Final Environmental Assessment for Additional Site Assessment Activities on Beacon Wind, LLC's Renewable Energy Lease OCS-A 0527

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Final Environmental Assessment for Additional Site Assessment Activities on Beacon Wind, LLC's Renewable Energy Lease OCS-A 0520

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Executive Summary

ES.1 Purpose and Need for Action

On March 2, 2023, Beacon Wind submitted, for Bureau of Ocean Energy Management (BOEM) review, a Site Assessment Plan (SAP) Amendment (Tetra Tech 2023) application for additional site assessment activities in Lease Area OCS-A 0520 (Lease Area) not included in the SAP previously approved by BOEM in 2021. This Environmental Assessment (EA) supplements analysis presented in BOEM's 2014 revised EA for *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts* and focuses on new site assessment activities and their potential impacts that have not been previously evaluated. This EA complies with the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) §§ 4321–4370f, the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) §§ 1501.3(b) and 1508.9, U.S. Department of Interior (USDOI) regulations implementing NEPA at 43 CFR Part 46, and USDOI Manual (DM) Chapter 15 (516 DM 15).

The Proposed Action for this EA is approval of Beacon Wind's amended SAP to conduct additional site assessment activities in the Lease Area. The site assessment activities consist of repeated short-term deployment and subsequent removal (i.e., tests) of a single suction bucket at select locations in the Lease Area proposed for eventual installation of wind turbines. The suction bucket deployed during testing would be similar to the suction bucket jacket foundation type considered for use in supporting wind turbines and offshore substations within the Beacon Wind Construction and Operations Plan (COP). The activities would be conducted to further assess the site conditions and gather information to support the engineering design of suction bucket jacket foundations that may be installed within the Lease Area subject to BOEM's ongoing review and approval of the COP, which BOEM is assessing in an environmental impact statement currently in preparation (88 *Federal Register* 42390).

The purpose of the Proposed Action is to approve the SAP Amendment in support of site assessment activities within the Lease Area on the Outer Continental Shelf (OCS) offshore Massachusetts. The need for BOEM's approval of the SAP Amendment is to enable the Lessee to adequately assess whether the geological and geotechnical conditions of select locations within the Lease Area are suitable for, and could support, commercial-scale wind energy production by wind turbine generators and offshore substations that use suction bucket jacket foundations.

ES.2 Proposed Action and Alternatives

The Proposed Action is to approve additional site assessment activities as described in the SAP Amendment (Tetra Tech 2023). This EA analyzes the reasonably foreseeable effects of activities that are anticipated to occur from the Proposed Action.

The proposed site assessment activities consist of 35 deployments and removals of a single suction bucket foundation at 26 locations within the Lease Area (shown on **Figure 2-1** and listed in **Table 2-2**). Suction bucket foundations are an alternative foundation design to traditional pile-driven foundations. The suction bucket design technology secures a steel bucket-shaped foundation by penetrating the sediment and pumping water from within the bucket to create an area of reduced pressure against the seafloor, also described as vacuum suctioning the bucket foundation into the seafloor. Due to reduced noise and depth disturbance of these foundation types relative to pile-driven foundations, suction bucket designs can have environmental and technical advantages over pile-driven designs. Results of this testing activity may provide data that informs the significance of these advantages, such as acoustic impact minimization for marine life, which will further the knowledge of this technology and has the potential to facilitate future implementation of the technology for the Beacon Wind Project and the offshore wind industry.

In this EA, BOEM analyzes two alternatives (**Table ES-1**).

Table ES-1. Alternatives analyzed in detail

Alternative	Description
Alternative A—No Action	Under Alternative A, BOEM would not approve the additional site assessment activities proposed in the Beacon Wind SAP Amendment. Alternative A includes other ongoing activities and future planned actions (**Appendix C**) occurring in the same geographic area and timeframe.
Alternative B—Proposed Action: Approval of Beacon Wind's Supplemental Site Assessment Activities (Foundation Testing)	Under Alternative B, BOEM would approve the additional site assessment activities proposed in the Beacon Wind SAP Amendment.

BOEM = Bureau of Ocean Energy Management; SAP = Site Assessment Plan.

ES.3 Foreseeable Activities and Impact-Producing Factors

This EA considers the reasonably foreseeable effects of Foundation Testing and non-routine activities associated with the proposed site assessment activities within the Lease Area. The scenario of reasonably foreseeable activity and impact-producing factors is informed by Beacon Wind's SAP Amendment; the requirements of the renewable energy regulations at 30 CFR Part 585; applicable BOEM guidance for lessees; and previous EAs prepared for similar activities. Reasonably foreseeable non-routine and low-probability events and hazards that could occur during site assessment activities include (1) severe storms, such as hurricanes and extratropical cyclones; (2) allisions and collisions between the site assessment structure or associated vessels and other marine vessels or marine life; (3) spills from collisions or fuel spills resulting from generator refueling; and (4) recovery of lost survey equipment.

The analysis did not consider construction and operation of any commercial wind power facilities within the Beacon Wind Lease Area, which are being evaluated as part of a separate NEPA process and environmental impact statement evaluating the COP submitted by the Lessee on June 5, 2023. Impact-producing factors (IPFs) from the Proposed Action that could affect resources include the following:

- Noise
- Air Emissions
- Lighting
- Habitat Degradation
- Vessel Traffic
- Routine Vessel Discharges
- Bottom Disturbance
- Entanglement

ES.4 Environmental Consequences

This EA uses a four-level classification scheme (negligible, minor, moderate, and major) to characterize the environmental impacts predicted for each alternative. **Table ES-2** summarizes potential impacts that could occur under the Proposed Action (Alternative B). Under Alternative A (No Action), any potential environmental and socioeconomic impacts, including benefits, associated with Alternative B (Proposed Action) would not occur; however, impacts could occur from other ongoing or future planned actions (**Section 3**).

Table ES-2. Summary of impact determinations for Alternative B: Proposed Action

Resource	Impact Determination: Alternative B (Proposed Action)	
	Foundation Testing Activities	Non-Routine Events
Air Quality and Greenhouse Gas Emissions	Negligible	Negligible
Benthic Resources	Negligible	Negligible
Commercial and Recreational Fishing	Negligible to Minor	Negligible
Cultural, Historical, and Archaeological Resources	Negligible	Negligible
Finfish, Invertebrates, and Essential Fish Habitat	Negligible to Minor	Negligible
Marine Mammals	Negligible	Negligible
Sea Turtles	Negligible	Negligible

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List of Abbreviations and Acronyms

µm	micrometer
ACHP	Advisory Council on Historic Preservation
ADCP	Acoustic Doppler Current Profilers
ADIOS	Automated Data Inquiry for Oil Spills
APE	Area of Potential Effect
ASLFs	Ancient Submerged Landform Features
BA	Biological Assessment
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
Call	Call for Information and Nominations
CD	Consistency Determination
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COP	Construction and Operations Plan
DM	USDOI Manual
DoD	U.S. Department of Defense
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FR	Federal Register
GHG	greenhouse gas emissions
HAPC	Habitat Area of Particular Concern
HAPs	Hazardous Air Pollutants
IPaC	Information for Planning and Consultation
IPFs	Impact-producing factors
km	kilometers
NAAQS	National Ambient Air Quality Standards
NARW	North Atlantic right whale
NAVFAC	Naval Facilities Engineering Systems Command
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPS	National Park Service

NRHP	National Register of Historic Places
OCS	Outer Continental Shelf
PA	Programmatic Agreement
PEIS	Programmatic Environmental Impact Statement
ppb	parts per billion
PRDP	Post-Review Discovery Plan
SAP	Site Assessment Plan
SHPO	State Historic Preservation Office
SOCs	Standard Operating Conditions
TSSs	Traffic Separation Schemes
U.S.C.	United States Code
USCG	U.S. Coast Guard
USDOI	U.S. Department of Interior
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOCs	Volatile Organic Compounds

1 Introduction

The U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) has prepared this Environmental Assessment (EA) to determine whether approval of additional site assessment activities as proposed by Beacon Wind LLC (Beacon Wind) within Lease Area OCS-A 0520 (Lease Area; **Figure 1-1**) offshore Massachusetts would lead to reasonably foreseeable significant impacts on the environment.

On June 3, 2014, BOEM issued a Finding of No Significant Impact (FONSI) based on a Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts (BOEM 2014; referred to herein as the "2014 EA") which covered Lease Area OCS-A 0520. On December 8, 2020, Beacon Wind submitted a Site Assessment Plan (SAP) for the Lease Area in support of site assessment activities consisting of installation and operation of metocean equipment, with updated versions submitted April 27, 2021, and June 28, 2021. The 2014 EA addressed the activities included in the SAP, and the SAP was approved by BOEM on September 24, 2021. The metocean equipment was deployed in the Lease Area on November 10, 2021, and was removed in December 2023.

1.1 Purpose and Need

On March 2, 2023, Beacon Wind submitted, for BOEM review, a SAP Amendment (Tetra Tech 2023) application for additional site assessment activities in the Lease Area not included in the 2020 SAP, which consist of short-term deployment and subsequent removal of representative wind turbine/offshore substation foundation components (Proposed Action). The Proposed Action includes repeated tests of a single suction bucket within the Lease Area, at selected locations planned for eventual installation of wind turbines. The suction bucket would be similar to those considered within the Beacon Wind Construction and Operations Plan (COP) for the suction bucket jacket foundation, which may support wind turbines and/or offshore substations. The Proposed Action will be conducted to further assess the geological and geotechnical conditions and gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area for the proposed Beacon Wind Project.

This EA supplements analysis presented in the 2014 EA and focuses on new site assessment activities and their potential impacts that have not been previously evaluated. This EA complies with the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) §§ 4321-4370f, the Council on Environmental Quality (CEQ) regulations at 40 Code of Federal Regulations (CFR) §§ 1501.3(b) and 1508.9, U.S. Department of Interior (USDOI) regulations implementing NEPA at 43 CFR Part 46, and USDOI Manual (DM) Chapter 15 (516 DM 15).

The purpose of the Proposed Action is to approve the SAP Amendment in support of site assessment activities within the Lease Area on the Outer Continental Shelf (OCS) offshore Massachusetts. The need for BOEM's approval of the SAP Amendment is to enable the Lessee to adequately assess whether the geological/geotechnical conditions of areas within the Lease Area are suitable for, and could support, commercial-scale wind energy production by wind turbine generators that use suction bucket foundations.

