available data to evaluate the effects of exposure to the survey noise by sea turtles that could result in physical effects (Anderson 2021; US Navy 2017).

Injury and mortality in fishes exposed to impulsive sources may vary depending on the presence or absence of, and type of swim bladder. Injury and mortal injury have not been observed in fishes without a swim bladder because of exposure to impulsive sources (Halvorsen et al. 2011; 2012a). Therefore, if any effects were to occur, they would likely occur above the given thresholds in Table 8. Cumulative sound exposure thresholds for mortality and injury in fishes with a swim bladder were measured by investigators (Halvorsen et al. 2011; 2012a; 2012b). However, only the single strike peak sound pressure level was measured during these experiments; therefore, mortality and injury thresholds are assumed to be the same across all hearing groups with a swim bladder (Popper et al. 2014).

Although the proposed action does not include the use of air guns, since no other data for fishes exists, as a proxy, exposure to sound produced from an air gun at a cumulative sound exposure level of 186 dB re 1 μPa^2-s has resulted in TTS in fishes (Popper et al. 2005). TTS is not likely to occur in fishes without a swim bladder and would likely occur above the given threshold in Table 8 for fishes with a swim bladder not involved in hearing.

Table 8: Impulsive Acoustic Thresholds Identifying the Onset of PTS and TTS for Marine Mammal, Sea Turtle, and Fish 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 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) (underwater)	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
Atlantic/shortnose Sturgeon[3]	100 Hz to 800 Hz	>207 Peak[5] 203 dB cSEL	186 dB cSEL
Atlantic Salmon[3]	< 380 Hz	>207 Peak[5] 203 dB cSEL	186 dB cSEL
Sharks[4]	<1.5 kHz	>213 dB Peak[5] >216 dB cSEL	NC

Notes: cSEL = Cumulative sound exposure level (decibel referenced to 1 micropascal squared seconds [dB s]), Peak = Peak sound pressure level (decibel referenced to 1 micropascal [dB re 1 µPa]), "> indicates that the given effect would occur above the reported threshold dB = decibels Hz = hertz kHz = kilohertz NC = effects not likely to occur

[1] NMFS, 2018b, [2] US Navy, 2017, [3] Hawkins and Johnstone, 1978, [4] Chapuis et al., 2019, [5] Popper et al., 2014

Vessel Noise

For most of the world oceans, shipping and seismic exploration noise dominate the low-frequency portion of the spectrum (Hildebrand 2009). In particular, noise generated by shipping has increased as the number of ships on the high seas has increased. Along the west coast of North America, long-term monitoring data suggest an average increase of about 3 dB per decade in low-frequency ambient noise (Andrew et al. 2002; McDonald et al. 2006; 2008).

The sound generated from individual vessels can contribute to overall ambient noise levels in the marine environment on variable spatial scales. The survey vessels would contribute to the overall noise environment by transmitting noise through both air and water. Underwater noise produced by vessels is a combination of narrow-band (tonal) and broadband sound. Tones typically dominate up to about 50 Hz, whereas broadband sounds may extend to 100 kHz. According to Southall (2005) and Richardson et al. (1995), vessel noise typically falls within the range of 100–200 Hz.

In the frequency range of 20-500 Hz, distant shipping is the primary source of ambient noise (URI 2017). Spray and bubbles associated with breaking waves are the major contributions to ambient noise in the 500-100,000 Hz range. At frequencies greater than 100,000 Hz, "thermal noise" caused by the random motion of water molecules is the primary source. Ambient noise sources, especially noise from wave and tidal action, can cause coastal environments to have particularly high ambient noise levels.

Vessel noise can potentially mask vocalizations and other biologically important sounds (e.g., sounds of prey or predators) that marine mammals may rely on. Potential masking can vary depending on the ambient noise level within the environment, the received level and frequency of the vessel noise, and the received level and frequency of the sound of biological interest. For example, right whales were observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks et al. 2007) as well as increasing the amplitude (intensity) of their calls (Parks et al. 2011; Parks et al. 2009). Right whales also had their communication space reduced by up to 84 percent in the presence of vessels (Clark et al. 2009). Although humpback whales did not change the frequency or duration of their vocalizations in the presence of ship noise, their source levels were lower than expected, potentially indicating some signal masking (Dunlop 2016).

Vessel Collisions

Most vessel strikes of marine mammals reported involve commercial vessels and occur over or near the continental shelf (Laist et al. 2001). Reporting to NMFS of whale strikes by commercial vessels is not required, and reporting rates are therefore unknown but likely to be much lower than actual occurrences. Additionally, although the public is prohibited from harassing, harming, pursuing, wounding, killing, capturing, or collecting marine species protected by the ESA and MMPA, there are no national requirements for commercial vessels to mitigate for vessel strikes with protected species other than NOAA's Marine Life Viewing Guidelines (https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines) and federal law that requires vessels to remain 100 yards away from humpback whales in Hawaii and Alaska waters, 200 yards from killer whales in Washington State inland waters, and 500 yards away from North Atlantic right whales anywhere in U.S. waters.

While some risk of a vessel strike exists for all the U.S. West Coast waters, 74 percent of blue whale, 82 percent of humpback whale, and 65 percent of fin whale known vessel strike mortalities occur in the shipping lanes associated with the ports of San Francisco and Los Angeles/Long Beach (Rockwood et al. 2017). A gray whale calf was severely injured offshore Morro Bay, California during installation of a trans-Pacific cable. The injury consisted of a severely cut tail stock and flukes completely severed off the animal. The extent of the injury (severing of the caudal peduncle) was consistent with a propeller strike (Burton and Harvey 2001). Vessel traffic within the U.S. West Coast EEZ continues to be a ship strike threat to all large whale populations (Redfern et al. 2013; Moore et al. 2018).

Vessels strikes pose a threat to the West Pacific DPS 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 percent of total; NMFS unpublished data). The range of the DPS overlaps with many high-density vessel traffic areas and it is possible that the vast majority of vessel strikes are undocumented. However, information on vessel strikes for other locations is not available (NMFS and USFWS 2020a). Additionally, vessel strikes (e.g., hull impacts and propeller lacerations) likely injure or kill loggerheads. However, few vessel strikes are documented, and no estimate of the frequency of occurrence if available. Therefore, the effect on the DPS is unknown (NMFS and USFWS 2020b).

Habitat Alteration

Geotechnical sampling (gravity cores, piston cores, vibracores, deep borings, cone penetration tests, etc.) and biological grab sampling may damage benthic habitats by removing soft sediments from the seabed. Collection of samples causes disturbance as sediment moves to fill the hole left by the removed core or grab, possibly exposing animals in the surrounding sediment to predators (Skilleter 1996). Sampling may also disrupt microbial assemblages in the sediments and breakdown biotic structures which help bind sediments (e.g., microbial mats). The distribution of these samples will occur throughout the leases, but the total spatial extent of sampling will be a small percentage compared to the overall area.

Habitat disturbance to seafloor sediments may occur during geotechnical investigations, biological grab sampling, and buoy emplacement/removal activities. Disturbance may cause sediments and benthic organic material to be introduced into the water column and may also increase local turbidity levels. Direct effects from sediment suspension and increased turbidity on fish populations may include exposure to contaminants, changes in feeding rates, reduction in predator-avoidance ability, or smothering of feeding and respiratory organs (Wilber and Clarke 2001; Utne-Palm 2002; Au et al. 2004). To avoid these consequences, fishes may choose to relocate until water clarity returns to levels similar to pre-disturbance conditions. Indirect effects on fish populations from sediment suspension and increased turbidity may occur by harming the populations of prey species on which the fishes depend (Airoldi 2003). Biological response to these potential impacts is often a function of concentration and exposure duration (Newcombe and Jensen 1996). The proposed activities from the project are predicted to generate only minimal and short-term impacts to benthic habitats and cause a negligible increase in suspended materials over a short time frame. Therefore, proposed activities associated will have minimal adverse effects to EFH.

Indirect effects from buoy emplacement may preserve habitat integrity as fishers may avoid these areas until buoys are decommissioned. The damage from bottom-contact gear would then be displaced to outside of the lease area.

Entanglement in ROV cables and Metocean Buoy Mooring

Most entanglements are never observed, but those that are include many cases of entangled whales with unidentified gear (IWC 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 (Richards 2012; Love 2013; Saez et al. 2021). Animals may swim into moorings accidentally or actively seek out anchor chains or boats as a surface to scratch against (Benjamins et al. 2014)(Benjamins et al. 2014)

A total of 511 whale entanglements, 429 confirmed, along the U.S. West Coast have been reported from 1982-2017. The annual average of total entanglement reports received by NMFS for the same period was 14, with an average of 12 confirmed entanglement reports per year (Saez et al. 2021). There are no recorded events in the literature of ESA-listed species becoming entangled in ROV cables. The following gear types have been identified as involved in the entanglement of large whales off the U.S. West Coast between 1982 and 2017: netting, commercial and recreational fishing pots/traps, salmon troll line, steel cables, and one weather buoy (in 2014). Since 2000 (289 confirmed reports), pot/trap gear has become the most commonly identified gear type associated with entanglement reports (32 %).

Sea turtles have been documented to be entangled in a large variety of man-made items (Duncan et al. 2017; NMFS and USFWS 2008; Dodge et al. 2022). Sea turtle entanglements are an underestimate as not all entanglements are reported. In waters off the Northeast United States, the primary species entangled is the leatherback sea turtle, but loggerhead and green sea turtle entanglements also occur. Since the Sea Turtle Disentanglement Network was formed in 2002 and through 2014, there have been 275 entanglements in vertical lines (NMFS 2015). Turtles are usually entangled around the neck and/or front flippers. Sightings of leatherback sea turtles in the eastern North Pacific are most frequently encountered off the coast of central California (Benson et al. 2007). This species faces significant threats from bycatch in fisheries (entanglement and/or hooking) (Benson et al. 2020; Dodge et al. 2022). A leatherback was found dead, entangled in a 3/8” galvanized boat mooring chain, offshore Massachusetts (Dodge et al. 2022).

Accidental Release of Pollutants and Marine Debris

Oil and other chemical spills are a specific type of ocean contamination that can have damaging effects on some marine mammal species directly through exposure to oil or chemicals and indirectly due to pollutants’ impacts on prey and habitat quality (Engelhardt 1983; MMC 2010; Matkin et al. 2008). In the five-year period from 2013–2017 along the Pacific coast, there were 127 pinnipeds found stranded with a serious injury or mortality caused by oil or tar coating their body (Carretta et al. 2019a).

On a broader scale ocean contamination resulting from chemical pollutants inadvertently introduced into the environment by industrial, urban, and agricultural use is also a concern for marine mammal conservation and has been the subject of numerous studies (Cossaboon et al. 2019; Desforges et al. 2016; Fair et al. 2010; Krahn et al. 2007; 2009; Moon et al. 2010; Ocean Alliance 2010). For example, the chemical components of pesticides used on land flow as runoff into the marine environment and can accumulate in the bodies of marine mammals and be transferred to their young through mother’s milk (Fair et al. 2010). The presence of these chemicals in marine mammals has been assumed to put those animals at greater risk for adverse health effects and potential impact on their reproductive success given toxicology studies and results from laboratory animals (Fair et al. 2010; Goddard-Codding et al. 2011; Krahn et al. 2007; 2009; Peterson et al. 2014; 2015). Desforges et al. (2016) have suggested that exposure to chemical pollutants may act in an additive or synergistic manner with other stressors, resulting in significant population-level consequences. Although the general trend has been a decrease in chemical pollutants in the environment following their regulation, chemical pollutants remain important given their potential to impact marine mammals (Bonito et al. 2016; Jepson and Law 2016; Law et al. 2014).

Potential sources of chemical pollution related to the proposed action are from allisions with the metocean buoy and/or a spill during fuel transfer to the generator on the metocean buoy.

Ocean litter, or marine debris, is a persistent, well-documented problem of global scale. Anthropogenic (human-caused) litter has been observed on seafloors and in submarine canyons, in sediments, surface waters, and the water column, and on beaches and shorelines worldwide (Galgani et al. 2015). Most marine debris is thought to come from land-based sources, though ocean-based debris can be significant in some areas (e.g., Sheavly 2007; Jang et al. 2014). Ocean-based litter is generated by the intentional or unintentional discharge of debris directly into the ocean. Marine activities that generate ocean-based litter include commercial shipping, recreational and commercial fishing, aquaculture, research and military endeavors, and offshore drilling (Galgani et al. 2015; UN Environment & GRID-Arendal 2016). The vast majority of marine debris is made up of various forms of plastic that are highly persistent and often contain toxic chemicals or acquire them from the surrounding seawater. The fragmentation of plastics produces large numbers of microplastic particles that are easily taken up by a wide range of marine organisms (SCBD 2016).