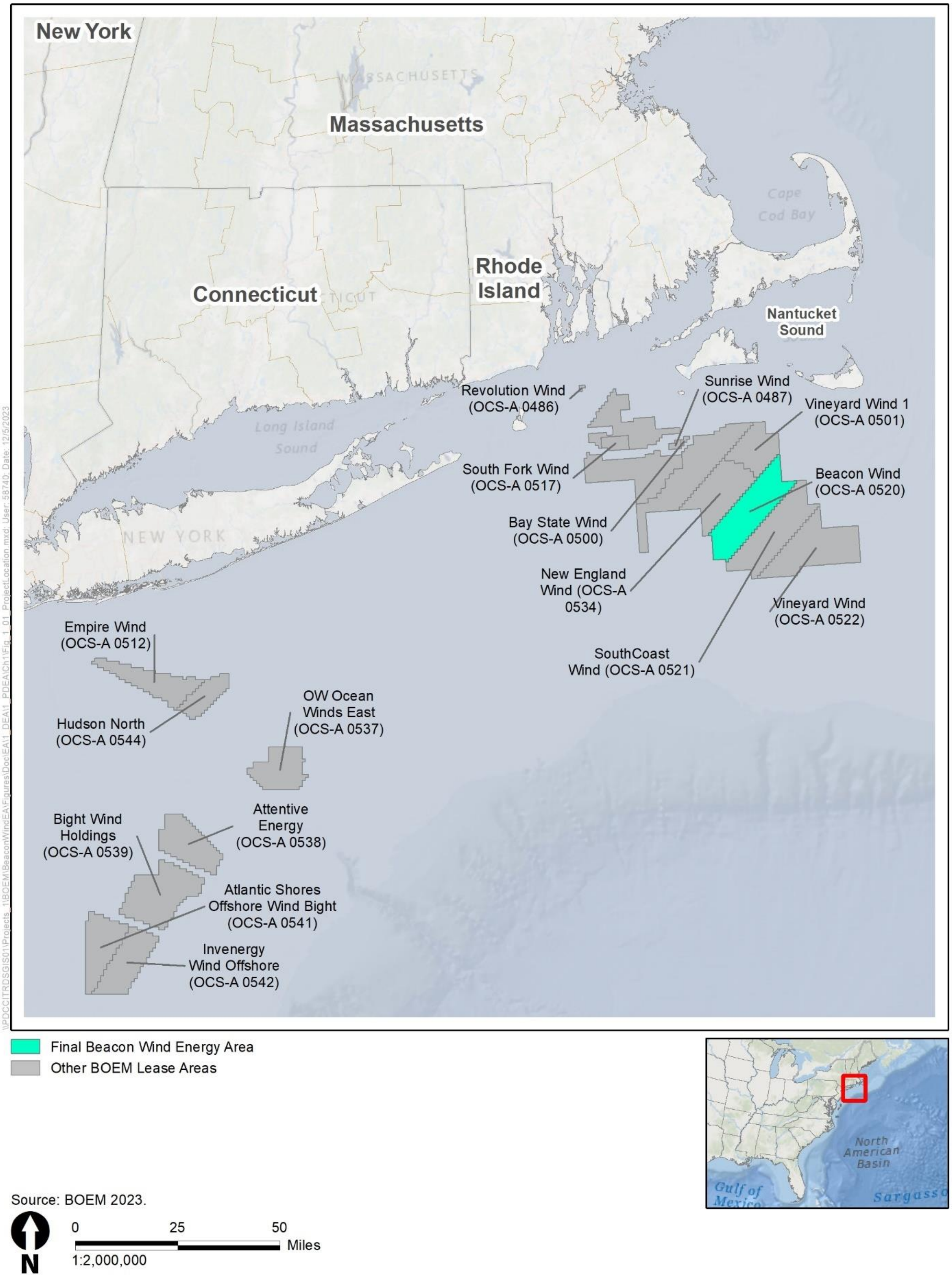


Figure 1-1. Beacon Wind Lease Area

1.2 Information Considered and Supporting National Environmental Policy Act Evaluations

Information considered in scoping this EA includes the following:

- Public response to the November 7, 2023, Notice of Intent (NOI) to prepare this EA.
- Ongoing or completed consultations with other federal agencies, including the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS).
- Research and review of current relevant NEPA documents that assess similar activities, as well as relevant scientific and socioeconomic literature.

The following NEPA documents were used to inform preparation of this EA and are herein incorporated in their entirety by reference:

- *Final Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf*, OCS Environmental Impact Statement (EIS)/Environmental Assessment (EA) Minerals Management Service (MMS) 2007-046 (MMS 2007b).
- *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment*, OCS EIS/EA BOEM 2014-603 (BOEM 2014).

Additional environmental studies performed to support decisions concerning offshore wind energy development are available on BOEM's website at https://www.boem.gov/renewable-energy-research-completed-studies.

1.3 Changes Made Since the Draft EA

The Final EA incorporates changes made due to the emergence of new information or in response to comments on the Draft EA and subsequent reviews of the administrative Final EA by BOEM staff. The most notable changes are listed below.

- Additional ichthyoplankton data for the entrainment analysis were added in **Section 4.3** to reflect the update to the Foundation Testing window.
- Additional text was added to **Appendix E**, which summarizes and responds to public comments received during the two public comment periods for the EA.
- Inclusion of a new appendix, **Appendix G**, which includes all consultation documents.

2 Alternatives, Including the Proposed Action

This section describes the two alternatives considered in this EA for the Beacon Wind SAP Amendment. See Table 2-1.

Table 2-1. Alternatives Considered

Alternative	Description
Alternative A – No Action	Under Alternative A, BOEM would not approve the additional site assessment activities proposed in the Beacon Wind SAP Amendment. Alternative A includes other ongoing activities and future planned actions (**Appendix C**) occurring in the same geographic area and timeframe.
Alternative B - Proposed Action: Approval of Beacon Wind's Supplemental Site Assessment Activities (Foundation Testing)	Under Alternative B, BOEM would approve the additional site assessment activities proposed in the Beacon Wind SAP Amendment.

2.1 Alternative A (No Action)

Alternative A is the No Action Alternative, which would not include the proposed suction bucket testing, but would include other ongoing activities and future planned actions. Alternative A would result in the continued approved site assessment activities in the Lease Area as described in the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore NY, Revised EA* (BOEM 2016) and as Alternative A Proposed Action in the 2014 EA, but no additional site assessment activities as described in the SAP Amendment would occur. The original site assessment activities included up to 5 meteorological towers, 10 meteorological buoys, or a combination of towers and buoys on the Lease Area. The original site characterization and assessment activities combined were projected to result in between 2,808 and 6,500 vessel round trips as a maximum scenario over a 5-year period (see Section 3.1.3.4 of the 2014 EA). Vessel traffic was divided between 10 major and 21 smaller ports in Massachusetts, Rhode Island, Connecticut, and New York (see Section 3.1.2 of the 2014 EA). These leasing, site characterization, and site assessment scenarios were described in detail in Section 3 of the 2014 EA. The impacts of Alternative A on environmental resources and socioeconomic conditions are described in detail in Section 4.2 of the 2014 EA.

2.2 Alternative B (Proposed Action)

The Proposed Action is to approve additional site assessment activities as described in the SAP Amendment (Tetra Tech 2023). Under the Proposed Action, BOEM would approve the additional site assessment activities for Foundation Testing that will occur within the Lease Area. This EA analyzes the reasonably foreseeable effects of activities that are anticipated to occur from the Proposed Action.

The proposed site assessment activities consist of up to 35 deployments and removals of a single steel suction bucket foundation at up to 26 locations within the Lease Area (shown on **Figure 2-1** and listed in **Table 2-2**) to gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area for a future Beacon Wind project. The suction bucket used for the Foundation Tests would be similar to those considered within the COP (AECOM 2023) for the suction bucket jacket foundations, which may be used for some of the wind turbines and/or offshore substations. Suction bucket foundations are an alternative foundation design to traditional pile-driven foundations. The suction bucket design technology secures a steel bucket-shaped foundation by penetrating the sediment and pumping water from within the bucket to create an area of reduced pressure against the seafloor, also described as vacuum suctioning the bucket foundation into the seafloor. Due to reduced noise and depth disturbance of these foundation types relative to pile-driven foundations, suction bucket designs can have environmental and technical advantages over pile-driven designs. Results of this testing activity may provide data that informs the significance of these advantages, such as acoustic impact minimization for marine life, which will further the knowledge of this technology and has the potential to facilitate future implementation of the technology for the Beacon Wind Project and the offshore wind industry.

These two alternatives are analyzed in full in this EA.

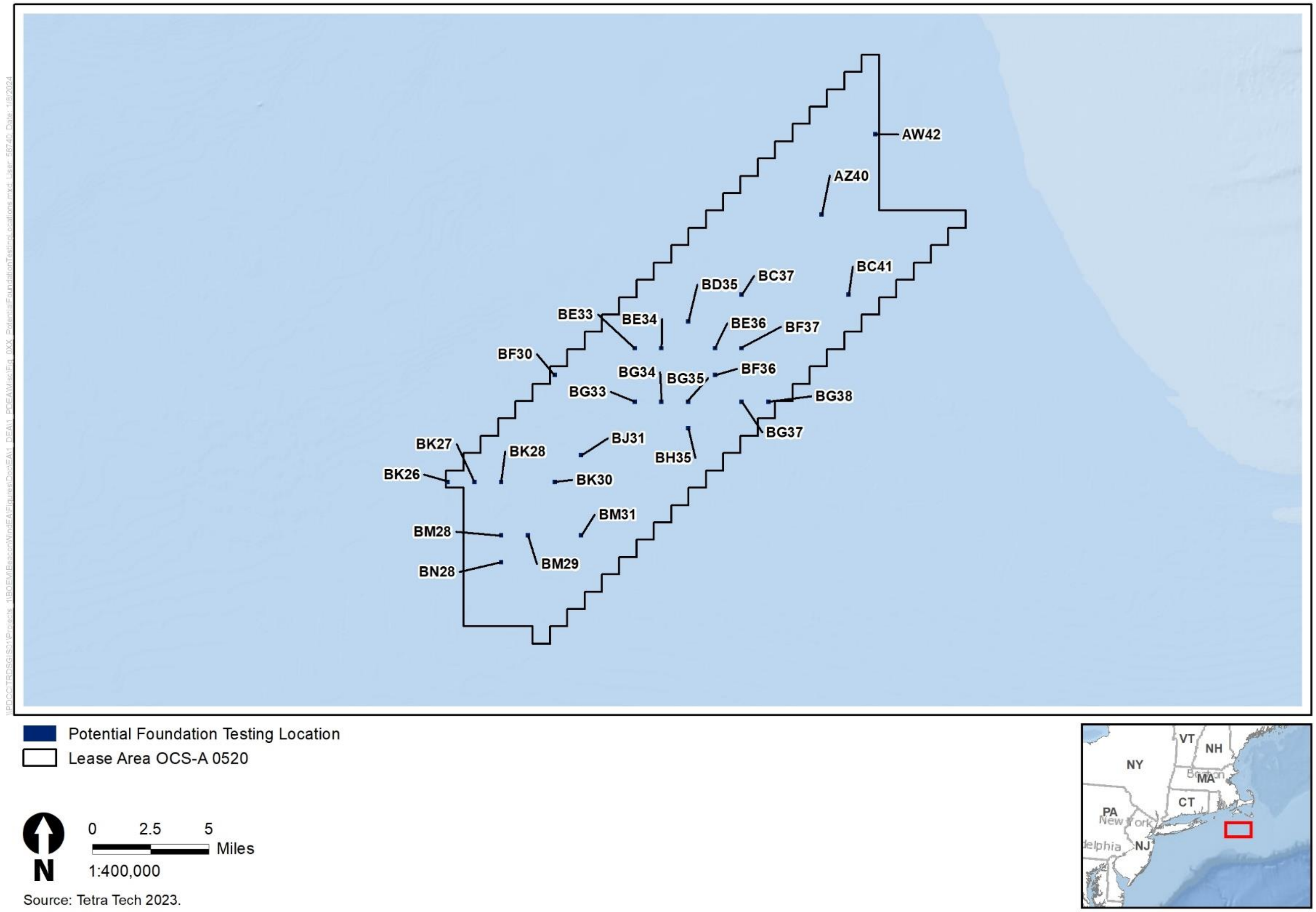


Figure 2-1. Foundation Testing locations

Table 2-2. Location of Foundation Testing *sites*

Wind Turbine Location Name	Latitude (Center of Foundation Testing Area)	Longitude (Center of Foundation Testing Area)	Minimum Water Depth (meters)	Maximum Water Depth (meters)
AW42	40.97132	-70.3722	-42.41	-41.71
AZ40	40.92075	-70.4151	-45.78	-44.94
BC41	40.87099	-70.3921	-48.80	-48.10
BC37	40.86989	-70.48	-52.69	-52.28
BD35	40.85264	-70.5235	-54.48	-53.94
BE33	40.83538	-70.5671	-52.81	-51.75
BE34	40.83567	-70.5451	-54.02	-52.28
BE36	40.83625	-70.5012	-55.21	-54.63
BE37	40.83654	-70.4792	-54.15	-53.62
BF30	40.81778	-70.6325	-55.99	-55.45
BF36	40.81957	-70.5008	-53.78	-52.62
BG33	40.80202	-70.5663	-55.03	-54.38
BG34	40.80232	-70.5443	-53.76	-53.18
BG35	40.80261	-70.5224	-53.44	-52.99
BG37	40.80318	-70.4785	-52.68	-51.95
BG38	40.80346	-70.4565	-52.69	-51.75
BH35	40.78593	-70.522	-53.39	-53.14
BJ31	40.76806	-70.6094	-57.60	-56.98
BK30	40.75108	-70.6309	-58.82	-58.32
BK28	40.75045	-70.6748	-60.40	-60.06
BK27	40.75013	-70.6967	-60.83	-60.12
BM28	40.71709	-70.6739	-60.78	-60.09
BM29	40.71741	-70.652	-60.25	-59.71
BM31	40.71803	-70.6082	-58.73	-58.31
BN28	40.70042	-70.6735	-61.08	-60.59
BK26	40.7498	-70.7186	-61.15	-60.53

3 Scenario of Reasonably Foreseeable Activity and Impact-Producing Factors

3.1 Geographic Analysis Area

BOEM used a localized geographic scope to evaluate impacts from planned actions for resources that are fixed in nature (i.e., their location is stationary—such as benthic and archaeological resources) or for resources where impacts from the Proposed Action would only occur in waters in the Lease Area (e.g., water quality). Although some resources are mobile and, in some cases, migratory (e.g., marine mammals, sea turtles, and fish/fishing), impacts from the Proposed Action are anticipated to remain within the Lease Area, and, as a result, the geographic analysis area will remain the same for these resources.

BOEM has not defined onshore areas from which the Proposed Action would be visible as part of the analysis area because BOEM has concluded that the equipment and vessels performing these activities would be indistinguishable from existing lighted vessel traffic for an observer onshore.

3.2 Routine Activities and Impact-Producing Factors

Routine activities included for the Proposed Action (Alternative B) are summarized in **Table 3-1**. This scenario is based on the requirements of the renewable energy regulations at 30 CFR Part 585, applicable BOEM guidance for lessees, previous plans that have been submitted to BOEM, previous EAs prepared for similar activities (**Section 1.2)**, and the biological assessment (BA) evaluating the effects of survey and data collection activities associated with renewable energy on the Atlantic OCS (Baker and Howson 2021). Unless otherwise noted, assumptions in this section are based on these sources.

Table 3-1. Routine activities for the Proposed Action (Alternative B) scenario

Overall Scenario
BOEM would approve Foundation Testing activities at up to 26 sites within the Beacon Wind Lease Area.
Surveying and Sampling Activities
Foundation Testing will be conducted at sea during a single approximately 10- to 15-day effort in the Lease Area.
Foundation Testing will occur shortly after EA approval and SAP Amendment approval.
Foundation Testing will require a seabed sample at every potential wind turbine location including the possibility of multiple tests at a single location, such that up to 35 total deployment trials would be conducted.
Beacon Wind will be required to comply with Standard Operating Conditions (SOCs) developed to avoid and minimize adverse effects on resources (**Section 5**).
Installation, Decommissioning, and Operations and Maintenance Activities
Because the Foundation Testing is a temporary activity, all testing equipment would be removed and no facilities installed; therefore, no decommissioning is required.

Assumptions for Generation of Noise
Under the Proposed Action, the following activities and equipment would generate noise: Foundation Testing survey equipment and vessel engines during testing.

BOEM = Bureau of Ocean Energy Management; EA = Environmental Assessment; SAP = Site Assessment Plan; SOC = Standard Operating Condition

This EA analyzes the effects of Foundation Testing activities (as shown in **Section 3.2.1**) within the Lease Area. It does not consider construction and operation of any commercial wind power facilities on a lease or grant in the identified Lease Area, which will be evaluated in a separate Environmental Impact Statement (EIS).

Impact-producing factors (IPFs) associated with the proposed testing activities that could affect resources include the following:

- Noise
- Air Emissions
- Lighting
- Vessel Traffic
- Routine Vessel Discharges
- Bottom Disturbance

3.2.1 Foundation Testing Activities

Foundation Testing will consist of trials of up to 35 deployments and removals of a single steel suction bucket. The suction bucket equipment will be similar to that considered within the COP for the suction bucket jacket foundation, which may support wind turbines and/or offshore substations. The Foundation Testing will be conducted to gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area. Suction bucket foundations are an alternative foundation design to traditional pile-driven foundations. This technology secures a steel bucket-shaped foundation by penetrating the sediment and pumping water from within the bucket to create an area of reduced pressure against the seafloor. Potential advantages of suction bucket foundations include reduced noise and depth disturbance compared to pile-driven foundations.

The Foundation Testing will be conducted at sea over approximately 15 days in the Lease Area. No foundation materials or other survey equipment will be detached from the vessel or remain in-water for a period exceeding the suction bucket trial periods at each deployment/removal site. The vessel will utilize dynamic positioning; therefore, no anchors or jack-up legs will be used.

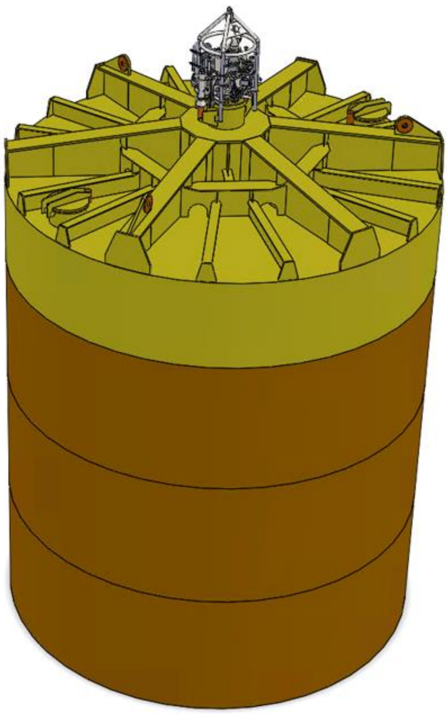
There are 26 proposed deployment/removal sites, all within the Lease Area. Because multiple tests may occur at some of the sites, up to a total of 35 trials may be conducted (**Figure 2-1**). The coordinates for the locations under consideration are provided in **Table 2-2**. At each site, activities will occur within a 984- by 984-foot (300- by 300-meter) square, which is centered on the location for eventual installation of the proposed wind turbines under the COP (AECOM 2023). This area is conservative and would cover all Foundation Testing activities at each location, including the possibility of multiple tests at a single location.

The suction bucket (**Figure 3-1**) used in the test will have a diameter of 30 to 39 feet (9 to 12 meters), a height of 36 to 39 feet (11 to 12 meters), and total weight of approximately 200 tons. The suction bucket will be designed to penetrate the seafloor to a maximum of between 33 and 39 feet (10 and 12 meters). This is significantly less than the maximum seafloor penetration for metocean tower foundations assessed in the 2014 EA, which assumed that such foundations would be pile-driven up to 100 feet (30 meters) below the seafloor.

Source: Tetra Tech 2023.

Figure 3-1. Representative Photograph of a Suction Bucket

A low-flow suction pump (**Figure 3-2**) would be mounted to the top of the suction bucket approximately 19 feet (6 meters) above the seabed. After the bucket has settled into the seafloor, the suction pump would slowly remove water from within the bucket to create an area of reduced pressure, which would assist in completing penetration to the target depth. The suction pump would generate noise during operation, but observations conducted at other offshore wind facilities suggest that noise from suction pumps would attenuate to background noise levels at a relatively short distance from the pump (e.g., within 1,640 feet [500 meters]; Koschinski and Lüdemann 2020).



Source: Tetra Tech 2023.

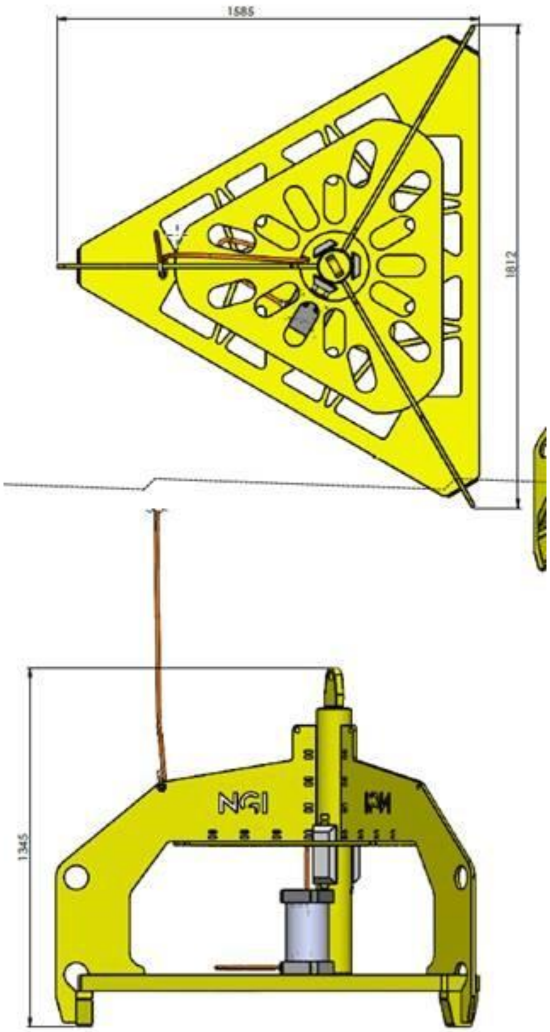
Figure 3-2. Illustrative Drawing of a Suction Pump Mounted atop a Suction Bucket

The suction pump would operate at a nominal rate of 1,320 gallons per minute (5 cubic meters [m^3] per minute), and the removed water would be released immediately outside the bucket. The volume of seawater removed would be limited to the volume inside the bucket, with a maximum of 358,504 gallons (1,357 m^3) removed per test. The suction pump would not be screened to avoid potential pressure losses due to clogging of the screen (e.g., if a small piece of debris became suctioned to the screen), which would cause the pump to malfunction. At the completion of each test, the pump would slowly return water to the interior of the bucket to create positive pressure inside the bucket, allowing it to be removed from the seafloor.