Ocean litter has detrimental ecological, economic, and social impacts. Marine species, including seals, sea birds, sea turtles, whales, and dolphins can become entangled in debris, resulting in hindered movement, decreased feeding ability, injury, and death (Kühn et al. 2015; NOAA MDP 2014). Fish, crustaceans, shellfish, and zooplankton ingest microplastics, and some of these organisms consume less food and have decreased energy for growth as a result (Boerger et al. 2010; Browne et al. 2008; Cole et al. 2013; Murray and Cowie 2011; Watts et al. 2015). Furthermore, microplastics adsorb organic contaminants and trace metals from their surrounding environments (Holmes et al. 2012; Rochman et al. 2013).

There is a clear increase in the number of species, particularly marine mammals, known to be affected with 40 per cent of the taxa known to ingest marine debris, mainly attributable to a review of the impacts of marine debris on cetaceans (Baulch and Perry 2014). The number of marine fish and seabirds affected by ingestion or entanglement has also risen. New records for plastic ingestion by fish have been reported in a range of habitats, including open ocean, deep-water and temperate pelagic and demersal (See Appendix 1a in Secretariat SCBD 2016).

According to the 2007 National Marine Debris Monitoring Program Report, a total of 54.3 % of the ocean litter found on California’s beaches is land-based, while about 10.2 % is ocean-based (Sheavly 2007). The remaining 35 % is characterized as general-source debris, or items that could be either land-based or ocean-based (Sheavly 2007).

Impacts to Threatened and Endangered Species

Marine Mammals and Sea Turtles

The potential IPFs for marine mammals and sea turtles associated with the Proposed Action include noise from HRG and geotechnical surveys, vessel noise, the potential for collision with project-related vessels and potential entanglement in mooring systems associated with the installation of a metocean buoy, as well as accidental release of pollutants and marine debris.

BOEM directs lessees to incorporate best management practices into their plans. These have been developed through years of conventional energy operations and refined through BOEM's renewable energy program and consultations with NMFS, including vessel strike avoidance measures, visual monitoring, and shutdown and reporting. These measures, which will minimize or eliminate potential effects from site characterization surveys and site assessment activities to protected marine mammal and sea turtle species, are found in Appendix A.

Project-Related Noise

High-Resolution Geophysical (HRG) Surveys

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)(Crocker and Fratantonio 2016). Using 19 HRG source levels (excluding side-scan sonars operating at frequencies greater than 180 kHz, and other equipment that is unlikely to be used for data collection/site characterization surveys associated with offshore renewable energy) with NOAA's sound exposure spreadsheet tool, injury (PTS) exposure distance ranges were calculated for ESA-listed species (Table 9). To provide the maximum impact scenarios, the highest power levels and most sensitive frequency setting for each hearing group was used. A geometric spreading model, together with calculations of absorption of high frequency acoustic energy in sea water, when appropriate, was used to estimate injury and disturbance distances for listed marine mammals. The spreadsheet and geometric spreading models do not consider the tow depth and directionality of the sources; therefore, these are likely overestimates of actual injury and disturbance distances. All sources were analyzed at a tow speed of 2.315 meters per second (m/s) (4.5 knots).

Table 9: Summary of PTS Exposure Distances (in m) for Marine Protected Species from Mobile HRG Sources Towed at a Speed of 4.5 knots

Table 9a: Mobile, Impulsive, Intermittent Sources

HRG SOURCE	PTS EXPOSURE DISTANCE (m)							
	Highest Source Level (dB re 1 µPa)	Low Frequency (e.g., Baleen Whales)[1]	Mid-Frequency (e.g., Dolphins and Sperm Whales)[1]	High Frequency (e.g., Porpoise)	Phocids (true seals)	Otariids (sea lions and fur seals)	Sea Turtles	Fishes
Boomers, Bubble Guns (4.3 kHz)	176 dB SEL 207 dB RMS 216 peak	0.3	0	5.0	0.2	0	0	3.2
Sparkers (2.7 kHz)	188 dB SEL 214 dB RMS 225 peak	12.7	0.2	47.3	6.4	0.1	0	9.0
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	NA

Table 9b: Mobile, Non-Impulsive, Intermittent Sources

HRG SOURCE	PTS EXPOSURE DISTANCE (m)							
	Highest Source Level (dB re 1 µPa)	Low Frequency (e.g., Baleen Whales)[1]	Mid-Frequency (e.g., Dolphins and Sperm Whales)[1]	High Frequency (e.g., Porpoise)	Phocids (true seals)	Otariids (sea lions and fur seals)	Sea Turtles	Fishes
Multi-beam echosounder (100 kHz)	185 dB SEL 224 dB RMS 228 peak	0	0.5	251.4*	0	0	NA	NA
Multi-beam echosounder (>200 kHz)	182 dB SEL 218 dB RMS 223 peak	NA	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	NA

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

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

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

RMS = root mean square SEL = sound exposure level

Potential for injury: For marine mammal species expected to occur in the Proposed Action Area, PTS distances are generally small, ranging from 0–47 m (0-154 ft) (Table 9). The largest possible PTS distance is 251.4 m (825 ft) for porpoise species, only when the 100 MHz multi-beam echosounder is used. However, this range is likely an overestimate since it assumes the unit is operated in full power mode, that it is an omnidirectional source, and absorption of sound over distance is not considered. With the vessel strike avoidance requirements, as well as requirements for qualified Protected Species Observers (PSOs) to monitor a 1,000 m (3,280 ft) clearance zone, for vessels to maintain 500 m (1,640 ft) from ESA-listed marine mammals, as well as the shutdown requirements when ESA-listed marine mammal species are sighted within 500 m, BOEM believes that the risk of PTS occurring for any ESA-listed marine mammal species from HRG surveys is discountable.

PTS exposure thresholds (calculated for 204 cSEL and 23 dB peak criteria (US Navy 2017)) are higher for sea turtles than for marine mammals, and based on the source characteristics, are not likely to result in PTS. The predicted distances from these mobile sound sources indicate the sound sources are transitory and have no risk of exposure to levels of noise that could result in PTS for sea turtles (Anderson 2021).

Potential for disturbance: Using the same sound sources as for the PTS analysis, maximum disturbance distances to the non-frequency weighted 160 dB re 1 µPa RMS threshold for marine mammals, 175 dB re 1 µPa RMS for sea turtles, and 150 dB re 1 µPa RMS for fish were calculated using a spherical spreading model (20 LogR). These results describe maximum disturbance exposures for protected species, including ESA-listed marine mammals, sea turtles, and fish to each potential sound source (Table 10).

Table 10: Summary of Maximum Disturbance Distances for Protected Marine Protected Species from Mobile HRG Sources Towed at a Speed of 4.5 knots

Table 10a: Mobile, Impulsive, Intermittent Sources

HRG SOURCE	DISTURBANCE DISTANCE (m)						
	Low Frequency (e.g., Baleen Whales)[1]	Mid-Frequency (e.g., Dolphins and Sperm Whales)[1]	High Frequency (e.g., Porpoise)	Phocids (true seals)	Otariids (sea lions and fur seals)	Sea Turtles	Fishes
Boomers, Bubble Guns (4.3 kHz)	224	224	224	224	224	40	708
Sparkers (2.7 kHz)	502	502	502	502	502	90	1,585
Chirp Sub-Bottom Profilers (5.7 kHz)	282	282	282	282	282	50	NA

Table 10b: Mobile, Non-Impulsive, Intermittent Sources

HRG SOURCE	DISTURBANCE DISTANCE (m)						
	Low Frequency (e.g., Baleen Whales)[1]	Mid-Frequency (e.g., Dolphins and Sperm Whales)[1]	High Frequency (e.g., Porpoise)	Phocids (true seals)	Otariids (sea lions and fur seals)	Sea Turtles	Fishes
Multi-beam Echosounder (100 kHz)	NA	370	370	NA	NA	NA	NA
Multi-beam Echosounder (>200 kHz)	NA	NA	NA	NA	NA	NA	NA
Side-scan Sonar (>200 kHz)	NA	NA	NA	NA	NA	NA	NA

Notes:

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

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

The disturbance distances depend on the equipment and the species present. The range of disturbance distances for all ESA-listed marine mammal and sea turtle species expected to occur in the Proposed Action Area is from 40–502 m (131–1,647 ft), with sparkers producing the upper limit of this range (Table 10). Visual monitoring requirements of a 500 m (1,640 ft) exclusion zone for ESA-listed large whales will ensure that any potential impacts to these species from noise generated by HRG survey equipment will be reduced to insignificant levels.

The largest possible disturbance distance for sea turtles is 90 m from a HRG vessel. In a scenario where a vessel is approaching a turtle at 90 m, it will reach the turtle in 39 seconds at a speed of 4.5 knots (2.315 m/sec). Subsequently, a vessel could pass a turtle and be beyond the 90 m disturbance distance in another 39 sec. Therefore, the largest potential disturbance time is likely to be no longer than 78 seconds along any given survey line. BOEM believes that these brief, periodic disturbances will have discountable effects on sea turtles.

The purpose of the clearance zone is to monitor for behavioral disturbance when ESA-listed species are within the survey area and to watch for any animals heading toward the exclusion zone. For any animals sighted within the clearance zone, a shut-down would not be required unless adverse responses are observed or animals are in distress (e.g., an injured or entangled animal). The purpose of the exclusion zones for all listed marine mammal species is to avoid or minimize the number of exposures by means of monitoring and HRG equipment shut-down provisions when listed marine mammals are sighted within the exclusion distance. A description of the PDCs and associated BMPs for PSOs, including clearance zones, exclusion zones, shut-downs, and ramp-up requirements can be found in Appendix A. Harm from periodic behavioral reactions to HRG survey noise is not expected to occur for any ESA-listed species with the implementation of the proposed PDCs.

Disturbance distances to ESA-listed marine mammal and sea turtle species are conservative, as explained above, and any behavioral effects will be intermittent and short in duration and are expected to result in discountable to insignificant effects.

Geotechnical Surveys

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

Vessel Noise

The vessels used for the proposed action will produce low-frequency, broadband underwater sound below 1 kHz (for larger vessels), and higher-frequency sound between 1 kHz to 50 kHz (for smaller vessels), although the exact level of sound produced varies by vessel type.

The general frequency range for vessel noise (10 to 1000 Hz; MMS 2007) overlaps with the generalized hearing range for blue, fin, sei, humpback (7 Hz to 35 kHz) and sperm whales (150 Hz to 160 kHz) and would therefore be audible. Vessels without ducted propeller thrusters would produce levels of noise of 150 to 170 dB re 1 µPa-1 meter at frequencies below 1,000 Hz, while the expected sound-source level for vessels with ducted propeller thrusters level is 177 dB (RMS) at 1 meter (BOEM 2015, Rudd et al. 2015). For ROVs, source levels may be as high as 160 dB (BOEM 2021). Given that the noise associated with the operation of project vessels is below the thresholds that could result in injury, no injury is expected.

In the open ocean, ambient noise levels are between about 60 and 80 dB re 1 µPa in the band between 10 Hz and 10 kHz due to a combination of natural (e.g., wind) and anthropogenic sources (Urick 1983), while inshore noise levels, especially around busy ports, can exceed 120 dB re 1 µPa. When the noise level is above the sound of interest, and in a similar frequency band, masking could occur. This analysis assumes that any sound that is above ambient noise levels and within an animal's hearing range may potentially cause masking. However, the degree of masking increases with increasing noise levels; a noise that is just detectable over ambient levels is unlikely to cause any substantial masking.

Vessel noise has the potential to disturb marine mammals and elicit an alerting, avoidance, or other behavioral reaction. These reactions are anticipated to be short-term, likely lasting the amount of time the vessel and the whale are in close proximity (Magalhães et al. 2002; Richardson et al. 1995; Watkins 1981), and not consequential to the animals. Additionally, short-term masking could occur. Masking by passing ships or other sound sources transiting the action area would be short term and intermittent, and therefore unlikely to result in any substantial costs or consequences to individual animals or populations. Areas with increased levels of ambient noise from anthropogenic noise sources such as areas around busy shipping lanes and near harbors and ports may cause sustained levels of masking for marine mammals, which could reduce an animal's ability to find prey, find mates, socialize, avoid predators, or navigate (Anderson 2021).

Based on the best available information, ESA-listed whales are either not likely to respond to vessel noise or are not likely to measurably respond in ways that would significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding or sheltering. Therefore, the effects of vessel noise on ESA-listed whales are insignificant (i.e., so minor that the effect cannot be meaningfully evaluated or detected) (Anderson 2021).

Per Anderson (2021) ESA-listed turtles could be exposed to a range of vessel noises within their hearing abilities. Depending on the context of exposure, potential responses of leatherback and loggerhead sea turtles to vessel noise disturbance would include startle responses, avoidance, or other behavioral reactions, and physiological stress responses. Very little research exists on sea turtle responses to vessel noise disturbance. Currently, there is nothing in the available literature specifically aimed at studying and quantifying sea turtle response to vessel noise. However, a study examining vessel strike risk to green sea turtles suggested that sea turtles may habituate to vessel sound and may be more likely to respond to the sight of a vessel rather than the sound of a vessel, although both may play a role in prompting reactions (Hazel et al. 2007). Regardless of the specific stressor associated with vessels to which turtles are responding, they only appear to show responses (avoidance behavior) at approximately 10 m or closer (Hazel et al. 2007).