Measurement equipment would be deployed inside the bucket during testing to monitor the soil plug on the inside of the bucket and to gather data to assist with foundation engineering. Imaging equipment (e.g., sonar, echo sounder, sub-bottom profiler) would be mounted inside the lid of the bucket. The imaging equipment would be operated at frequencies at or above 400 kilohertz (kHz), which is inaudible to marine organisms.

Two remotely operated vehicles (ROVs) may be used to assist in precisely locating the bucket during deployment, as well as to observe and gather data on the process of penetration and recovery. The ROVs would be suspended in the water column and would not contact the seafloor. The ROVs would be controlled from on board the vessel and would navigate via hydraulic propellers or thrusters that do not generate significant underwater noise.

Prior to lowering the bucket to the seafloor, a reference frame (**Figure 3-3**) would be lowered to the seafloor to assist the vessel lowering the bucket onto the targeted location and to ensure accurate positioning of the bucket on the seafloor. The reference frame is made of steel with a maximum weight of approximately 1,100 pounds (500 kilograms). The footprint of the reference frame is approximately 11 square feet (ft^2; 1 square meter [m^2]). The reference frame would be directly lowered from the vessel onto the seafloor and would remain stationary on the seafloor for the duration of each foundation installation test. The edge studs of the reference frame may penetrate the top 2 inches (5 centimeters) of the seabed. Upon completion of each trial, the reference frame would be raised vertically back onto the vessel.



Source: Tetra Tech 2023.

Figure 3-3. Top and Side View of a Representative Reference Frame

Each Foundation Test installation is expected to take 6 to 9 hours, including 3 to 5 hours for deployment (lowering and seabed penetration) and 3 to 4 hours for removal (reverse penetration, lifting, potential cleaning, and lifting onboard). Increased vessel presence and traffic during Foundation Testing could result in several IPFs, including noise, air emissions, routine vessel discharge, and lighting.

A suction bucket will be fabricated and transported from Europe, and a vessel and crew will be mobilized from Europe, Canada, and/or the United States. Foundation Testing activities are expected to occur over approximately 10–15 days, barring weather delays.

The Foundation Testing will use a single large vessel, equipped with a crane rated to a minimum of 300-ton capacity. Once the construction vessel arrives at each Foundation Testing location, it will be positioned using dynamic positioning technology, without the use of anchors or jack-up legs. Once the suction bucket deployment is complete, retrieval will be initiated. The onboard crane will lift it from the seabed to the surface. If sticky soil is present at the site and becomes attached to the surface of the bucket's walls, it may be cleaned under the water prior to lifting back onboard. The bucket will then be lifted back on the vessel deck, followed by lifting and onboarding of the reference frame. After all equipment is onboard and secure, the vessel will transit to the next trial location and the above process will be repeated. If the sea state conditions are hazardous, the bucket may be left suspended under the vessel and above the seabed as the vessel transits at low speed to the next location to ensure safe operations. Once testing at all sites is complete, crew and materials will transit back to the port of origin and demobilize. Ports being considered for crew mobilization are Halifax (Nova Scotia, Canada), New Bedford, Providence, and Davisville.

Beacon Wind will notify BOEM, United States Fleet Forces N46, the United States Army Corps of Engineers (USACE), and the United States Coast Guard (USCG) prior to mobilization to perform Foundation Testing activities. Written notice via email will be provided to the appropriate contact at Fleet Forces Command prior to mobilization to avoid potential conflicts with military operations. Beacon Wind will update Fleet Forces Command on the testing schedule following BOEM approval of the SAP Amendment and detailed planning.

Additionally, Beacon Wind will notify mariners, fishermen, and other users of the area by submitting a request to the USCG for publication of a Local Notice to Mariners at least 2 weeks prior to the start of the in-water work. This notice will include the contact names for the vessel, local fisheries liaison officer, channels of communication, and the duration of the work. Copies of all USCG communications will be provided to BOEM as required. Additionally, in accordance with standard maritime practices, the vessel captain(s) will broadcast via VHF radio on Marine Channel 16 notification to mariners of their position and limited mobility during Foundation Testing activities. Beacon Wind will also provide a continual live Automatic Identification System (AIS) feed of vessel activity within and around the Lease Area, which can be accessed at https://www.beaconwind.com/environment-sustainability/mariners-fisheries/ along with additional information on Beacon Wind's ongoing coordination with mariners and fisheries for the ongoing Beacon Wind EIS.

Within 30 days of completing Foundation Testing, Beacon Wind will notify BOEM in writing that testing is complete. Per Lease Stipulation 2.2.1, Beacon Wind will continue to submit a semi-annual progress report to BOEM every 6 months for the duration of the site assessment term.

3.2.2 Non-Routine Events

Reasonably foreseeable non-routine and low-probability events and hazards that could occur during Foundation Testing include the following: (1) severe storms, such as hurricanes and extratropical cyclones; (2) collisions between the associated vessel with other marine vessels or marine life; (3) spills from collisions; and (4) loss and recovery of survey equipment. These events and hazards are identical to events addressed in the 2014 EA, and that previous analysis is incorporated here by reference, with the exception that the additional Foundation Testing will not involve the installation of fixed structures and will be conducted over a much shorter timeframe (10–15 days), and therefore the likelihood of non-routine events occurring during the additional Foundation Testing activity is greatly reduced. Accordingly, the potential impacts from non-routine events as described in the 2014 EA, the SAP, and SAP Amendment are briefly described herein but not analyzed in detail. However, recovery of lost survey equipment is not addressed in the 2014 EA and is carried forward for analysis in this EA.

Storms

Severe weather events have the potential to cause structural damage and injury to personnel. Major storms, winter nor'easters, and hurricanes pass through the area, resulting in elevated water levels (storm surge) and high waves and winds. Storm surge and wave heights from passing storms are worse in shallow water and along the coast but can pose hazards in offshore areas. The Atlantic Ocean hurricane season extends from June 1 to November 30, with a peak in September when hurricanes would be most likely to impact the Lease Area. Storms could contribute to an increased likelihood of allisions and collisions that could result in a spill. However, the storm would cause the spill and its effects to dissipate faster, vessel traffic is likely to be significantly reduced in the event of an impending storm, and the proposed testing activities would be postponed until after the storm had passed. The Foundation Testing will be conducted over a period of 10–15 days; therefore, the likelihood of such a storm event occurring during the activity is extremely low.

Collisions

Collisions between vessels are considered unlikely because vessel traffic will use and stay in the Nantucket to Ambrose Fairway, south of the Lease Area. Vessel traffic is controlled by multiple routing measures, such as safety fairways and Traffic Separation Schemes (TSSs).

Spills

A spill of petroleum product could occur as a result of hull damage from collisions between vessels. From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88 gallons (333 liters; 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 fuel would be expected to dissipate very rapidly, evaporate, and biodegrade within a few days (MMS 2007a). The National Oceanic and Atmospheric Administration's (NOAA's) Automated Data Inquiry for Oil Spills (ADIOS; 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% varied between 0.5 and 2.5 days, depending on ambient wind (Tetra Tech 2015), suggesting that 88 gallons (333 liters) 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, notification, and best management practices (BMPs) as detailed in the SAP and SAP Amendment. BOEM expects that the Foundation Testing vessel would minimize the potential for a release of oils and/or chemicals in accordance with 33 CFR Part 151, 33 CFR Part 154, and 33 CFR Part 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.

Recovery of Lost Survey Equipment

The Foundation Testing is not expected to result in any trash or bottom debris. However, following the completion of testing, Beacon Wind will ensure that the seafloor has been cleared of all obstructions created by activities on the Lease. This will be accomplished via photo documentation of all deployed and retrieved equipment. Additionally, to confirm that all equipment was retrieved from the site, Beacon Wind will carry out a photographic bottom survey.

3.3 Resources Eliminated from Further Consideration

NEPA requires important resources and areas that may be impacted or affected by the action be the focus of the analysis. Because many of the activities described in this EA have been previously analyzed in the 2014 EA, resource areas of concern for site assessment activities for the proposed Foundation Testing have been well documented. The Foundation Testing as proposed is a short-term, temporary activity conducted offshore, so impacts on many important resources and areas are not expected. Therefore, the resources and areas listed below will not be carried forward for analysis in this EA given that their impacts are anticipated to be negligible or lower.

3.3.1 Bats

The potential impacts on bats associated with the proposed Foundation Testing activities would be negligible. Impacts on bats are analyzed in detail within the 2014 EA, the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore NY, Revised EA* (BOEM 2016), and other recently published offshore wind EISs in the vicinity of the Project including Vineyard Wind 1, New England Wind, and SouthCoast. Bat activity in the Atlantic has been found to decline dramatically 11 nautical miles (nm; 20.4 kilometers) from shore (Sjollema et al. 2014), and it is generally considered unlikely that any bats would travel 15 nm (28 kilometers) or more from land over open water to forage in the Lease Area (Peterson 2016; Sjollema et al. 2014).

Although rare in the Lease Area, bats could have avoidance or attraction responses to the survey vessel due to noise, lighting, and the possible presence of insects. Due to the scarcity of bats offshore in the Lease Area and the limited amount of added vessel traffic, collisions between bats and boats are unlikely. Thus, the overall impact of activities associated with the Proposed Action on bats would be negligible.

3.3.2 Birds

The potential impact on birds from the proposed Foundation Testing would be negligible. Potential impacts on birds from site assessment activities are analyzed in detail in the 2014 EA, the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore NY, Revised EA* (BOEM

2016), and other recently published offshore wind EISs in the vicinity of the Project including Vineyard Wind 1, Northeast Wind, and SouthCoast. Although birds could be affected by accidental vessel discharges during the proposed Foundation Testing, any such discharge would be short term and localized.

3.3.3 Coastal Habitats

No direct impacts on wetlands or other coastal habitats would occur from the proposed Foundation Testing activities. Existing ports or industrial areas are expected to be used in support of the proposed activities, and no expansion of existing facilities is expected to occur. Indirect impacts from routine activities may include wake-induced erosion and increased turbidity caused by nearshore vessel traffic but would be negligible or less given the small amount of added vessel traffic caused by one vessel transiting to and from the Lease Area.

3.3.4 Demographics and Employment

Temporary increases in employment from the proposed Foundation Testing activities could occur. However, the small number of workers on the single vessel that would be directly employed for the short-term (10–15 days) testing activities would not have a perceptible impact on local employment and demographic characteristics, such as population. Any impacts on employment, population, and the local economies in and around the ports that would support the Foundation Testing would be short term and imperceptible; therefore, impacts would be negligible.

3.3.5 Environmental Justice

Based on the distance of the nearest shoreline from the proposed Foundation Testing and the negligible impacts of the activities on demographics and employment, the proposed Foundation Testing would not result in disproportionate and adverse environmental or health effects on minority or low-income populations. Only the use of existing coastal facilities has the potential to affect minority or low-income populations. However, existing coastal facilities in the region would support proposed activities without any need for expansion. There would be no impacts on environmental justice because disproportionately high and adverse human health or environmental effects that would disproportionately affect low-income and minority persons would not occur as a result of the Proposed Action.

3.3.6 Geology

The potential impacts on sediments from proposed Foundation Testing would have negligible impacts on geology. Seafloor impacts will occur only within the footprint of the reference frame, which will affect 0.028 acre (114 m^2) of seafloor per test, and up to 0.986 acre (3,990 m^2) across the Lease Area, the total area of impact covering a very small portion of the total Lease Area. The Foundation Testing suction bucket would penetrate to a maximum depth of 39 feet (12 meters), which will not impact the underlying geology of the area. Impacts on the geology of the seafloor would be negligible.

3.3.7 Military Use Areas

Potential impact on military use areas from site assessment activities within the Lease Area was fully analyzed in the 2014 EA. Any impact on the Navy's training areas and other U.S. Department of Defense (DOD) activities from the proposed Foundation Testing activities could be mitigated by site-specific stipulations designed in consultation with DOD. Therefore, any impacts would be negligible and avoidable when coordinated with DOD.

3.3.8 Navigation and Vessel Traffic

Impacts on vessel traffic and navigation as a result of the proposed Foundation Testing will be negligible in the affected area. The additional vessel activity associated with the Proposed Action will be temporary, limited to a single vessel for 10–15 operational days. Impact on navigation and vessel traffic from all other vessels associated with site assessment activities was fully analyzed in the 2014 EA. The 2014 EA concluded that impacts on vessel traffic and navigation as a result of site characterization surveys would be negligible to minor. Because only one vessel will be associated with the Proposed Action, the number of vessels passing through the Lease Area is not expected to significantly increase vessel traffic density when compared to existing and projected future vessel traffic in the Lease Area. Based on this information, it is expected that any impacts on navigation and vessel traffic would be short term and negligible.

Additionally, Beacon Wind will notify mariners, fishermen, and other users of the area by submitting a request to the USCG for publication of a Local Notice to Mariners at least 2 weeks prior to the start of the in-water work (**Section 3.2.2**).

3.3.9 Recreation and Visual Resources

The potential impacts on visual resources from Foundation Testing would be negligible. The action includes temporary and short-term vessel activity and does not include placement of permanent infrastructure. Most recreational boating activity occurs within 3 miles (4.8 kilometers) of the shore, and a very limited number of recreational routes have been recorded in the Lease Area. Given the distance of the proposed activities from shore, the fact that no new coastal infrastructure would be necessary, and the small amount of temporary vessel traffic associated with the Proposed Action, impacts on visual resources, onshore cultural resources, and recreation and tourism would be short term and negligible.

3.3.10 Water Quality

Potential impacts on water quality from the proposed Foundation Testing include vessel discharges (including bilge and ballast water, and sanitary waste) and sediment suspension. Non-routine events could include the recovery of lost survey equipment and the potential for spills.

Impacts on coastal and marine waters from vessel discharges would likely be of short duration and remain undetectable or minimal with adherence to regulations governing discharges (BOEM 2015). The Proposed Action is not anticipated to increase runoff or onshore discharge into harbors, waterways, coastal areas, or the ocean environment. The Project vessel would utilize dynamic positioning thrusters to maintain position, and therefore no anchoring impacts would occur. Sediment suspension in the water column resulting from activities associated with the foundation/suction bucket test would be short term, would temporarily impact local turbidity and water clarity, and is not anticipated to result in any significant impact on water quality. Impacts on water quality as a result of potential spills would be minimized by adherence to USCG requirements relating to the prevention and control of oil spills, notification, and BMPs.

Impacts on water quality could occur during Foundation Testing due to vessel discharges, sediment suspension, recovery of lost equipment, and spills. Water quality is expected to return, without mitigation, to its original state after testing is completed. Impacts from vessel discharges and recovery of lost equipment on marine water quality would be short term and negligible, with any changes being small in magnitude, highly localized, and transient. All regulations governing discharges will be adhered to during Foundation Testing. Impacts on water quality as a result of sediment suspension in the water column would also be short term and negligible as sediments will settle to the seafloor within hours to days. Impacts on water quality due to potential spills would be short term and minor as impacts would be minimized by adherence to USCG requirements.

4 Environmental Consequences

4.1 Assessment Methodology

This EA uses a four-level classification scheme (negligible, minor, moderate, and major) to characterize the environmental impacts predicted if the Proposed Action or the No Action Alternative is implemented. Definitions of impacts are presented in two separate groups: (1) biological and physical resources and (2) socioeconomic resources. Impact level definitions used in this EA are described in **Table 4-1**.

The impact level definitions were originally developed for BOEM's Programmatic EIS (PEIS) for Alternative Energy Development (MMS 2007b), were used in other previous lease issuance EAs (**Section 1.2**), and are used in this EA to provide consistency in BOEM's discussion of impacts.

Table 4-1. Definitions of impact determinations used in this EA

Impact Determination	Definition for Biological and Physical Resources	Definition for Socioeconomic Resources
Negligible	Little to no effect or no measurable impacts.	Little to no effect or no measurable impacts.
Minor	Most impacts on the affected resource could be avoided with proper mitigation. Impacts would not disrupt the normal or routine functions of the affected resource. If impacts occur, the affected resource would recover completely without any mitigation once the impacting agent is eliminated.	Adverse impacts on the affected activity or community could be avoided with proper mitigation. Impacts would not disrupt the normal or routine functions of the affected activity or community. Once the impacting agent is eliminated, the affected activity or community would return to a condition with no measurable effects without any mitigation.
Moderate	Impacts on the affected resource are unavoidable. Proper mitigation would reduce impacts substantially during the life of the Proposed Action. The viability of the affected resource is not threatened, although some impacts may be irreversible, or the affected resource would recover completely if proper mitigation is applied during the life of the Proposed Action or proper remedial action is taken once the impacting agent is eliminated.	Impacts on the affected activity or community are unavoidable. Proper mitigation would reduce impacts substantially during the life of the Proposed Action. The affected activity or community would have to adjust somewhat to account for disruptions due to impacts of the Proposed Action, or, once the impacting agent is eliminated, the affected activity or community would return to a condition with no measurable effects if proper remedial action is taken.
Major	Impacts on the affected resource are unavoidable. Proper mitigation would reduce impacts somewhat during the life of the Proposed Action. The viability of the affected resource may be threatened, and the affected resource would not fully recover, or the resource may retain measurable effects indefinitely even if proper mitigation is applied during the life of the Proposed Action or remedial action is taken once the impacting agent is eliminated.	Impacts on the affected activity or community are unavoidable. Proper mitigation would reduce impacts somewhat during the life of the Proposed Action. The affected activity or community would experience unavoidable disruptions to a degree beyond what is normally acceptable, and, once the impacting agent is eliminated, the affected activity or community may retain measurable effects indefinitely, even if remedial action is taken.

In order to comply with the page limits stated in Section 1501.5 of the CEQ implementing regulations, BOEM has focused the main body of this EA on the impacts for resources of most concern and has moved the analysis of other resources to **Appendix A**, including all resources for which implementation of the Proposed Action would result in negligible impacts, including air quality (air emissions estimates are presented in **Appendix B**) and cultural, historical, and archaeological resources.

4.2 Alternative A – No Action Alternative and Affected Environment

Under the No Action Alternative, BOEM would not approve the additional proposed Foundation Testing activities included in the Proposed Action as described in the SAP Amendment. Therefore, additional vessel traffic associated with Foundation Testing activities would not occur.

The No Action Alternative discussions that follow include descriptions of the baseline conditions of each resource, as well as descriptions of how the affected environment or baseline for each resource may change, evolve, or shift (i.e., the trajectory of the resource) absent the Proposed Action (Alternative B). This EA identifies other present (ongoing) and planned actions (formerly referred to as cumulative) that contribute to the No Action baseline that include activities as described in the original 2014 EA, along with impacts on the resources from those actions; this EA focuses on effects that are reasonably foreseeable in the same location and timeframe.

Appendix C includes a list of the ongoing and planned projects and IPFs that BOEM has identified as potentially contributing to reasonably foreseeable impacts when combined with impacts from the Proposed Action over the geography and time scale described in **Section 3**. Reasonably foreseeable planned actions include Foundation Testing activities within the existing Beacon Wind Lease Area. As indicated in **Section 2**, approval of site assessment activities, by itself, does not authorize any construction within the Lease Area. Therefore, the analysis in this EA does not consider development of the Lease Area. However, the No Action Alternative does consider approved, proposed, and contemplated projects across other existing leases.

BOEM has completed a study of IPFs on the North Atlantic OCS to consider in an offshore wind development cumulative impacts (now referred to as "planned actions") scenario (Avanti Corporation and Industrial Economics Inc. 2019).[1] The study identifies cause-and-effect relationships between renewable energy projects and resources potentially affected by such projects. It further classifies those relationships into a manageable number of IPFs through which renewable energy projects could affect resources. It also identifies the types of actions and activities to be considered in a planned actions impacts scenario. The study identifies actions and activities that may affect the same physical, biological, economic, or cultural resources as renewable energy projects and states that such actions and activities may have the same IPFs as offshore wind projects.

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[1] On July 16, 2020, the CEQ, which is responsible for Federal agency implementation of NEPA, updated the regulations for implementing the procedural provisions of NEPA (85 *Federal Register* 43304–43376). The new implementing regulations went into effect on September 14, 2020. The update eliminated explicit references to "cumulative impacts" from the regulations. Instead, "the environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration, including the reasonably foreseeable environmental trends and planned actions in the area(s)." As such, the term "cumulative" has been replaced by planned actions throughout this EA.

The Avanti Corporation and Industrial Economics Inc. (2019) study identifies the relationships between IPFs associated with specific ongoing and reasonably foreseeable planned actions and activities in the North Atlantic OCS to consider in a NEPA planned actions impacts scenario. These IPFs and their relationships were utilized in the EA analysis and identification of planned actions impacts, and the determination as to which IPF applied to which resource was decided by BOEM. If an IPF was not associated with the Proposed Action, it was not included in this analysis.

As discussed in the Avanti Corporation and Industrial Economics Inc. (2019) study, planned actions other than offshore wind projects may also affect the same resources as the Proposed Action or other offshore wind projects, possibly via the same IPFs or IPFs through which offshore wind projects do not contribute. This section describes different resources and how these reasonably foreseeable planned actions could affect each of those resources in the absence of the Proposed Action.