Therefore, the noise from vessels is not likely to affect sea turtles from further distances, and disturbance may only occur if a sea turtle hears a vessel nearby or sees it as it approaches. These responses appear limited to non-injurious, minor changes in behavior based on the limited information available on sea turtle response to vessel noise.

For these reasons, vessel noise is expected to cause minimal disturbance to sea turtles. If a sea turtle detects a vessel and avoids it or has a stress response from the noise disturbance, these responses are expected to be temporary and only endure while the vessel transits through the area where the sea turtle encountered it. Therefore, sea turtle responses to vessel noise disturbance are considered insignificant (i.e., so minor that the effect cannot be meaningfully evaluated), and a sea turtle would be expected to return to normal behaviors and stress levels shortly after the vessel passes by.

Vessel Collisions

The number of round trips for project-related vessels over a 3-year period will range from 138-543 for 24-hour operations and 456-861 for 10-hour daily operations in the Humboldt project area, and 150-555 for 24-hour operations and 464-873 for 10-hour daily operations in the Morro Bay project area. Since

BOEM has not received any survey plans in the Pacific to date, the number of surveys within the Action Area is a highly conservative estimate, meaning the highest possible number of trips is assumed even though it is unlikely this many trips will take place. An additional 42-50 round trips will be conducted over a 5-year period for the deployment, maintenance, and decommissioning of 6 metocean buoys (3 in Humboldt WEA and 3 in Morro Bay WEA). According to industry practice, vessel speeds will be limited to less than 5 knots (2.57 m/s) during HRG surveys, and approximately 10 knots or less during biological surveys. Vessel transit speeds in Federal waters will vary, however BOEM's BMPs encourage transit speeds of 10 knots or less whenever practicable and safe to do so, in addition to requirements for protected species observers and vessel strike avoidance measures (Appendix A). Within CA state waters, BOEM's BMP states that all vessels transiting to and from ports, conducting site characterization studies, surveys, metocean buoy installation, maintenance, or decommissioning will travel at speeds no more than 10 knots during all related activities. If future consultation with NMFS, USFWS or other state or federal agency results in different vessel speed requirements, BOEM will work with California Coastal Commission staff to ensure that any new requirements remain consistent and do not diminish the level of resource protection provided by this requirement.

BOEM and BSEE monitor for any takes that have occurred as a result of vessel strikes by requiring any operator of a vessel immediately report the striking of any ESA-listed marine animal. BOEM's proposed BMP for Vessel Strike Avoidance and Injured/Dead Protected Species Reporting requires operators to implement measures to minimize the risk of vessel strikes to protected species and report observations of injured or dead protected species. This BMP will be required for every applicable permit and plan that has associated vessel traffic that is approved by BOEM or BSEE. BOEM's BMP states that Lessees will have qualified PSOs on board, or dedicated crew on watch to monitor a vessel strike avoidance zone for protected species. All vessels will reduce travel speeds to 10 knots or less if whales are detected within 500 m of the forward path of any vessel, and the vessel will steer a course away from the whale at 10 knots or less or stop their vessel to avoid striking protected species. If a sea turtle is sighted within the operating vessel's forward path, the vessel operator must slow down to 4 knots (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, BOEM and 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 measures for avoiding impacts to mother/calf pairs (https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines#guidelines-&-distances). Additionally, wherever available, Lessees will ensure all vessel operators check for daily information regarding protected species sighting locations. These media may include, but are not limited to: Channel 16 broadcasts, whalesafe.com, and the Whale/Ocean Alert App.

Rockwood et al (2017) recommend types of enhanced conservation measures to decrease ship strike mortality. The potential for effects to all ESA-listed species from vessel traffic associated with data collection activities are expected to be reduced to discountable levels with the implementation of the BMP for vessel operations. Similar activities have taken place since at least 2012 in association with BOEM's renewable energy program in the Atlantic OCS and there have been no reports of any vessel strikes of marine mammals and sea turtles.

Entanglement in ROV cables and Metocean Buoy Moorings

Reviews of entanglements of large whales and sea turtles have resulted in a number of recommendations to reduce the risk of entangling animals (IWC 2016; NMFS 2015), some of which are practicable for marine industries in general. General recommendations to reduce entanglement risks include reduced number of buoy lines, no floating line 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. Use sinking lines, rubber-coated lines, sheaths, chains, acoustic releases, weak links, and other potential solutions to lower entanglement risk. Weak links may not be feasible if there is a risk of the data buoy being lost, but they may be feasible on ancillary lines that will not affect the integrity of the buoy mooring. However, there are several best practices available that can reduce risks on all mooring types. BOEM's BMPs to use the best available technologies to reduce entanglement risks greatly reduce the risk of entanglement.

There are no recorded events of ESA-listed species becoming entangled in ROV cables, however, to minimize this risk, BOEM requires protected species observers to monitor a clearance zone (1000 m for ESA-listed species) for 30 minutes before any ROVs are deployed to make sure no ROVs are deployed around ESA-listed species.

PNNL deployed two LiDAR metocean buoys – one in the Humboldt WEA and one in the Morro Bay WEA (PNNL 2019). Including the multiple metocean buoys deployed along the NE Atlantic coast associated with site assessment activities, no incidents of entanglement have been reported to date. BOEM continues to work with lessees and requires the use of the best available mooring systems, using the shortest practicable line lengths, anchors, chain, cable, or coated rope systems, to prevent or reduce to discountable levels any potential entanglement of marine mammals and sea turtles. BOEM reviews each buoy design to ensure that reasonable low-risk mooring designs are used. Potential impacts on ESA-listed species from entanglement related to buoy deployment and operation are thus expected to be discountable.

Lost or derelict fishing gear may become entangled in the metocean buoy lines and present an entanglement risk to protected species. Approximately 6 metocean buoys will be deployed as part of the proposed action. From 1982-2017, 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 1980's 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 6 offshore metocean buoy lines and present an entanglement risk to protected species. Risk of secondary entanglement related to buoy deployment and operation 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 (BOEM 2022), and are expected to be limited in spatial scope, considering existing fishing grounds, and short-term. Entanglement impacts to marine mammals and sea turtles, as a result of displaced fishing effort, are expected to be discountable.

Accidental Release of Pollutants and Marine Debris

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

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

Records of interactions between anthropogenic marine debris and wildlife have been increasing rapidly in recent decades and is a cumulative source of impacts on ESA-listed species and other marine life. In the marine environment alone, the number of species reported to be affected by debris increased by more than 159% during 1995–2015 (Fossi et al. 2018). Sea turtles are reported to be ingesting large amounts of debris worldwide (Schuyler et al. 2013). Lessees are prohibited from deliberately discharging containers and other similar materials (i.e., trash and debris) into the marine environment (30 C.F.R. 250.300(a) and (b)(6)) and are required to make durable identification markings on equipment, tools, containers (especially drums), and other material (30 C.F.R. 250.300(c)). The intentional jettisoning of trash has been the subject of strict laws such as MARPOL, Annex V and the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies including USCG and EPA. As a BMP to reduce the anthropogenic impact of marine debris, BSEE NTL 2015-G03 "Marine Trash and Debris Awareness and Elimination" provides guidance to prevent intentional and/or accidental introduction of debris into the marine environment. BOEM also requires that operators ensure that all offshore employees and those contractors actively engaged in their offshore operations complete awareness training that includes viewing a training video or slide show (specific options are outlined in the NTL. With continued training and awareness, marine debris is not expected to be a significant concern from the proposed action and the effects to ESA-listed marine mammal and sea turtle species will be discountable.

Fishes

This section provides a general discussion of the potential effects of the identified IPFs that may affect listed fish species. BOEM has identified two potential impact-producing factors generated by activities associated with site characterization and assessment: noise and habitat alteration/turbidity. A summary description of each impacting source are the resulting effects to ESA-listed species are discussed below.

Noise

Being a dense medium, water transmits sound faster and for longer distances than air transmits sound. Aquatic organisms may use this phenomenon to quickly glean information about their environment over relatively large areas. Fishes possess two mechanoreception sensory systems to detect sound in their environment. The first is the lateral line system (LLS) which is a series of pore-receptors along the body of a fish. The LLS detects vibration and pressure gradients in the water within a few body lengths of the organism. The lateral line detects particle motion at low frequencies from below 1 hertz (Hz) up to at least 400 Hz (Hastings & Popper 2005; Higgs & Radford 2013).

The second hearing organ fish possess is an inner ear (Popper & Hastings 2019). For most species, the inner ear contains three dense otoliths (small calcareous bones) that sit atop many delicate hair cells, comparable to the hair cells found in the mammalian ear. Sound waves in water pass through the fish's body, which has a composition similar to water, but will differentially affect the heavier otoliths. This causes a change in the relative motion between the otoliths and the surrounding body tissues and can be detected by the hair cells and sensed by the nervous system.

Some fishes possess additional morphological adaptations or specializations that can enhance their sensitivity to sound pressure, such as an anatomical extension that connects a gas-filled swim bladder to the auditory system (Astrup 1999; Popper & Fay 2010; Popper & Hastings 2019). The swim bladder can enhance sound detection by converting acoustic pressure into localized particle motion, which may then be detected by the inner ear (Radford et al, 2012). Fishes with a swim bladder generally have better sensitivity to sound and can detect higher frequencies than fishes without a swim bladder (Popper & Fay 2010; Popper et al. 2014). In addition, structures such as gas-filled bubbles near the ear or swim bladder also increase sensitivity and allow for high-frequency hearing capabilities and better sound pressure detection.

Many fishes use sound to (1) find food, habitat, and mates; (2) provide orientation cues for migration; (2) communicate during territorial defense, aggression, mating, and as a method of indicating alarm; and (3) detect and avoid predators (Popper and Hawkins 2019). Anthropogenic noise may mask, disrupt, or distract organisms that use sound as a source of information for these important activities. Noise at very high energy levels may affect fish directly by increasing stress levels, causing temporary or permanent loss of hearing, damage to body tissues, or increased mortality rates (Popper and Hawkins 2019).

The majority of the native fishes on the Pacific Coast are hearing generalists and are most sensitive to particle motion. Hearing generalist species include salmonids and green sturgeon (A. Popper, personal communication) because, although they possess a swim bladder, they lack the accessory organs that connect the swim bladder to the inner ear, and this makes them less able to detect sound pressure waves. Although particle motion may be the more relevant exposure metric for many fish species, there are few data available that measure it due to a lack of standard measurement methodology and experience with particle motion detectors (Popper et al 2014). Historically, studies that have investigated hearing in fishes and the consequences of anthropogenic noise have been carried out with sound pressure metrics. In these instances, particle motion can be inferred from pressure measurements (Nedelec et al. 2016).

Noise produced by project activities result from the operation of marine vessels and from survey and biological collection. The adverse effects, if any, are expected to last for the duration of the activities that are producing the noise and are not expected to have long-lasting consequences. For fish species capable of sensing the introduced noise, they may alter their behavior and leave the affected area. Project activities are likely to have temporary, largely undetectable effects to the populations of listed fish species due to the minimal influence project activities may have across larger spatial and temporal scales.

Habitat Alteration and Turbidity

Project activities that may alter habitats or increase turbidity in the action areas include geotechnical and biological sampling, and buoy emplacement, operation, and retrieval.

Geotechnical sampling (gravity cores, piston cores, vibracores, deep borings, cone penetration tests, etc.) and biological grab sampling may damage benthic habitats by permanently removing small amounts of sediments from the seabed. Animals within or on top of these samples will likely be killed. Collection of samples causes nearby disturbance as sediment moves to fill the hole left by the removed core or grab, possibly exposing animals in the surrounding sediment to predators (Skilleter 1996). Sampling may also disrupt microbial assemblages in the sediments and breakdown biotic structures which help bind sediments together (e.g., microbial mats; Skilleter 1996). Recovery rates of sampled areas to baseline conditions are mostly unknown but may exceed several weeks (Skilleter 1996). The distribution of these samples will occur throughout the leases, but the total spatial extent of sampling will be a very small percentage compared to the overall action area (Table 2A).

Habitat disturbance may cause sediments and benthic organic material to be introduced into the water column and may also increase local turbidity levels. Direct effects from sediment suspension and increased turbidity on fish populations may include exposure to contaminants, changes in feeding rates, reduction in predator-avoidance ability, or smothering of feeding and respiratory organs (Wilber and Clarke 2001; Utne-Palm 2002; Au et al. 2004). To avoid these consequences, fishes may choose to relocate until water clarity returns to levels approximating pre-disturbance conditions. Indirect effects on fish populations from sediment suspension and increased turbidity may occur by harming the populations of prey species on which the fishes depend (Airoldi 2003). Biological response to these potential impacts is often a function of concentration and exposure duration (Newcombe and Jensen 1996). The proposed activities from the project are predicted to generate only minimal and short-term impacts to benthic habitats and cause a negligible increase in suspended materials over a short time frame. The offshore location of the WEAs suggests that terrestrial-based pollutants are not likely to be found in large concentrations within disturbed sediments. Salmon, green sturgeon and eulachon are not likely to occur in the deep benthic habitats of the Action Area, however green sturgeon and eulachon may occur in shallower waters along the proposed cable routes where habitat alteration may occur. Impacts are expected to be short-term and temporary, therefore, populations of listed fish species are not likely to be adversely affected by the proposed benthic sampling activities.

PNNL (2019) assessed potential effects from a data-collecting metocean buoy within the Morro Bay WEA. The consequences to ESA-listed species from buoy emplacement, operations, and retrieval from the proposed project is expected to be similar to those described in PNNL (2019). A buoy system may also function as a small de facto artificial reef, providing a minor amount of additional hard substrate within the WEAs from the anchor, mooring lines, and buoy structure. The environment effects are expected to be similar to that produced by marine debris and generate local increases in biomass and species diversity (Caselle et al. 2002). Indirect effects from buoy emplacement may preserve habitat integrity of the seabed as fishers, especially trawlers, may avoid these areas until buoys are decommissioned. The damage from bottom-contact trawls would then be displaced to outside of the local buoy area. The spatial extent of environmental consequences from buoys will be a small percentage compared to the overall action area. Salmon, green sturgeon and eulachon are not likely to occur in the deep benthic habitats where habitat alteration due to metocean buoy deployment may occur. Therefore, no effects are expected to populations of listed fish species from these activities.

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Impacts to Critical Habitat

Effective May 21, 2021, NMFS issued an updated final rule to designate critical habitat for the endangered Central America Distinct Population Segment (DPS), and the threatened Mexico DPS of humpback whales (*Megaptera novaeangliae*) (86 FR 21082). Critical habitat for these DPSs serve as feeding habitat and contain the essential biological feature of humpback whale prey. Critical habitat for the Central America DPS of humpback whales contains approximately 48,521 square nautical miles (nmi^2) of marine habitat in the North Pacific Ocean within the portions of the California Current Ecosystem off the coasts of Washington, Oregon, and California. Specific areas designated as critical habitat for the Mexico DPS of humpback whales contain approximately 116,098 nmi^2 of marine habitat in the North Pacific Ocean, including areas within portions of the eastern Bering Sea, Gulf of Alaska, and California Current Ecosystem. The Humboldt WEA consists of approximately 156 nmi^2 and the Morro Bay WEA consists of approximately 284 nmi^2 and both overlap with humpback whale critical habitat. Any displacement of prey species as a result of 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.

The Southern Resident DPS of killer whales was federally listed as endangered in 2005 (70 FR 69903). Critical habitat for this DPS was designated in the summer core area in Haro Strait and waters around the San Juan Islands, Puget Sound, and the Strait of Juan de Fuca (79 FR 69054). In August 2021, additional critical habitat was designated along the U.S. West Coast from the Canadian border to Point Sur, California, including offshore of Humboldt County between depths of 6.1–200 m (20–656 ft) (86 FR 41668). Any displacement of prey species or individuals as a result of limited vessel transits, to and from the WEAs to their respective and/or alternative ports, 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.

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 mi^2 (64,760 km^2) stretching from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000-m depth contour. During the critical habitat review, it was determined that the oceanographic features of the general area off Morro Bay produce prey of sufficient condition, distribution, abundance and density to provide for foraging that is essential to the conservation of leatherback sea turtles, i.e., “high” conservation value (NMFS 2012). The Morro Bay WEA overlaps with approximately 284 nmi^2 of critical habitat for leatherback sea turtles. No sightings of leatherbacks have been recorded in the Morro Bay WEA, with limited sightings in the vicinity (NMFS, 2012 – see Figure 6 above) and any displacement of prey species or individuals as a result of limited vessel surveys and transits, to and from the WEAs to their respective and/or alternative ports, 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.

Critical habitat for listed green sturgeon overlaps with the action area associated with the Humboldt WEA. Any displacement of prey species or individuals as a result of limited vessel transits, to and from the Humboldt WEA and respective and/or alternative ports, 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.

Cumulative Effects

In addition to commercial vessel traffic levels and current commercial fishing activities, aquaculture operations (specifically in Humboldt Bay and Morro Bay), Department of Defense operations throughout the Pacific, there are 23 oil and gas platforms in the Southern California Planning Area (SCPA) (Argonne 2019).

Leasing, exploration, development and production of offshore oil and gas reserves on the outer continental shelf of the Pacific Coast began in the early 1960's and the last oil and gas platform was installed in southern California in 1989. There are no plans to conduct new lease sales at this time and no new platforms are expected to be installed in the foreseeable future. Emphasis has shifted from leasing new areas to maximizing the development of oil and gas resources within the range of existing platforms and infrastructure. Routine oil and gas development activities currently underway include seismic surveys, support vessel and operator aircraft activity, ongoing discharges, emissions, well simulation treatments, well conductor installations and removals, daily inspection flights by BSEE and oil spill response exercises. Potential impacts to protected species from these activities include noise, discharge of pollutants, vessel collisions, indirect effects of oil spills.

Seven platforms are currently shut-in and pending decommissioning, and well plugging operations on these platforms are underway. Thus, decommissioning of these platforms is expected to occur in the reasonably foreseeable future. In addition, decommissioning of an additional 8 platforms could occur within the next 10 years. It is currently unknown when decommissioning may be initiated for the 15 platforms still in production, though by regulation an initial platform removal application must be submitted at least 2 years before production is projected to cease.

ESA-listed protected species experience a variety of anthropogenic impacts, including collisions with vessels (ship strikes), entanglement with fishing gear, noise from human activities, pollution, disturbance of marine and coastal environments, climate change, effects on benthic habitat, waste discharge, and accidental fuel leaks or spills. Many marine mammals migrate long distances and are affected by these factors over very broad geographical scales. Potential effects associated with the proposed action are expected to be relatively minor. Vessel trips associated with the proposed action will not significantly increase vessel traffic in the action area. Vessels generally move slowly while surveying or remain stationary. Vessels may transit at higher speeds between surveys and departing/returning from ports and offshore areas. The proposed action would result in a minor incremental contribution to cumulative impacts. Adherence to BOEM’s BMPs (Appendix A) regarding vessel strike avoidance measures and exclusion zones to minimize acoustic impacts would reduce the potential for cumulative impacts on listed marine mammals. Based on the analysis in this BA, BOEM has determined that the incremental contribution to cumulative impacts on marine mammals from the proposed action will be discountable.

Leatherback and loggerhead sea turtles are ESA-listed as threatened or endangered and are all highly migratory species that could occur within the action area. Human impacts on sea turtles in the U.S Pacific include collisions with vessels, entanglement with fishing gear, noise, pollution, disturbance of marine and coastal environments, disturbance of nesting habitat, and climate change. The most likely impacts on sea turtles as a result of the proposed action are minor disturbance at very close ranges through noise exposure, effects of vessel impacts, and the physical placement of metocean buoys. Based on this analysis that considers the low numbers of sightings of leatherbacks and loggerheads in the action area, as well as the adherence to BOEM's BMPs regarding vessel strike avoidance measures, marine debris training, mooring BMPs, and measures to reduce exposure to non-injurious sound, BOEM has determined that the incremental contribution to cumulative impacts on leatherback and loggerhead sea turtles from the proposed action will be discountable.

Conclusion

Due to the nature of the proposed activities, as well as the PDCs and BMPs employed as part of the Proposed Action (Appendix A), BOEM has determined that the impacts to protected species and critical habitat from site characterization surveys and site assessment activities will be negligible and not likely to adversely affect ESA-listed protected species or associated critical habitat. See Table 11 for a summary of effect determinations for the activities in the Proposed Action.

Table 11: Summary analysis of effects from the proposed action on ESA-listed species covered in this BA. NLAA = Not Likely to Adversely Affect; NE = No Effect

Activity	Route of Effect	Potential Effect	BMP	Effect Determination		
				Whales	Sea Turtles	Fish
Metocean Buoy Installation						
Installation of metocean buoys, wave gliders, and other data collection devices	Habitat Alteration/Turbidity/	Foraging/prey availability	N	NE	NLAA	NLAA
	Physical presence of moorings/buoys	Entanglement	Y	NLAA	NLAA	NE
Accidental release of pollutants	Onboard generators and fuel storage	Water Quality	N	NLAA	NLAA	NLAA
	Marine Debris	Ingestion, entanglement	Y	NLAA	NLAA	NLAA
HRG and Geotechnical Surveys						
HRG surveys	Noise	Disturbance	Y	NLAA	NLAA	NLAA
Geotechnical surveys	Habitat Alteration/Turbidity	No effect	N	NE	NE	NLAA
	Noise	Disturbance	Y	NLAA	NLAA	NLAA
	Side-scan sonar (≥200 kHz)	No effect	N	NE	NE	NE
Vessel Operations						
Vessel transits and operations	Strikes	Injury	Y	NLAA	NLAA	NE
	Noise	Disturbance	N	NLAA	NLAA	NLAA
Vessel Engines and Thrusters	Noise	Disturbance	Y	NLAA	NLAA	NE
	Impingement	No Effect	N	NE	NE	NE

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Part III: Essential Fish Habitat Assessment:

Prepared by the Bureau of Ocean Energy Management for the National Marine Fisheries Service in Accordance with the Magnuson-Stevens Fishery Conservation and Management Act, as Amended in 1996**.**

Purpose

Under Section 305 (b) (2) of the Magnuson Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.) as amended by the Sustainable Fisheries Act on October 11, 1996, Federal agencies are required to consult with the Secretary of Commerce on any actions that may adversely affect essential fish habitat (EFH). The Department of Commerce published an interim final rule (50 CFR Part 600) in the Federal Register (December 19, 1997, Volume 62, Number 244) that detailed the procedures under which Federal agencies would fulfill their consultation requirements. As set forth in the regulations, EFH Assessments must include: 1) a description of the proposed action; 2) an analysis of the effects, including cumulative effects, of the action on EFH, the managed species, and associated species by life history stage; 3) the Federal agency's views regarding the effects of the action on EFH; and 4) proposed mitigation if applicable.

Project Description

This EFH assessment covers lease issuance, site characterization and site assessment for the Humboldt and Morro Bay Wind Energy Areas (WEAs). Details and maps of the action areas are provided in Part I of this document.

Managed Species

The Pacific Fishery Management Council (PFMC) manages or monitors (as ecosystem component species) numerous fishes and invertebrates under four Fishery Management Plans (FMPs): 1) Coastal Pelagic Fishery Management Plan; 2) Highly Migratory Species Fishery Management Plan; 3) Pacific Groundfish Fishery Management Plan; and 4) Pacific Salmon Fishery Management Plan (Table 12). In addition to species identified under these four FMPS, a suite of shared ecosystem component species is also monitored.

*Table 12: Fish and invertebrate species managed or monitored (as ecosystem component species or ecs) by the Pacific Fishery Management Council. Species distributions that overlap with the WEAs and nearby action area = X; species distributions that potentially overlap within the WEAs and nearby action area = ?; species distributions that do not overlap with the WEA or nearby action area = *. Distribution data obtained from Love et al. (2021).*

Common Name	Scientific Species Name or Family	Humboldt WEA	Morro Bay WEA
Coastal Pelagic Species FMP			
Pacific sardine	*Sardinops sagax*	X	X
Pacific (chub) mackerel	*Scomber japonicus*	X	X
Northern anchovy	*Engraulis mordax*	X	X
Market squid	*Doryteuthis opalescens*	X	X
Jack mackerel	*Trachurus symmetricus*	X	X
All endemic krill and euphausiid species		X	X
Pacific herring (ecs)	*Clupea pallasii pallasii*	X	X
Jacksmelt (ecs)	*Atherinopsis californiensis*	X	X