4.2.1 Benthic Resources

Description of the Affected Environment

The description of benthic resources in this section is supported by studies conducted by Beacon Wind, as well as other studies reviewed in the literature (COP Section 5.5, Appendix G, Appendix S, and Appendix T; AECOM 2023). Site-specific benthic surveys were conducted from July 2021 to September 2021 in the Lease Area at 157 proposed WTG locations, including those proposed for Foundation Testing, utilizing grab sampling, drop and towed camera stills and video, and sediment profile and plan view imaging (SPI/PV) and at 218 locations along interarray cable routes using SPI/PV. From July 2021 to November 2021, site-specific benthic surveys were conducted along the export cable corridor, with SPI/PV imaging collected at 374 stations along the route and benthic grab samples and video collected at 198 of the 374 stations. Benthic video only was collected at an additional 93 stations along the route. Detailed baseline descriptions of the affected environment within the Lease Area are provided in COP Volume II, Appendix S and Section 5.5 (AECOM 2023), and are summarized in this section.

The Beacon Wind Lease Area is located approximately 20 miles (32 kilometers) south of Nantucket, Massachusetts, and 60 miles (97 kilometers) east of Montauk, New York. The Lease Area covers approximately 28,811 acres (52,128 hectares) and the sediments are predominately muddy sands (138 out of 157 stations) throughout the Lease Area (COP Appendix S, Table 20; AECOM 2023). No hardbottom or rocky habitats were observed in the Lease Area during site-specific sampling conducted in 2021. Polychaete worms (*Levinsenia gracilis*, *Polygordius* spp., *Ninoe nigripes*, and *Terrebellides stroemi*), amphipods (*Ampleisca vadorum*, *Unciola irrorata*, and *Ericthonius brasiliensis*), bivalves (*Nucula proxima* and *Periploma papyratium*), and cumaceans (*Eudorella pusilla*) were the most numerically abundant infaunal organisms in the Lease Area. Faunal assemblages in the Lease Area had generally low percent coverage and included sea stars (Asterias sp. and Astropecten sp.), which were more abundant in the southern portion of the Lease Area, and sand dollars (likely *Echinarachnius parma*), which were observed in the northwest portion of the Lease Area. No nonnative species, seagrass, macroalgae, sensitive habitats, or NOAA species of concern were observed in the Lease Area.

Impact Analysis of Alternative A

Benthic resources are subject to pressure from ongoing activities and conditions, especially climate change, commercial fishing using bottom-tending gear (e.g., dredges, bottom trawls, traps/pots), vessel anchoring, cable and pipeline emplacement and maintenance activities, electromagnetic fields (EMF), underwater noise from construction activities, and sediment dredging for navigation. These routine activities are expected to continue for the foreseeable future and would affect benthic habitats and their community compositions. Construction of ongoing and planned offshore wind projects would affect benthic resources through the primary IPFs of accidental releases, cable emplacement and maintenance, noise, and land disturbance.

Conclusion

Under the No Action Alternative, benthic resources would continue to be affected by existing environmental trends and ongoing activities. BOEM expects ongoing activities to have continuing short-term, long-term, and permanent impacts (e.g., disturbance, injury, mortality, habitat degradation, habitat conversion) on benthic resources primarily through regular maritime activity, offshore construction impacts, cable emplacement, and climate change. Offshore wind activities are expected to involve several IPFs, primarily new cable emplacement and the presence of structures (i.e., foundations and scour/cable protection). However, habitat disturbance from offshore construction is expected to be minimal, and recovery of benthic communities is expected over time. BOEM anticipates the No Action Alternative to result in **negligible** to **moderate** impacts on benthic resources.

4.2.2 Commercial and Recreational Fishing

Description of the Affected Environment

Most fisheries resources in Federal waters of the New England region are managed under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §1801 et seq.) through two Regional Fishery Management Councils, the New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC). The Regional Fishery Management Councils develop species-specific Fisheries Management Plans (FMPs), which establish fishing quotas, seasons, and closure areas, as well as protections for Essential Fish Habitat (EFH). Fishery resources managed under NEFMC include the Atlantic Herring FMP; Monkfish FMP; Northeast Multispecies (Large-Mesh and Small-Mesh) FMPs; Red Crab FMP; Sea Scallop FMP; and Skate FMP (NEFMC 2023). Fishery resources managed under MAFMC include the Bluefish FMP; Golden and Blueline Tilefish FMP; Mackerel, Squid, Butterfish FMP; Spiny Dogfish FMP; Summer Flounder, Scup, Black Sea Bass FMP; and Surfclam, Ocean Quahog FMP (MAFMC 2023). Additional fishery resources include the Highly Migratory Species FMP managed under NMFS (NMFS 2006), as well as the American Lobster FMP, Jonah Crab FMP, and Shad and River Herring FMP managed under the Atlantic States Marine Fisheries Commission (ASMFC 2023). These FMP fisheries are referred to throughout this section; therefore, the author-date citations are provided only here.

Commercial fisheries in Federal waters of the New England region harvest a variety of finfish and shellfish species, including American lobster (*Homarus americanus*), Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), bluefish (*Pomatomus saltatrix*), clams (Atlantic surfclam [*Spisula solidissima*] and ocean quahog (*Arctica islandica)*), Atlantic sea scallop (*Placopecten magellanicus*), groundfish such as Atlantic cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*), Jonah crab (*Cancer borealis*), monkfish (*Lophius americanus*), longfin squid (*Doryteuthis pealeii)* and shortfin squid (*Illex illecebrosus*), and summer flounder (*Paralichthys dentatus*). These fishery resources are harvested with a variety of fishing gear, including mobile gear (e.g., bottom trawl, dredge, midwater trawl) and fixed gear (e.g., gillnet, pot, bottom longline, seine, hand line).

The primary source of data used to describe the commercial fisheries in the Lease Area was NMFS's Socioeconomics Impacts of Atlantic Offshore Wind Development reports (NMFS 2023f). These reports combine data from Vessel Trip Reports (VTRs) and dealer reports submitted by those issued a permit for managed species in Federal waters. Annual average commercial fishing landings and revenue in the Lease Area from 2008–2021 are summarized by species for the top 10 species by revenue in **Table 4-2**. Commercial fishing activity in the Lease Area landed an annual average weight of 596,389 pounds and generated an annual average revenue of $590,863. The species that generated the highest revenue in the Lease Area was longfin squid, which accounted for 22% of the revenue generated there. Other species that were among the highest in revenue generated in the Lease Area were the silver hake (*Merluccius bilinearis*), Jonah crab, monkfish, summer flounder, and scup (*Stenotomus chrysops*).

Table 4-2. Annual commercial fishing landings and revenue in the Lease Area by species, 2008–2021

Species[1]	Average Landings (pounds)	Maximum Landings (pounds)	Average Revenue (2021 dollars)	Maximum Revenue (2021 dollars)
Longfin Squid	95,730	317,923	$131,716	$445,964
Silver Hake	119,018	237,572	$84,779	$192,556
Jonah Crab	71,457	145,726	$65,183	$144,828
Monkfish	31,769	68,395	$50,337	$153,141
Summer Flounder	16,026	41,317	$49,938	$132,827
Scup	58,136	150,621	$47,625	$126,272
American Lobster	6,246	14,314	$32,515	$63,928
Skates spp.	60,683	130,055	$32,218	$59,565
Golden Tilefish	4,774	29,767	$20,359	$129,237
Atlantic Sea Scallop	1,789	3,772	$19,625	$39,165
All Species[2]	**596,389**	**1,134,824**	**$590,863**	**$964,613**

Source: NMFS 2023f.
Note: Data are for vessels issued Federal fishing permits by the Greater Atlantic Regional Fisheries Office.
[1] Species are sorted by average revenue in descending order.
[2] Includes 59 species that were harvested in the Lease Area.

Annual average commercial fishing landings and revenue in the Lease Area from 2008–2021 are summarized by fishing port for the top 10 ports by revenue in **Table 4-3**. The fishing ports with the highest landed weight and revenue in the Lease Area were Point Judith, Rhode Island, and New Bedford, Massachusetts, which collectively accounted for approximately 60% of the landed weight and 57% of revenue from the Lease Area. Other fishing ports that accounted for substantial landings and revenue in the Lease Area included Montauk, New York; Chatham, Massachusetts; and Little Compton, Rhode Island.

Table 4-3. Annual commercial fishing landings and revenue in the Lease Area by fishing port, 2008–2021

Fishing Port[1]	Average Landings (pounds)	Maximum Landings (pounds)	Average Revenue (2019 dollars)	Maximum Revenue (2019 dollars)
Point Judith, RI	201,941	433,007	$202,173	$389,229
New Bedford, MA	158,955	595,253	$135,002	$342,808
Montauk, NY	53,271	171,831	$64,428	$153,878
Chatham, MA	18,701	50,733	$20,114	$77,402
Little Compton, RI	19,813	64,533	$19,416	$63,077
Newport, RI	16,863	40,271	$18,198	$29,684
Westport, MA	8,289	18,764	$11,042	$27,178
Fairhaven, MA	11,129	66,639	$10,240	$60,893
Beaufort, NC	3,229	16,263	$9,380	$43,115
Hampton, VA	2,589	8,998	$6,155	$22,414
All ports[2]	**596,388**	**1,134,823**	**$590,863**	**$964,613**

Source: NMFS 2023f.
Note: Data are for vessels issued Federal fishing permits by the Greater Atlantic Regional Fisheries Office.
MA = Massachusetts, NC = North Carolina, NY = New York, RI = Rhode Island, VA = Virginia
[1] Fishing ports are sorted by average revenue in descending order.
[2] Includes 31 ports for which there were reported landings in the Lease Area.

As with the commercial fishing industry, the for-hire recreational fishing fleets contribute to the economy through direct employment, income, and gross revenues of the for-hire businesses, as well as through spending on products and services to maintain and operate their vessels, triggering further indirect multiplier effects that are dependent upon the initial demands of the for-hire fleet (Steinback and Brinson 2013). For-hire recreational fishing boats are operated by licensed captains for businesses that sell recreational fishing trips to anglers. These boats include both party boats, defined as boats on which fishing space and privileges are provided for a fee, and charter boats, defined as boats operating under charter for a price wherein the participants are part of a preformed group of anglers.

Recreational fishing in the Lease Area is accessed by boats from various ports and inlets located in Massachusetts, New York, and Rhode Island. There are several documented recreational fishing locations within or near the Lease Area, including “The Star,” located in the northeastern portion of the Lease Area; “The Dump,” a former offshore disposal area located west of the Lease Area; and “Gordon’s Gully,” located northwest of the Lease Area (**Figure 4-1**). Recreational saltwater fishing in the region occurs year-round with the most intensity during warmer months when the seasons for many recreational finfish are open (April/May through September/October; MA DMF 2023).

Recreational fishing for highly migratory species occurs in the Lease Area (**Figure 4-2**). Several Atlantic Highly Migratory Species tournaments are based out of ports near the Lease Area, including ports in Block Island, Nantucket, and Cape Cod. Species targeted in these tournaments have included blue marlin, white marlin, sailfish, swordfish, and various tuna species. Based on the NMFS Large Pelagics Survey, an intercept survey that includes both for-hire and private fishing, the level of recreational fishing effort for highly migratory species from 2002–2019 was moderate in the Lease Area.

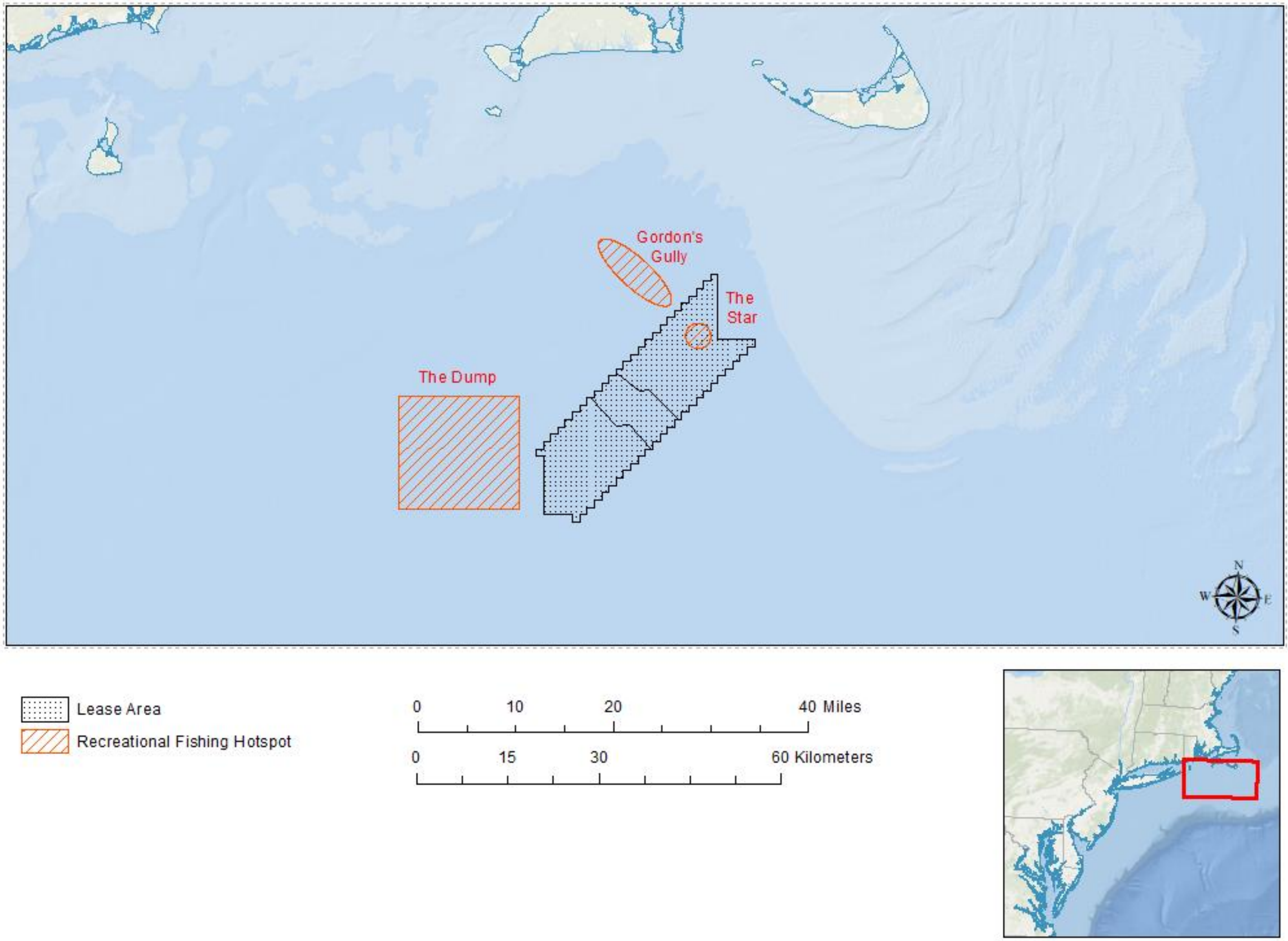

Figure 4-1. Recreational fishing hotspots within or near the Lease Area

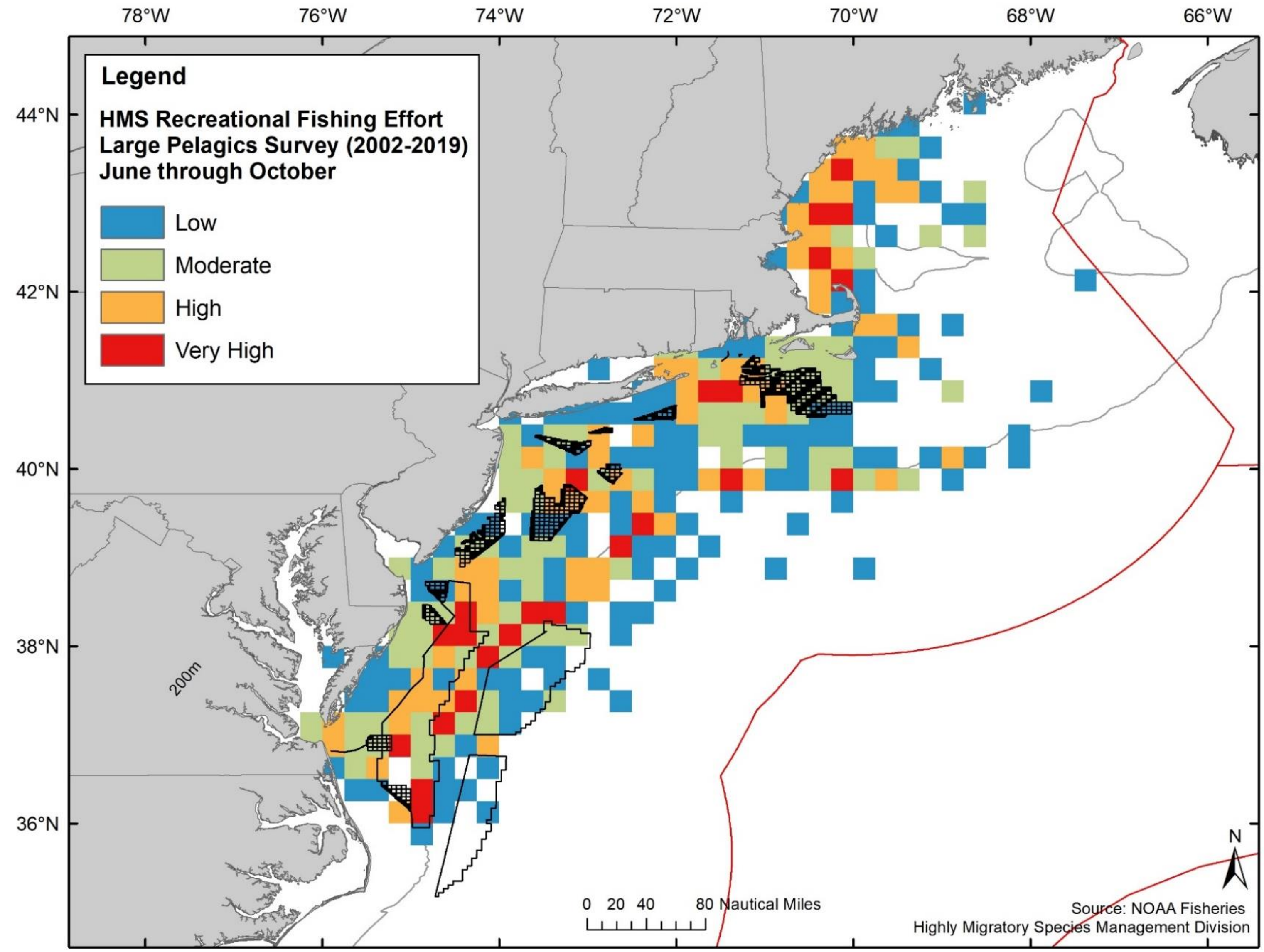

Figure 4-2. Fishing effort for highly migratory species in the Greater Atlantic

Note: Data is based on intercept surveys and include both for-hire and private fishing for highly migratory species

The primary source of data used to describe the for-hire recreational fisheries in the Lease Area was NMFS's Socioeconomics Impacts of Atlantic Offshore Wind Development reports (NMFS 2023a). Annual average for-hire recreational fishing effort from 2008–2021 is summarized by state for the Lease Area in **Table 4-4**. For-hire recreational fishing vessels originating from Massachusetts accounted for the highest level of fishing effort in the Lease Area with an annual average of six angler trips and one vessel trip. Rhode Island and New York also reported trips to the Lease Area, but the for-hire recreational fishing effort from those states was low, as there was less than one vessel trip from each of those states to the Lease Area per year.

Table 4-4. Annual for-hire recreational fishing effort in the Lease Area by state, 2008–2021

State	Average Angler Trips[1]	Maximum Angler Trips	Average Vessel Trips	Maximum Vessel Trips
Massachusetts	6	42	1	7
Rhode Island	1	6	< 1	1
New York	4	55	< 1	1
All Ports	**10**	**68**	**2**	**7**

Source: NMFS 2023f.

[1] Angler trips is the number of passengers reported on Vessel Trip Reports for party and charter vessels.

Impact Analysis of Alternative A

Under the No Action Alternative, baseline conditions for commercial fisheries and for-hire recreational fishing would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities. Ongoing activities within the Greater Atlantic region that have impacts on commercial and for-hire recreational fisheries include undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications), tidal energy projects, marine minerals use and ocean-dredged material disposal, military use, marine transportation, onshore development activities, fisheries use and management, and climate change. Some of these activities may also result in bottom disturbance or habitat conversion and may alter the distribution of fishery-targeted species and increase individual mortality. Risks to fisheries associated with these events include the ability to safely conduct fishing operations (e.g., because of storms) and climate-related habitat or distribution shifts in targeted species. If these risks result in a decrease in catch or increase in fishing costs, the profitability of businesses engaged in commercial fisheries and for-hire recreational fishing would be adversely affected.

Conclusion

Under the No Action Alternative, ongoing activities would have continuing impacts on commercial and for-hire recreational fishing, primarily through port use, vessel activity, other offshore development, climate change, and fisheries use and management. BOEM anticipates that the commercial fisheries and for-hire recreational fishing impacts from ongoing activities associated with the No Action Alternative would be permanent and **moderate** to **major**. The major impact rating for some fisheries and fishing operations is primarily driven by regulated fishing effort and climate change associated with ongoing activities.

4.2.3 Finfish, Invertebrates, and Essential Fish Habitat

Description of the Affected Environment

The affected environment includes benthic, demersal, and pelagic habitats within the Beacon Wind geographic analysis area described in **Section 3.1** (i.e., the Lease Area). Approximate depths in the Lease Area range from 118 to 203 feet (36 to 62 meters). Affected benthic habitats and benthic organisms are more comprehensively discussed in **Section 4.2.1** and are summarized in this section to include discussions on impacts on finfish species that utilize benthic habitats (e.g., sand lances). Demersal habitats are characterized as near sea bottom habitats including the lower layer of the water column and the interface between the seafloor and water column. There is overlap between benthic and demersal habitats, but demersal habitat is not inclusive of subsurface sediment layers. The pelagic habitat is anywhere in the open water column.