Common Name	Scientific Species Name or Family	Humboldt WEA	Morro Bay WEA
Highly Migratory Species FMP			
North Pacific albacore	*Thunnus alalunga*	X	X
Yellowfin tuna	*Thunnus albacares*	X	X
Bigeye tuna	*Thunnus obesus*	*	X
Skipjack tuna	*Katsuwonus pelamis*	X	X
Pacific bluefin tuna	*Thunnus orientalis*	X	X
Common thresher shark	*Alopias vulpinus*	X	X
Shortfin mako	*Isurus oxyrinchus*	X	X
Blue shark	*Prionace glauca*	X	X
Striped marlin	*Kajikia (Tetrapturus) audax*	X	X
Swordfish	*Xiphias gladius*	X	X
Dorado	*Coryphaena hippurus*	X	X
Bigeye thresher shark (ecs)	*Alopias superciliosus*	*	X
Common mola (ecs)	*Mola mola*	X	X
Escolar (ecs)	*Lepidocybium flavobrunneum*	?	?
Lancetfishes (ecs)	Alepisauridae	X	X
Louvar (ecs)	*Luvarus imperialis*	X	X
Pelagic stingray (ecs)	*Pteroplatytrygon (Dasyetis) violacea*	X	X
Pelagic thresher shark (ecs)	*Alopias pelagicus*	*	*
Wahoo (ecs)	*Acathocybium solandri*	*	*
Pacific Groundfish FMP			
Big skate	*Raja binoculata*	X	X
Leopard shark	*Triakis semifasciata*	X	X
Longnose skate	*Raja rhina*	X	X
Spiny dogfish	*Squalus suckleyi*	X	X
Cabezon	*Scorpaenichthys marmoratus*	X	X
Kelp greenling	*Hexagrammos decagrammus*	X	X
Lingcod	*Ophiodon elongatus*	X	X
Pacific cod	*Gadus macrocephalus*	X	X
Pacific whiting (hake)	*Merluccius productus*	X	X
Sablefish	*Anoplopoma fimbria*	X	X
Aurora rockfish	*Sebastes aurora*	X	X
Bank rockfish	*Sebastes rufus*	X	X
Black rockfish	*Sebastes melanops*	X	X
Black-and-yellow rockfish	*Sebastes chrysomelas*	X	X
Blackgill rockfish	*Sebastes melanostomus*	X	X
Blackspotted rockfish	*Sebastes melanostictus*	X	X
Blue rockfish	*Sebastes mystinus*	X	X
Bocaccio	*Sebastes paucispinis*	X	X
Bronzespotted rockfish	*Sebastes gilli*	X	X
Brown rockfish	*Sebastes auriculatus*	X	X
Calico rockfish	*Sebastes dallii*	*	X
California scorpionfish	*Scorpaena guttata*	*	X
Canary rockfish	*Sebastes pinniger*	X	X
Chameleon rockfish	*Sebastes phillipsi*	X	X
Chilipepper rockfish	*Sebastes goodei*	X	X
China rockfish	*Sebastes nebulosus*	X	X
Copper rockfish	*Sebastes caurinus*	X	X

Common Name	Scientific Species Name or Family	Humboldt WEA	Morro Bay WEA
Cowcod	*Sebastes levis*	X	X
Darkblotched rockfish	*Sebastes crameri*	X	X
Deacon rockfish	*Sebastes diaconus*	X	X
Dusky rockfish	*Sebastes ciliatus*	*	*
Dwarf-red rockfish	*Sebastes rufinanus*	*	*
Flag rockfish	*Sebastes rubrivinctus*	X	X
Freckled rockfish	*Sebastes lentiginosus*	*	*
Gopher rockfish	*Sebastes carnatus*	X	X
Grass rockfish	*Sebastes rastrelliger*	X	X
Greenblotched rockfish	*Sebastes rosenblatti*	*	X
Greenspotted rockfish	*Sebastes chlorostictus*	X	X
Greenstriped rockfish	*Sebastes elongatus*	X	X
Halfbanded rockfish	*Sebastes semicinctus*	X	X
Harlequin rockfish	*Sebastes variegatus*	*	*
Honeycomb rockfish	*Sebastes umbrosus*	*	X
Kelp rockfish	*Sebastes atrovirens*	*	X
Longspine thornyhead	*Sebastolobus altivelis*	X	X
Mexican rockfish	*Sebastes macdonaldi*	*	X
Olive rockfish	*Sebastes serranoides*	X	X
Pink rockfish	*Sebastes eos*	X	X
Pinkrose rockfish	*Sebastes simulator*	*	X
Pygmy rockfish	*Sebastes wilsoni*	X	X
Pacific ocean perch	*Sebastes alutus*	X	X
Quillback rockfish	*Sebastes maliger*	X	X
Redbanded rockfish	*Sebastes babcocki*	X	X
Redstripe rockfish	*Sebastes proriger*	X	X
Rosethorn rockfish	*Sebastes helvomaculatus*	X	X
Rosy rockfish	*Sebastes rosaceus*	X	X
Rougheye rockfish	*Sebastes aleutianus*	*	?
Sharpchin rockfish	*Sebastes zacentrus*	X	X
Shortraker rockfish	*Sebastes borealis*	X	X
Shortspine thornyhead	*Sebastolobus alascanus*	X	X
Silvergray rockfish	*Sebastes brevispinis*	X	X
Speckled rockfish	*Sebastes ovalis*	X	X
Splitnose rockfish	*Sebastes diploproa*	X	X
Squarespot rockfish	*Sebastes hopkinsi*	X	X
Sunset rockfish	*Sebastes crocotulus*	?	X
Starry rockfish	*Sebastes constellatus*	*	X
Stripetail rockfish	*Sebastes saxicola*	X	X
Swordspine rockfish	*Sebastes ensifer*	X	X
Tiger rockfish	*Sebastes nigrocinctus*	X	X
Treefish	*Sebastes serriceps*	*	X
Vermilion rockfish	*Sebastes miniatus*	X	X
Widow rockfish	*Sebastes entomelas*	X	X
Yelloweye rockfish	*Sebastes ruberrimus*	X	X
Yellowmouth rockfish	*Sebastes reedi*	X	*
Yellowtail rockfish	*Sebastes flavidus*	X	X
Arrowtooth flounder (turbot)	*Atheresthes stomias*	X	X

Common Name	Scientific Species Name or Family	Humboldt WEA	Morro Bay WEA
Butter sole	*Isopsetta isolepis*	X	X
Curlfin sole	*Pleuronichthys decurrens*	X	X
Dover sole	*Microstomus pacificus*	X	X
English sole	*Parophrys vetulus*	X	X
Flathead sole	*Hippoglossoides elassodon*	X	*
Pacific sanddab	*Citharichthys sordidus*	X	X
Petrale sole	*Eopsetta jordani*	X	X
Rex sole	*Glyptocephalus zachirus*	X	X
Rock sole	*Lepidopsetta bilineata*	X	X
Sand sole	*Psettichthys melanostictus*	X	X
Starry flounder	*Platichthys stellatus*	X	X
Shortbelly rockfish	*Sebastes jordani (ecs)*	X	X
Aleutian skate	*Bathyraja aleutica (ecs)*	X	*
Bering/sandpaper skate	*Bathyraja interrupta (ecs)*	*	*
California skate	*Beringraja (Raja) inornata (ecs)*	X	X
Roughtail/black skate	*Bathyraja trachura (ecs)*	X	X
Endemic softnose skates	Arhynchobatidae *(ecs)*	X	X
Pacific grenadier	*Coryphaenoides acrolepis (ecs)*	X	X
Giant grenadier	*Coryphaenoides (Albatrossia) pectoralis (ecs)*	X	X
Endemic grenadiers	Macrouridae *(ecs)*	X	X
Fine scale codling/Pacific flatnose	*Antimora microlepis (ecs)*	X	X
Spotted ratfish	*Hydrolagus colliei (ecs)*	X	X
Soupfin shark	*Galeorhinus galeus (zyopterus) (ecs)*	X	X
Pacific Salmon FMP			
Chinook Salmon	*Oncorhynchus tshawytscha*	X	X
Coho Salmon	*Oncorhynchus kisutch*	X	X
Pink Salmon	*Oncorhynchus gorbuscha*	X	X
Shared Ecosystem Component Species			
Round herring	*Etrumeus (teres) acuminatus*	*	X
Thread herring	*Opisthonema libertate, O. medirastre*	*	*
Endemic mesopelagic fish species	Myctophidae, Bathylagidae, Paralepididae, and Gonostomatidae	X	X
Pacific sand lance	*Ammodytes hexapterus*	*	*
Pacific saury	*Cololabis saira*	X	X
Endemic silversides	Atherinopsidae	X	X
Endemic smelts	Osmeridae	X	X
Endemic squid species	Cranchiidae, Gonatidae, Histioteuthidae, Octopoteuthidae, Ommastrephidae except (*Dosidicus gigas*), Onychoteuthidae, and Thysanoteuthidae	X	X

The marine environment in the Humboldt and Morro Bay WEAs and nearby regions are rich in fish species due to the high productivity of the California Current System and the wide variety of habitats located therein. The vast majority of the species managed by the Council can be found within the project area during their life cycle (Love 1996). The PFMC has identified EFH and habitat areas of particular concern (HAPCs) for each of the four FMPs (PFMC, 2016, 2018, 2019, 2020). EFH and HAPCs will be present within the action area and therefore this analysis will be broad in scope and will discuss the effects of the identified impact-producing factors on a wide range of prey, habitats, and managed or monitored species.

Potential Impacting-Producing Factors

BOEM has identified two potential impact-producing factors generated by activities associated with site characterization and assessment: noise and habitat alteration/turbidity. A summary description of each impacting source is included in the following section.

Effects on EFH

Noise

Being a dense medium, water transmits sound faster and for longer distances than air transmits sound. Aquatic organisms may use this phenomenon to quickly glean information about their environment over relatively large areas. Fishes possess two mechanoreception sensory systems to detect sound in their environment. The first is the lateral line system (LLS) which is a series of pore-receptors along the body of a fish. The LLS detects vibration and pressure gradients in the water within a few body lengths of the organism. The lateral line detects particle motion at low frequencies from below 1 hertz (Hz) up to at least 400 Hz (Hastings & Popper, 2005; Higgs & Radford, 2013).

The second hearing organ fish possess is an inner ear (Popper & Hastings, 2019). For most species, the inner ear contains three dense otoliths (small calcareous bones) that sit atop many delicate hair cells, comparable to the hair cells found in the mammalian ear. Sound waves in water pass through the fish's body, which has a composition similar to water, but will differentially affect the heavier otoliths. This causes a change in the relative motion between the otoliths and the surrounding body tissues and can be detected by the hair cells and sensed by the nervous system.

Some fishes possess additional morphological adaptations or specializations that can enhance their sensitivity to sound pressure, such as an anatomical extension that connects a gas-filled swim bladder to the auditory system (Astrup, 1999; Popper & Fay, 2010; Popper & Hastings, 2019). The swim bladder can enhance sound detection by converting acoustic pressure into localized particle motion, which may then be detected by the inner ear (Radford et al., 2012). Fishes with a swim bladder generally have better sensitivity to sound and can detect higher frequencies than fishes without a swim bladder (Popper & Fay, 2010; Popper et al., 2014). In addition, structures such as gas-filled bubbles near the ear or swim bladder also increase sensitivity and allow for high-frequency hearing capabilities and better sound pressure detection.

Many fishes use sound to (1) find food, habitat, and mates; (2) provide orientation cues for migration; (2) communicate during territorial defense, aggression, mating, and as a method of indicating alarm; and (3) detect and avoid predators (Popper and Hawkins, 2019). Anthropogenic noise may mask, disrupt or distract organisms that use sound as a source of information for these important activities. Noise at very high levels may affect fish directly by increasing stress levels, causing temporary or permanent loss of hearing, damage to body tissues, or increased mortality rates (Popper and Hawkins, 2019). Fishes residing in environments where there is little light, such as the deep sea, may have a greater reliance on sound to sense their environments (Marshall, 1966; Deng et al., 2011). Eggs and larval fish stages may be less sensitive due to their immature or undeveloped sensory organs (Kunc et al., 2016). The majority of the native fishes on the Pacific Coast are hearing generalists, although some species managed under the Coastal Pelagic Species FMP (e.g. Pacific sardine, northern anchovy) would be considered hearing specialists (Hastings & Popper, 2005).

Although particle motion may be the more relevant exposure metric for many fish species, there are few data available that measure it due to a lack of standard measurement methodology and experience with particle motion detectors (Popper et al., 2014). Historically, studies that have investigated hearing in fishes and the consequences of anthropogenic noise were carried out with sound pressure metrics. In these instances, particle motion can be inferred from pressure measurements (Nedelec et al., 2016). In this analysis, impact assessment is expected to be conservative.

Noise produced by project activities (described in detail in Part I) result from the operation of marine vessels and from survey and biological collection. The adverse effects, if any, are expected to last for the duration of the activities that are producing the noise and are not expected to have long-lasting consequences. For fish species capable of sensing the introduced noise, they may alter their behavior and leave the affected area (e.g. the pelagic fish species within each FMP) or move closer to the seabed (e.g. demersal fishes within the Pacific Groundfish FMP). Adults may have greater sensitivity to noise impacts compared to larvae and eggs given their better developed hearing systems. No population-level effects are expected due to the minimal influence project activities may have across larger spatial and temporal scales. Project activities are likely to have temporary, minimally adverse impacts to managed species. Additional discussion on noise impacts to fishes stemming from High-Resolution Geophysical (HRG) Surveys is further discussed in Section II.

Because invertebrate species lack gas-filled structures within their bodies, they may be less sensitive to anthropogenic noise sources compared to fishes, although many taxa appear to have morphological structures (e.g. hair cells) that can be sensitive to particle motion (Popper & Hawkins, 2018). A recent review indicates that some invertebrates change their behavior when exposed to chronic shipping noise (Murchy et al., 2019). Much more research needs to be done to determine if such behavior changes translate into population-level effects. The low levels of expected anthropogenic noise are not known to permanently alter characteristics of pelagic or benthic habitats. Therefore, project activities are expected to have no or minimally adverse effects to EFH (including HPACs) or to the invertebrate prey base of managed species.

Habitat Alteration and Turbidity

Project activities that may alter habitats or increase turbidity in the action areas include geotechnical and biological sampling, and buoy emplacement, operation, and retrieval.

Geotechnical sampling (gravity cores, piston cores, vibracores, deep borings, cone penetration tests, etc.) and biological grab sampling may damage benthic habitats by permanently removing small amounts of sediments from the seabed. Animals within or on top of these samples will likely be killed. Collection of samples causes nearby disturbance as sediment moves to fill the hole left by the removed core or grab, possibly exposing animals in the surrounding sediment to predators (Skilleter, 1996). Sampling may also disrupt microbial assemblages in the sediments and breakdown biotic structures which help bind sediments together (e.g., microbial mats; Skilleter, 1996). Recovery rates of sampled areas to baseline conditions are mostly unknown, but may exceed several weeks (Skilleter, 1996). The distribution of these samples will occur throughout the leases, but the total spatial extent of sampling will be a very small percentage compared to the overall action area so only minimally adverse effects to EFH are expected.

PNNL (2019) assessed potential effects from a data-collecting buoy within the Morro Bay WEA and determined that minimal and temporary adverse effects to EFH were expected. The consequences to EFH from buoy emplacement, operations, and retrieval from the proposed project is expected to be similar to those described in PNNL (2019). A buoy system may also function as a small de facto artificial reef, providing a minor amount of additional hard substrate within the WEAs from the anchor, mooring lines, and buoy structure. The environment effects are expected to be similar to that produced by marine debris and generate local increases in biomass and species diversity (Caselle et al., 2002). Indirect effects from buoy emplacement may preserve habitat integrity of the seabed as fishers, especially trawlers, may avoid these areas until buoys are decommissioned. The damage from bottom-contact trawls would then be displaced to outside of the local buoy area. The spatial extent of environmental consequences from buoys will be a small percentage compared to the overall action area so only minimal effects to managed species and EFH are expected.

Habitat disturbance may cause sediments and benthic organic material to be introduced into the water column and may also increase local turbidity levels. Direct effects from sediment suspension and increased turbidity on fish populations may include exposure to contaminants, changes in feeding rates, reduction in predator-avoidance ability, or smothering of feeding and respiratory organs (Wilber and Clarke, 2001; Utne-Palm, 2002; Au et al., 2004). To avoid these consequences, fishes may choose to relocate until water clarity returns to levels approximating pre-disturbance conditions. Indirect effects on fish populations from sediment suspension and increased turbidity may occur by harming the populations of prey species on which the fishes depend (Airoldi, 2003). Biological response to these potential impacts is often a function of concentration and exposure duration (Newcombe and Jensen, 1996). The proposed activities from the project are predicted to generate only minimal and short-term impacts to benthic habitats and cause a negligible increase in suspended materials over a short time frame. The offshore location of the WEAs suggests that terrestrial-based pollutants are not likely to be found in large concentrations within disturbed sediments. Therefore, proposed activities associated will have minimal adverse effects to managed species and EFH.

Cumulative Analysis

This section describes the projects and activities considered in the cumulative analysis for the proposed cable installation project. Possible sources of cumulative impacts specific to managed species and EFH are those that degrade the environment via anthropogenic noise or habitat alteration/increased turbidity.

Sources of cumulative impacts include on-going and proposed oil and gas activities in Federal and State waters, commercial fishing marine vessel traffic, and non-point sources of ocean discharges. Climate change activities are also addressed. Potential cumulative impacts are discussed below.

Federal and State Offshore Energy Projects

Federal oil and gas operations do not spatially overlap with the action area but do occur within the larger region nearby the Morro Bay WEA. The cumulative effects of Federal structures and earlier development activities can be found in previous environmental analyses (MMS, 1995). Foreseeable ongoing oil and gas operations are not expected to include notable changes in baseline activities that may affect noise, habitats, or turbidity for the duration of project activities (M. Mitchell, Department of the Interior, Bureau of Safety and Environmental Enforcement, personal communication). Environmental consequences of foreseeable decommissioning (removal) of oil and gas platforms are being examined within a Programmatic Environmental Impact Statement that is under development and will include a description of potential impacts to managed fish species and EFH. However, it is likely these future decommissioning activities will not temporarily overlap with project activities. The proposed activities are only expected to produce a temporary and incrementally small increase in noise, habitat changes and turbidity within the regional environment.

The California State Lands Commission is processing two lease applications for offshore floating wind energy projects in California State waters, both located offshore central California near the Vandenberg Space Force Base. The two Project Applicants are CADEMO Corporation (CADEMO), a renewable energy development company, and IDEOL USA Inc. (IDEOL), a floating offshore wind technology company and project developer. CADEMO proposes to install and operate four offshore floating wind turbines. CADEMO proposes to examine the performance of two distinct floating foundation platforms (barge and tension-leg). Each wind turbine would be capable of producing 12 to 15 megawatts (MW) of renewable electricity. A combined maximum of 60 MW could be generated from the proposed four wind turbines, which would be connected in a series with electrical inter-array cables. The precise lease area and activities were initially evaluated through a preliminary environmental assessment released in October, 2021. The State will evaluate further as part of a State Environmental Impact Report process (California State Lands Commission 2021).

Non-Energy Projects and Activities

Commercial Fishing. Commercial fishing activity is ubiquitous along the Pacific Coast (Miller et al., 2017), and is the most widespread human exploitative activity in the marine environment, generating significant impacts to habitats and populations (Jennings & Kaiser, 1998). Proposed activities would only incrementally add to the impacts relative to fishing, and those impacts would be temporary.

Marine Vessel Traffic. Commercial shipping has seen rapid growth in recent years and is expected to increase (Kaplan & Solomon, 2016). The action area is adjacent to a maritime traffic corridor (Figure 2). Noise from this shipping traffic can vary considerably according to regulatory and economic events (McKenna et al., 2012), but it is an ongoing activity that occurs throughout the year. The proposed activities are only expected to produce a temporary increase in anthropogenic sound in the action area.

Nonpoint Source (NPS) Discharges. Turbidity can increase in marine environments from terrestrial runoff, especially during storm events. The nearest nonpoint sources of pollution are rivers and creeks which empty into the ocean along the mainland coast. Because water flow rate varies seasonally, most of the pollution enters the ocean in the winter months and, given the distance of the WEAs from the coast, turbidity plumes from NPS discharges may not overlap with the action area. The proposed activities are only expected to produce a temporary and incrementally small increase in turbidity within the action area.

Climate Change Conditions

Climate change conditions may have significant impacts to marine life stemming from large shifts in ocean temperature, circulation, stratification, nutrient input, oxygen content, and ocean acidification (Doney et al., 2012; Penn & Deutsch, 2022). In the short term, the minimally adverse consequences from project activities shall incrementally and temporarily increase the negative pressures faced by marine life and habitats. In the long term, a societal shift to renewable energy resources will lessen the degree and speed of climate change conditions and improve environmental conditions overall.

Cumulative Conclusion

The impacts from additional noise from project activities would be temporary and incremental and not generate population-level consequences to managed species or lasting negative effects to EFH. The short-term impact from habitat alteration/turbidity from the proposed activities would only contribute an incremental and temporary impact to managed species and EFH.

EFH Conservation Recommendations and Mitigation

Although project activities are expected to generate temporary and minimal adverse effects to EFH, BOEM proposes the following two conservation measures to further minimize impacts to EFH. These two measures will be project design criteria and serve to protect rocky reefs, a habitat of particular concern for Pacific Groundfish EFH that may be present in either the Morro Bay or Humboldt WEAs.

Project Design Criterion 1: Hard Bottom Avoidance and Metocean Buoy Anchoring Plan

Lessees and their contractors shall avoid intentional contact within hard substrate, rock outcroppings, seamounts, or deep-sea coral/sponge habitat and include a buffer that fully protects these habitats from bottom contact during the deployment of metocean buoy moorings. As part of any site assessment plan (SAP), the lessee shall submit to BOEM the details of how these activities will avoid contact with hard bottom. The Plan shall describe how the lessee will avoid placing anchors on sensitive ocean floor habitats and shall include the following information: 1) Detailed maps showing proposed anchoring sites that are located at least 12 m (40 ft) from hard substrate and other anthropogenic features (e.g. power cables), if present; 2) A description of the navigation equipment that would be used to ensure anchors are accurately set; and 3) Anchor handling procedures that would be followed to prevent or minimize anchor dragging, such as placing and removing all anchors vertically.

Project Design Criterion 8: Prohibition of Bottom Trawling During Project Activities

Lessees will characterize site-specific parameters within the WEAs to inform their site assessment plan and to generally describe local conditions, including biological attributes. Lessees and their contractors may employ a range of methods to accomplish these goals (BOEM, 2022), but may not employ trawling methodology (as defined by 50 CFR § 660.11 (11)) to conduct these activities.

Overall Conclusion

Project activities are expected to have temporary and minimally adverse impacts to managed species and EFH. Two proposed conservation recommendations, (1) Hard Bottom Avoidance and Metocean Buoy Anchoring Plan, and (2) Prohibition of Bottom Trawling during Project Activities, will further reduce the level of expected effects.

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Appendix A:

Project Design Criteria (PDC) and Best Management Practices (BMPs) that Minimize Effects to Threatened and Endangered Species and Essential Fish Habitat for Site Characterization and Site Assessment Activities to Support Offshore Wind Development

In line with BOEM's regulatory authorities, the following PDCs and BMPs apply in Federal waters. Additionally, in line with California Coastal Zone Management's Consistency Determination, BOEM's BMP states that all vessels transiting to and from ports, conducting site characterization studies, surveys, metocean buoy installation, maintenance, or decommissioning will travel at speeds no more than 10 knots during all related activities. If future consultation with NMFS, USFWS or other state or federal agency results in different vessel speed requirements, BOEM will work with California Coastal Commission staff to ensure that any new requirements remain consistent and do not diminish the level of resource protection provided by this requirement.

Any survey monitoring plan must meet the following minimum requirements specified below, except when complying with these requirements would put the safety of the vessel or crew at risk.

PDC 1: Hard Bottom Avoidance and Metocean Buoy Anchoring Plan

BMPs:

1. Lessees and their contractors shall avoid intentional contact within hard substrate, rock outcroppings, seamounts, or deep-sea coral/sponge habitat and include a buffer that protects these habitats from bottom contact during the deployment of metocean buoy moorings. As part of any site assessment plan (SAP), the lessee shall submit to BOEM the details of how these activities will avoid contact with hard bottom. The Plan shall describe how the lessee will avoid placing anchors on sensitive ocean floor habitats and shall include the following information:1) Detailed maps showing proposed anchoring sites that are located at least 12 m (40 ft) from hard substrate and other anthropogenic features (e.g. power cables), if present; 2) A description of the navigation equipment that would be used to ensure anchors are accurately set; and 3) Anchor handling procedures that would be followed to prevent or minimize anchor dragging, such as placing and removing all anchors vertically.

PDC 2: Marine Debris Awareness and Prevention

"Marine debris" is defined as any object or fragment of wood, metal, glass, rubber, plastic, cloth, paper or any other solid, man-made item or material that is lost or discarded in the marine environment by the Lessee or an authorized representative of the Lessee (collectively, the "Lessee") while conducting activities on the OCS in connection with a lease, grant, or approval issued by the Department of the Interior (DOI). To understand the type and amount of marine debris generated, and to minimize the risk of entanglement in and/or ingestion of marine debris by protected species, lessees must implement the following BMPS.

BMPs:

1. Training: All vessel operators, employees, and contractors performing OCS survey activities on behalf of the Lessee (collectively, "Lessee Representatives") must complete marine trash and

debris awareness training annually. The training consists of two parts: (1) viewing a marine trash and debris training video or slide show (described below); and (2) receiving an explanation from management personnel that emphasizes their commitment to the requirements. The marine trash and debris training videos, training slide packs, and other marine debris related educational material may be obtained at https://www.bsee.gov/debris. The training videos, slides, and related material may be downloaded directly from the website. Lessee Representatives engaged in OCS survey activities must continue to develop and use a marine trash and debris awareness training and certification process that reasonably assures that they, as well as their respective employees, contractors, and subcontractors, are in fact trained. The training process must include the following elements:

a. Viewing of either a video or slide show by the personnel specified above;
b. An explanation from management personnel that emphasizes their commitment to the requirements;
c. Attendance measures (initial and annual); and
d. Recordkeeping and availability of records for inspection by DOI.

By January 31 of each year, the Lessee must submit to DOI an annual report signed by the Lessee that describes its marine trash and debris awareness training process and certifies that the training process has been followed for the previous calendar year. The Lessee must send the reports via email to *marinedebris@bsee.gov*.

2. Marking: Materials, equipment, tools, containers, and other items used in OCS activities which are of such shape or configuration that they are likely to snag or damage fishing devices, and could be lost or discarded overboard, must be clearly marked with the vessel or facility identification and properly secured to prevent loss overboard. All markings must clearly identify the owner and must be durable enough to resist the effects of the environmental conditions to which they may be exposed.
3. Recovery: Lessees must recover marine trash and debris that is lost or discarded in the marine environment while performing OCS activities when such incident is likely to: (a) cause undue harm or damage to natural resources, including their physical, atmospheric, and biological components, with particular attention to those that could result in the entanglement of or ingestion by marine protected species; or (b) significantly interfere with OCS uses (e.g., are likely to snag or damage fishing equipment, or present a hazard to navigation). Lessees must notify DOI when recovery activities are (i) not possible because conditions are unsafe; or (ii) not practicable because the marine trash and debris released is not likely to result in any of the conditions listed in (a) or (b) above. The lessee must recover the marine trash and debris lost or discarded if DOI does not agree with the reasons provided by the Lessee to be relieved from the obligation to recover the marine trash and debris. If the marine trash and debris is located within the boundaries of a potential archaeological resource/avoidance area, or a sensitive ecological/benthic resource area, the Lessee must contact DOI for approval prior to conducting any recovery efforts.

   Recovery of the marine trash and debris should be completed immediately, but no later than 30 days from the date in which the incident occurred. If the Lessee is not able to recover the marine trash or debris within 48 hours (See BMP 4. Reporting), the Lessee must submit a recovery plan to DOI explaining the recovery activities to recover the marine trash or debris ("Recovery Plan"). The Recovery Plan must be submitted no later than 10 calendar days from the date in which the incident occurred. Unless otherwise objected by DOI within 48 hours of the filing of the Recovery Plan, the Lessee can proceed with the activities described in the

Recovery Plan. The Lessee must request and obtain approval of a time extension if recovery activities cannot be completed within 30 days from the date in which the incident occurred. The Lessee must enact steps to prevent similar incidents and must submit a description of these actions to BOEM and BSEE within 30 days from the date in which the incident occurred.

4. Reporting: The Lessee must report all marine trash and debris lost or discarded to DOI (using the email address listed on DOI's most recent incident reporting guidance).

   This report applies to all marine trash and debris lost or discarded, and must be made monthly, no later than the fifth day of the following month. The report must include the following:

   a. Project identification and contact information for the lessee, operator, and/or contractor;
   b. The date and time of the incident;
   c. The lease number, OCS area and block, and coordinates of the object's location (latitude and longitude in decimal degrees);
   d. A detailed description of the dropped object to include dimensions (approximate length, width, height, and weight) and composition (e.g., plastic, aluminum, steel, wood, paper, hazardous substances, or defined pollutants);
   e. Pictures, data imagery, data streams, and/or a schematic/illustration of the object, if available;
   f. Indication of whether the lost or discarded item could be a magnetic anomaly of greater than 50 nanoTesla (nT), a seafloor target of greater than 0.5 meters (m), or a sub-bottom anomaly of greater than 0.5m when operating a magnetometer or gradiometer, side scan sonar, or sub-bottom profile in accordance with DOI's applicable guidance;
   g. An explanation of how the object was lost; and
   h. A description of immediate recovery efforts and results, including photos.

   In addition to the foregoing, the Lessee must submit a report within 48 hours of the incident ("48-hour Report") if the marine trash or debris could (a) cause undue harm or damage to natural resources, including their physical, atmospheric, and biological components, with particular attention to those that could result in the ingestion by or entanglement of marine protected species; or (b) significantly interfere with OCS uses (e.g., are likely to snag or damage fishing equipment, or present a hazard to navigation). The information in the 48-hour Report would be the same as that listed above, but just for the incident that triggered the 48-hour Report. The Lessee must report to DOI if the object is recovered and, as applicable, any substantial variation in the activities described in the Recovery Plan that were required during the recovery efforts. Information on unrecovered marine trash and debris must be included and addressed in the description of the site clearance activities provided in the decommissioning application required under 30 CFR § 585.906. The Lessee is not required to submit a report for those months in which no marine trash and debris was lost or discarded.

PDC 3: Minimize Interactions with ESA-listed species during Geophysical Survey Operations

To avoid injury of ESA-listed species and minimize any potential disturbance, the following measures will be implemented for all vessels operating impulsive survey equipment that emits sound at frequency ranges <180 kHz (within the functional hearing range of marine mammals) as well as CHIRP sub bottom profilers (this does not apply to Parametric Sub-bottom Profilers, Ultra Short Baseline, echosounders or side scan sonar; the acoustic characteristics (frequency, narrow beam width, rapid attenuation) are such that no effects to ESA-listed species are anticipated). The Clearance Zone is defined as the area around the sound source that needs to be visually cleared of ESA-listed species for 30 minutes before the sound source is turned on. The Clearance Zone is equivalent to a minimum visibility zone for survey operations to begin (*See* BMP 6). The Shutdown Zone is defined as the area around the sound source that must be monitored for possible shutdown upon detection of ESA-listed whale species within or entering that zone. For both the Clearance and Shutdown Zones, these are minimum visibility distances and for situational awareness PSOs should observe beyond this area when possible.

BMPs:

1. For situational awareness a Clearance Zone extending at least (1000 m in all directions) must be established around all vessels operating sources <180 kHz.
    a. The Clearance Zone must be monitored by approved third-party PSOs at all times and any observed ESA-listed species must be recorded (see reporting requirements below).
    b. For monitoring around the autonomous surface vessel (ASV) where remote PSO monitoring must occur from the mother vessel, a dual thermal/HD camera must be installed on the mother vessel facing forward and angled in a direction so as to provide a field of view ahead of the vessel and around the ASV. PSOs must be able to monitor the real-time output of the camera on hand-held computer tablets. Images from the cameras must be able to be captured and reviewed to assist in verifying species identification. A monitor must also be installed in the bridge displaying the real-time images from the thermal/HD camera installed on the front of the ASV itself, providing a further forward view of the craft. In addition, night-vision goggles with thermal clip-ons and a handheld spotlight must be provided and used such that PSOs can focus observations in any direction around the mother vessel and/or the ASV.
2. To minimize exposure to noise that could be disturbing, Shutdown Zone(s) (500 m for ESA-listed whales visible at the surface) must be established around the sources operating at <180 kHz being towed from the vessel.
    a. The Shutdown Zone(s) must be monitored by third-party PSOs at all times when noise-producing equipment (<180 kHz) is being operated and all observed ESA-listed species must be recorded (see reporting requirements below).
    b. If an ESA-listed whale species is detected within or entering the respective Shutdown Zone, any noise-producing equipment operating below 180 kHz must be shut off until the minimum separation distance from the source is re-established and the measures in (5) are carried out.
        i. A PSO must notify the survey crew that a shutdown of all active boomer, sparker, and bubble gun acoustic sources below 180 kHz is immediately required. The vessel operator and crew must comply immediately with any call for a shutdown by the PSO. Any disagreement or discussion must occur only after shutdown.
    c. If the Shutdown Zone(s) cannot be adequately monitored for ESA-listed whale species presence (i.e., a PSO determines conditions, including at night or other low-visibility conditions, are such that ESA-listed species cannot be reliably sighted within the Shutdown Zone(s), no equipment operating at <180 kHz can be deployed until such time that the Shutdown Zone(s) can be reliably monitored.

3. Before any noise-producing survey equipment (operating at <180 kHz) is deployed, the Clearance Zone (1000 m for all ESA-listed species) must be monitored for 30 minutes of pre-clearance observation.
    a. If any ESA-listed species is observed within the Clearance Zone during the 30-minute pre-clearance period, the 30-minute clock must be paused. If the PSO confirms the animal has exited the zone and headed away from the survey vessel, the 30-minute clock that was paused may resume. The pre-clearance clock will reset to 30 minutes if the animal dives or visual contact is otherwise lost.
4. When technically feasible, a "ramp up" of the electromechanical survey equipment must occur at the start or re-start of geophysical survey activities. A ramp up must begin with the power of the smallest acoustic equipment for the geophysical survey at its lowest power output. When technically feasible the power will then be gradually turned up and other acoustic sources added in a way such that the source level would increase gradually.
5. Following a shutdown for any reason, ramp up of the equipment may begin immediately only if: (a) the shutdown is less than 30 minutes, (b) visual monitoring of the Shutdown Zone(s) continued throughout the shutdown, (c) the animal(s) causing the shutdown was visually followed and confirmed by PSOs to be outside of the Shutdown Zone(s) (500 m for ESA-listed whale species, and heading away from the vessel, and (d) the Shutdown Zone(s) remains clear of all ESA-listed whale species. If all (a, b, c, and d) the conditions are not met, the Clearance Zone (1000 m for all ESA-listed species) must be monitored for 30 minutes of pre-clearance observation before noise-producing equipment can be turned back on.
6. In order for geophysical surveys to be conducted at night or during low-visibility conditions, PSOs must be able to effectively monitor the Clearance and Shutdown Zone(s). No geophysical surveys may occur if the Shutdown Zone(s) cannot be reliably monitored for the presence of ESA-listed whale species to ensure avoidance of impact to those species.
    a. An Alternative Monitoring Plan (AMP) must be submitted to BOEM (or the federal agency authorizing, funding, or permitting the survey) detailing the monitoring methodology that will be used during nighttime and low visibility conditions and an explanation of how it will be effective at ensuring that the Shutdown Zone(s) can be maintained during nighttime and low-visibility survey operations. The plan must be submitted 60 days before survey operations are set to begin.
    b. The plan must include technologies that have the technical feasibility to detect all ESA-listed whales out to 1000 m and leatherback sea turtles out to 100 m.
    c. PSOs should be trained and experienced with the proposed alternative monitoring technology.
    d. The AMP must describe how calibration will be performed, for example, by including observations of known objects at set distances and under various lighting conditions. This calibration should be performed during mobilization and periodically throughout the survey operation.
    e. PSOs shall make nighttime observations from a platform with no visual barriers, due to the potential for the reflectivity from bridge windows or other structures to interfere with the use of the night vision optics.
7. At times when multiple survey vessels are operating within a lease area, adjacent lease areas, or exploratory cable routes, a minimum separation distance (to be determined on a survey specific basis, dependent on equipment being used) must be maintained between survey vessels to ensure that sound sources do not overlap.
8. Any visual observations of ESA-listed species by crew or project personnel must be communicated to PSOs on-duty.

9. During good conditions (e.g., daylight hours; Beaufort scale 3 or less) when survey equipment is not operating, to the maximum extent practicable, PSOs must conduct observations for protected species for comparison of sighting rates and behavior with and without use of active geophysical survey equipment. Any observed ESA-listed species must be recorded regardless of any mitigation actions required.

PDC 4: Minimize Vessel Interactions with ESA-listed species

All vessels associated with survey activities (transiting [i.e., travelling between a port and the survey site] or actively surveying) must comply with the vessel strike avoidance measures specified below. 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 (PDC 7). The Vessel Strike Avoidance Zone is defined as 500 m or greater from any sighted ESA-listed marine mammal species or other unidentified large marine mammal.

BMPs:

1. Vessel captain and crew must maintain a vigilant watch for all protected species and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any ESA-listed species. The presence of a single individual at the surface may indicate the presence of submerged animals in the vicinity; therefore, precautionary measures should always be exercised. If pinnipeds or small delphinids of the following genera: Delphinus, Lagenorhynchus, Tursiops and Phocoena are visually detected approaching the vessel (i.e., to bow ride) or towed equipment, vessel strike avoidance and shutdown is not required.
2. Anytime a survey vessel is underway (transiting or surveying), the vessel must maintain a 500 m minimum separation distance and a PSO must monitor a Vessel Strike Avoidance Zone (500 m or greater from any sighted ESA-listed whale species or other unidentified large marine mammal, or 100 m from any sea turtle visible at the surface) to ensure detection of that animal in time to take necessary measures to avoid striking the animal. If the survey vessel does not require a PSO for the type of survey equipment used, a trained crew lookout may be used (see #3). For monitoring around the autonomous surface vessels, regardless of the equipment it may be operating, a dual thermal/HD camera must be installed on the mother vessel facing forward and angled in a direction so as to provide a field of view ahead of the vessel and around the ASV. A dedicated operator must be able to monitor the real-time output of the camera on hand-held computer tablets. Images from the cameras must be able to be captured and reviewed to assist in verifying species identification. A monitor must also be installed in the bridge displaying the real-time images from the thermal/HD camera installed on the front of the ASV itself, providing a further forward view of the craft.
    a. Survey plans must include identification of vessel strike avoidance measures, including procedures for equipment shut down and retrieval, communication between PSOs/crew lookouts, equipment operators, and the captain, and other measures necessary to avoid vessel strike while maintaining vessel and crew safety. If any circumstances are anticipated that may preclude the implementation of this PDC, they must be clearly identified in the survey plan and alternative procedures outlined in the plan to ensure minimum distances are maintained and vessel strikes can be avoided.
    b. All vessel crew members must be briefed in the identification of protected species that may occur in the survey area and in regulations and best practices for avoiding vessel

collisions. Reference materials must be available aboard all project vessels for identification of ESA-listed species. The expectation and process for reporting of protected species sighted during surveys must be clearly communicated and posted in highly visible locations aboard all project vessels, so that there is an expectation for reporting to the designated vessel contact (such as the lookout or the vessel captain), as well as a communication channel and process for crew members to do so.

   c. The Vessel Strike Avoidance Zone(s) are a minimum and must be maintained around all surface vessels at all times.
   d. If a large whale is identified within 500 m of the forward path of any vessel, the vessel operator must steer a course away from the whale at 10 knots (18.5 km/hr) or less until the 500 m minimum separation distance has been established. Vessels may also shift to idle if feasible.
   e. If a large whale is sighted within 200 m of the forward path of a vessel, the vessel operator must reduce speed and shift the engine to neutral. Engines must not be engaged until the whale has moved outside of the vessel's path and beyond 500 m. If stationary, the vessel must not engage engines until the large whale has moved beyond 500 m.
   f. If a sea turtle is sighted within the operating vessel's forward path, the vessel operator must slow down to 4 knots (unless unsafe to do so) and steer away as possible. The vessel may resume normal operations once the vessel has passed the individual.
   g. During times of year when sea turtles are known to occur in the survey area, vessels must avoid transiting through areas of visible jellyfish aggregations. In the event that operational safety prevents avoidance of such areas, vessels must slow to 4 knots while transiting through such areas.
3. To monitor the Vessel Strike Avoidance Zone, a PSO (or crew lookout if PSOs are not required) must be posted during all times a vessel is underway (transiting or surveying) to monitor for ESA-listed species in all directions.
   a. Visual observers monitoring the vessel strike avoidance zone can be either PSOs or crew members (if PSOs are not required). If the trained lookout is a vessel crew member, this must be their designated role and primary responsibility while the vessel is transiting. Any designated crew lookouts must receive training on protected species identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements. All observations must be recorded per reporting requirements.
   b. Regardless of monitoring duties, all crew members responsible for navigation duties must receive site-specific training on ESA-listed species sighting/reporting and vessel strike avoidance measures.
4. Vessels underway must not divert their course to approach any ESA-listed species.
5. Lessees are directed to NMFS' Marine Life Viewing Guidelines, which highlight the importance of these measures for avoiding impacts to mother/calf pairs (https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines#guidelines-&-distances).
6. Wherever available, Lessees will ensure all vessel operators check for daily information regarding protected species sighting locations. These media may include, but are not limited to: Channel 16 broadcasts, whalesafe.com, and the Whale/Ocean Alert App.

PDC 5: Minimize Risk During ROV usage, Buoy Deployment, Operations, and Retrieval

Any mooring systems used during survey activities prevent any potential entanglement of ESA-listed species, and in the unlikely event that entanglement does occur, ensure proper reporting of entanglement events according to the measures specified below.

BMPs:

1. ROVs: A Clearance Zone (1000 m for all ESA-listed species) must be monitored for 30 minutes of pre-clearance observation by PSOs before ROVs are deployed.
    a. If any ESA-listed species is observed within the Clearance Zone during the 30-minute pre-clearance period, the 30-minute clock must be paused. If the PSO confirms the animal has exited the zone and headed away from the survey vessel, the 30-minute clock that was paused may resume. The pre-clearance clock will reset to 30 minutes if the animal dives or visual contact is otherwise lost.
2. Ensure that any buoys attached to the seafloor use the best available mooring systems. Buoys, lines (chains, cables, or coated rope systems), swivels, shackles, and anchor designs must prevent any potential entanglement of ESA-listed species while ensuring the safety and integrity of the structure or device.
3. All mooring lines and ancillary attachment lines must use one or more of the following measures to reduce entanglement risk: shortest practicable line length, rubber sleeves, weak-links, chains, cables or similar equipment types that prevent lines from looping, wrapping, or entrapping protected species.
4. Any equipment must be attached by a line within a rubber sleeve for rigidity. The length of the line must be as short as necessary to meet its intended purpose.
5. During all buoy deployment and retrieval operations, buoys should be lowered and raised slowly to minimize risk to ESA-listed species and benthic habitat. Additionally, PSOs or trained project personnel (if PSOs are not required) should monitor for ESA-listed species in the area prior to and during deployment and retrieval and work should be stopped if ESA-listed species are observed within 500 m of the vessel to minimize entanglement risk.
6. If a live or dead marine protected species becomes entangled, you must immediately contact the applicable NMFS stranding coordinator using the reporting contact details (see Reporting Requirements section) and provide any on-water assistance requested.
7. All buoys must be properly labeled with owner and contact information.

PDC 6: Protected Species Observers

Qualified third-party PSOs to observe Clearance and Shutdown Zones must be used as outlined in the conditions above.

BMPs:

1. All PSOs must have completed an approved PSO training program and must receive NMFS approval to act as a PSO for geophysical surveys. Documentation of NMFS approval for geophysical survey activities in the Atlantic and copies of the most recent training certificates of individual PSOs' successful completion of a commercial PSO training course with an overall examination score of 80% or greater must be provided upon request. Instructions and application requirements to become a NMFS-approved PSO can be found at:

www.fisheries.noaa.gov/national/endangered-species-conservation/protected-species-observers.

2. In situations where third-party party PSOs are not required, crew members serving as lookouts must receive training on protected species identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements.
3. PSOs deployed for geophysical survey activities must be employed by a third-party observer provider. While the vessel is underway, they must have no other tasks than to conduct observational effort, record data, and communicate with and instruct relevant vessel crew to the presence of ESA-listed species and associated mitigation requirements. PSOs on duty must be clearly listed on daily data logs for each shift. a. Non-third-party observers may be approved by NMFS on a case-by-case basis for limited, specific duties in support of approved, third-party PSOs.
4. A minimum of one PSO (assuming condition 5 is met) must be on duty observing for ESA-listed species at all times that noise-producing equipment <180 kHz is operating, or the survey vessel is actively transiting during daylight hours (i.e., from 30 minutes prior to sunrise and through 30 minutes following sunset). Two PSOs must be on duty during nighttime operations. A PSO schedule showing that the number of PSOs used is sufficient to effectively monitor the affected area for the project (e.g., surveys) and record the required data must be included. PSOs must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch. PSOs must not be on active duty observing for more than 12 hours in any 24-hour period.
5. Visual monitoring must occur from the most appropriate vantage point on the associated operational platform that allows for 360-degree visual coverage around the vessel. If 360-degree visual coverage is not possible from a single vantage point, multiple PSOs must be on watch to ensure such coverage.
6. Suitable equipment must be available to each PSO to adequately observe the full extent of the Clearance and Shutdown Zones during all vessel operations and meet all reporting requirements.
    a. Visual observations must be conducted using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.
    b. Rangefinders (at least one per PSO, plus backups) or reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups) to estimate distances to ESA-listed species located in proximity to the vessel and Clearance and Shutdown Zone(s).
    c. Digital full frame cameras with a telephoto lens that is at least 300 mm or equivalent. The camera or lens should also have an image stabilization system. Used to record sightings and verify species identification whenever possible.
    d. A laptop or tablet to collect and record data electronically.
    e. Global Positioning Units (GPS) if data collection/reporting software does not have built-in positioning functionality.
    f. PSO data must be collected in accordance with standard data reporting, software tools, and electronic data submission standards approved by BOEM and NMFS for the particular activity.
    g. Any other tools deemed necessary to adequately perform PSO tasks.

PDCs 7: Reporting Requirements

To ensure compliance and evaluate effectiveness of mitigation measures, regular reporting of survey activities and information on all protected and ESA-listed species will be required as follows.

BMPs:

1. Data from all PSO observations must be recorded based on standard PSO collection and reporting requirements. PSOs must use standardized electronic data forms to record data. The following information must be reported electronically in a format approved by BOEM and NMFS:

Visual Effort:

a. Vessel name;
b. Dates of departures and returns to port with port name;
c. Lease number;
d. PSO names and affiliations;
e. PSO ID (if applicable);
f. PSO location on vessel;
g. Height of observation deck above water surface (in meters);
h. Visual monitoring equipment used;
i. Dates and times (Greenwich Mean Time) of survey on/off effort and times corresponding with PSO on/off effort;
j. Vessel location (latitude/longitude, decimal degrees) when survey effort begins and ends; vessel location at beginning and end of visual PSO duty shifts; recorded at 30 second intervals if obtainable from data collection software, otherwise at practical regular interval;
k. Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any change;
l. Water depth (if obtainable from data collection software) (in meters);
m. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions change significantly), including wind speed and direction, Beaufort scale, Beaufort wind force, swell height (in meters), swell angle, precipitation, cloud cover, sun glare, and overall visibility to the horizon;
n. Factors that may be contributing to impaired observations during each PSO shift change or as needed as environmental conditions change (e.g., vessel traffic, equipment malfunctions);
o. Survey activity information, such as type of survey equipment in operation, acoustic source power output while in operation, and any other notes of significance (i.e., pre-clearance survey, ramp-up, shutdown, end of operations, etc.);

Visual Sighting (all Visual Effort fields plus):

a. Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);
b. Vessel/survey activity at time of sighting;
c. PSO/PSO ID who sighted the animal;
d. Time of sighting;
e. Initial detection method;
f. Sighting’s cue;
g. Vessel location at time of sighting (decimal degrees);
h. Direction of vessel’s travel (compass direction);
i. Direction of animal’s travel relative to the vessel;
j. Identification of the animal (e.g., genus/species, lowest possible taxonomic level, or unidentified); also note the composition of the group if there is a mix of species;
k. Species reliability;

l. Radial distance;
m. Distance method;
n. Group size; Estimated number of animals (high/low/best);
o. Estimated number of animals by cohort (adults, yearlings, juveniles, calves, group composition, etc.);
p. Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);
q. Detailed behavior observations (e.g., number of blows, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior);
r. Mitigation Action; Description of any actions implemented in response to the sighting (e.g., delays, shutdown, ramp-up, speed or course alteration, etc.) and time and location of the action.
s. Behavioral observation to mitigation;
t. Equipment operating during sighting;
u. Source depth (in meters);
v. Source frequency;
w. Animal's closest point of approach and/or closest distance from the center point of the acoustic source;
x. Time entered shutdown zone;
y. Time exited shutdown zone;
z. Time in shutdown zone;
aa. Photos/Video

2. The project proponent must submit a final monitoring report to BOEM and NMFS (details to be provided) within 90 days after completion of survey activities. The report must fully document the methods and monitoring protocols, summarizes the survey activities and the data recorded during monitoring, estimates of the number of protected and/or ESA-listed species that may have been taken during survey activities, describes, assesses and compares the effectiveness of monitoring and mitigation measures. PSO sightings and effort data and trackline data in Excel spreadsheet format must also be provided with the final monitoring report.
3. In the event of a vessel strike of a protected species by any survey vessel, the project proponent must immediately report the incident to BOEM (details to be provided) and NMFS (details to be provided) and for marine mammals to the NOAA West Coast stranding hotline at 1-866-767-6114 and 562-506-4315. The report must include the following information:
   a. Name, telephone, and email or the person providing the report;
   b. The vessel name;
   c. The Lease Number;
   d. Time, date, and location (latitude/longitude) of the incident;
   e. Species identification (if known) or description of the animal(s) involved;
   f. Vessel's speed during and leading up to the incident;
   g. Vessel's course/heading and what operations were being conducted (if applicable);
   h. Status of all sound sources in use;
   i. Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike;
   j. Environmental conditions (wave height, wind speed, light, cloud cover, weather, water depth);
   k. Estimated size and length of animal that was struck;

l. Description of the behavior of the species immediately preceding and following the strike;
m. If available, description of the presence and behavior of any other protected species immediately preceding the strike;
n. Disposition of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, last sighted direction of travel, status unknown, disappeared); and
o. To the extent practicable, photographs or video footage of the animal(s).

5. Sightings of any injured or dead protected species must be immediately reported, regardless of whether the injury or death is related to survey operations, to BOEM (details to be provided), and the NOAA West Coast stranding hotline at 1-866-767-6114 and 562-506-4315. If the project proponent's activity is responsible for the injury or death, they must ensure that the vessel assist in any salvage effort as requested by NMFS. When reporting sightings of injured or dead protected species, the following information must be included:
    a. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
    b. Species identification (if known) or description of the animal(s) involved;
    c. Condition of the animal(s) (including carcass condition if the animal is dead);
    d. Observed behaviors of the animal(s), if alive;
    e. If available, photographs or video footage of the animal(s); and
    f. General circumstances under which the animal was discovered.
6. Reporting and Contact Information:
    a. Dead and/or Injured Protected Species:
        i. NOAA West Coast stranding hotline at 1-866-767-6114 and 562-506-4315.
    b. Injurious Takes of Endangered and Threatened Species:
        i. NOAA NMFS Long Beach Office, Protected Resources Division (details to be provided).
        ii. BOEM Office of Environment, Pacific Region (details to be provided).

PDC 8: Prohibition of Trawling for During Project Activities

Lessees will characterize site-specific parameters within the WEAs to inform their site assessment plan and to generally describe local conditions, including biological attributes. Lessees and their contractors may employ a range of methods to accomplish these goals, but may not employ trawling methodology (as defined by 50 CFR§ 660.11 (11)) to conduct these activities.