Benthic habitats include the seafloor surface and subsurface seabed sediments. Beacon Wind conducted surveys to characterize benthic habitats at 157 planned WTG locations, which include each of the 26 potential suction bucket Foundation Test sites. Bottom substrates at these sites are predominantly silt and sand soft bottom (COP Volume II, Section 4.5.5.1.1.2; AECOM 2023). Biogenic materials (e.g., shell fragments) are common at these sites and are mixed with silt, mud, and mixed sediments.

Demersal finfish that commonly occur in the Lease Area include red hake (*Urophycis chuss*), silver hake (*Merluccius bilinearis*), white hake (*Urophycis tenuis*), scup, goosefish and monkfish (Lophiidae), Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), pollock (*Pollachius pollachius*), ocean pout (*Macrozoarces americanus*), the flatfishes Atlantic halibut (*Hippoglossus hippoglossus*), yellowtail flounder (*Scophthalmus aquosus*), windowpane flounder (*Scophthalmus aquosus*), winter flounder (*Pseudopleuronectes americanus*), yellowtail flounder (*Limanda ferruginea*), summer flounder (*Paralichthys dentatus*), and plaice (*Hippoglossoides platessoides*), winter skate (*Leucoraja ocellata*), little skate (*Raja erinacea*), and clearnose skate (*Raja eglanteria*), sea raven (*Hemitripterus americanus*), and longhorn sculpin (*Myoxocephalus octodecemspinosus*; Shackell et al. 2022; MAFMC 2017; NEFMC 2017; NOAA Office of National Marine Sanctuaries 2017; Bonzek et al. 2017; Guida et al. 2017). Some demersal finfish in the Lease Area are important forage species for upper trophic levels including Atlantic butterfish (*Peprilus triacanthus*) and sand lances (*Ammodytes* spp.; Staudinger et al. 2020; Cross et al. 1999). Several of these species utilize benthic habitats. Finfish that predominantly stage or spend considerable time in contact with seafloor sediments include Lophiidae, flatfishes, and skates. Sand lances in the affected environment likely include American sand lance (*A. americanus*) and northern sand lance (*A. dubius*), which spend part of the day partially buried in seafloor sediments (Jones et al. 2023; Auster and Stewart 1986). Some species such as scup, butterfish, and summer flounder are more abundant during warm months in the Lease Area (Guida et al. 2017).

Pelagic finfish in the Lease Area include the forage species Atlantic menhaden (*Brevoortia tyrannus*), Atlantic herring (*Clupea harengus*), and Atlantic saury (*Scomberesox saurus*; MAFMC 2017). Species such as Atlantic herring and Atlantic menhaden form large schools that are targeted by feeding predators (Reid et al. 1999; Rogers and Van Den Avyle 1989). Pelagic predators include Atlantic bluefin tuna (*Thunnus thynnus*), yellowfin tuna (*Thunnus albacares*), bluefish (*Pomatomus saltatrix*), Atlantic mackerel (*Scomber scombrus*), king mackerel (*Scomberomorus maculates*), and whiting (*Merluccius bilinearis*).

Early life stages (ELS) of finfish and invertebrates (i.e., eggs and larvae) in the affected environment may occupy benthic/demersal or pelagic habitats, irrespective of which habitats are utilized during adult stages. For example, the demersal Atlantic cod produces buoyant eggs and pelagic larvae (Fahay et al. 1999). Conversely, the eggs of the pelagic Atlantic herring are benthic/demersal (Reid et al. 1999). Eggs of finfish species potentially present in the Lease Area include margined snake eel (*Ophichthus cruentifer*), Atlantic menhaden, striped anchovy, bay anchovy, silvery anchovy (*Engraulis urystole*), Mueller's pearlside (*Maurolicus muelleri*), lizardfishes (Synodontidae), cusk (*Brosme brosme*), fourbeard rockling (*Enchelyopus cimbrius*), Atlantic cod, and 31 other taxa (Berrien and Sibunka 1999). Presence and abundance levels of ELS vary spatially and temporally at seasonal and interannual scales (Berrien and Sibunka 1999). For example, the eggs of some species such as weakfish (*Cynoscion regalis*) are absent in the Southern New England OCS most years, but they do occur in some years (Berrien and Sibunka 1999). Furthermore, the ranges of species in the Atlantic OCS are experiencing northward shifts in distributions (Walsh et al. 2015). See **Section 4.2.1** for a more comprehensive list and discussion on benthic invertebrates.

Like finfish, invertebrate species may be benthic, demersal, or pelagic. Benthic and demersal invertebrates in the Lease Area include infaunal (i.e., burrowing) organisms such as annelid worms (Oligochaeta and Polychaeta), flatworms (Platyhelminthes), and nematodes (Nematoda; Beacon Wind 2023). Common demersal species associated with soft-bottom habitats include amphipods (Amphipoda), mysids (Mysida), copepods (Copepoda), and crabs (Brachyura; Beacon Wind 2023). Echinoderms are another abundant soft-bottom group found in the geographic analysis area that includes sand dollars (Clypeasteroida), starfishes (Asteroidea), and sea urchins (Echinoidea). Other soft-bottom invertebrates include commercially important shellfishes such as Atlantic surfclam (*Spisula solidissima*), ocean quahog (*Arctica islandica*), bay scallop (*Argopecten irradians*), and horseshoe crab (*Limulus polyphemus*; Beacon Wind 2023; Cargnelli et al. 1999).

Pelagic macroinvertebrates in the Lease Area include the longfin squid (*Doryteuthis pealeii)* and shortfin squid (*Illex illecebrosus*; Beacon Wind 2023). Pelagic mesozooplankton are abundant and include pelagic forms of copepods, amphipods, and water fleas (Cladocera) and pelagic early life stages of other invertebrates. Mesozooplankton are a major part of the marine forage base as they are preyed upon by pelagic jellyfishes including comb jellies (Ctenophora) and medusae (Medusozoa; Slater et al. 2020; Condon et al. 2013). Longfin squid are a common pelagic invertebrate species in the Lease Area (Guida et al. 2017).

There is EFH for 40 species within the Lease Area. Species with EFH include those managed by the NEFMC (18 species), the MAFMC (11 species), and NOAA's Atlantic Highly Migratory Species Division (11 species). The entire Lease Area also overlaps Habitat Area of Particular Concern (HAPC) for Atlantic cod. Specific habitat requirements for Atlantic cod juveniles, adults, and spawning include heterogeneous hardbottom habitats such as sand and gravel mixes and rocky bottom with and without eelgrass (NMFS 2017). This specific habitat is not found within the Beacon Wind Lease Area based on benthic monitoring surveys in 2021. Furthermore, Atlantic cod eggs are buoyant and together with larvae are found near the surface to depths of 246 feet (75 meters). These early life stages are not expected to be affected by seafloor activities described in **Section 4.3.3** if they drift into the Lease Area from other areas with specific HAPC habitats. These species are fully analyzed in the EFH Assessment for this EA, which was submitted to NMFS in December 2023.

Based on current and historical distributions, Endangered Species Act (ESA)-listed species that potentially occur in the Lease Area include Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and giant manta ray (*Mobula birostris*). The endangered Atlantic salmon (*Salmo salar*) historically ranged into the waters off Southeast New England and its tributaries, but the existing population does not occur south of Central New England based on current assessments and therefore is not expected to occur in the Lease Area (Rikardsen 2021; USASAC 2020; Moore et al. 2014; Spidle et al. 2001). Atlantic sturgeon have been documented to occur near the Lease Area (Kazyak et al. 2021). Giant manta ray potentially occur seasonally in the Lease Area from June to October based on recent models that used sighting data (Farmer et al. 2022). Atlantic sturgeon and giant manta ray are each susceptible to vessel interactions (Pate and Marshall 2020; McGregor et al. 2019; Balazik et al. 2012).

Impact Analysis of Alternative A

Under the No Action Alternative, baseline conditions for finfish, invertebrates, and EFH would continue to follow regional trends responding to impacts from ongoing activities in the Lease Area and climate change. Ongoing activities that impact finfish, invertebrates, and EFH in the region include undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications), tidal energy projects, marine minerals use and ocean-dredge material disposal, military use, marine transportation, onshore development activities, fisheries use and management, and climate change, as well as ongoing and planned offshore wind development. Within the geographic analysis area, impacts include marine transportation, fisheries use and management, and climate change.

Conclusion

Finfish, invertebrates, and EFH would continue to be impacted by ongoing activities in the geographic analysis area and the greater region, considering that the populations of most species in the geographic analysis area exist and move freely throughout the greater region. The impact factors from ongoing activities and climate change described in the previous section are expected to result in **negligible** to **moderate** adverse impacts on finfish, invertebrates, and EFH, depending on the impact factor. Considering planned actions in the foreseeable future, impacts are expected to range from **negligible** to **moderate** adverse with some **minor beneficial** impacts.

4.2.4 Marine Mammals

Description of the Affected Environment

Thirty-nine species of marine mammals are known to occur or could occur in U.S. waters of the northwest Atlantic Ocean, which is where all Project activities would occur: 6 mysticete species (i.e., baleen whales), 28 odontocete species (i.e., toothed whales, dolphins, and porpoises), 4 pinniped species (i.e., seals and sea lions), and 1 sirenian species (i.e., manatees and dugongs; BOEM 2014; CSA Ocean Sciences 2021). All 39 marine mammal species that occur in the northwest Atlantic OCS are protected under the Marine Mammal Protection Act (MMPA), and 6 are listed under the ESA. The blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), North Atlantic right whale (NARW; *Eubalaena glacialis*), sei whale (*B. borealis*), and sperm whale (*Physeter macrocephalus*) are listed as endangered. The West Indian manatee (*Trichechus manatus*) is listed as threatened. Critical habitat has been designated for NARW and West Indian manatee. However, critical habitat for these species is not within the area that would be affected by suction bucket testing (i.e., the Lease Area). NARW critical foraging habitat (Unit 1 of the designated critical habitat) is located approximately 38 miles (61 kilometers) northeast of the Lease Area; NARW critical calving habitat (Unit 2 of the designated critical habitat) is located off the coast of the southeastern United States, stretching from central Florida to the southernmost portion of the North Carolina coast. Manatee critical habitat is located within inland tributaries and along nearshore habitats of the coast of Florida.

Of the 39 species that are known to occur or could occur in the northwest Atlantic OCS, 38 have documented ranges that include the Lease Area (**Table 4-5**). For the purposes of the description of the affected environment in this EA, the focus is on the 11 species of marine mammals that would be likely to commonly occur in the Lease Area. Population information for these common species is provided in **Table 4-6**. Additional information for these species is provided below.

Table 4-5. Marine mammals occurring in the Lease Area

Common Name	Scientific Name	ESA/ MMPA Status[1]	Relative Occurrence in the Lease Area[2]	Seasonal Occurrence in the Lease Area
Mysticetes				
Blue whale	*Balaenoptera musculus*	E/D	Rare	N/A
Fin whale	*Balaenoptera physalus*	E/D	Common	Year-round
Humpback whale	*Megaptera novaeangliae*	None/N	Common	Year-round
Minke whale	*Balaenoptera acutorostrata*	None/N	Common	Spring, summer, and fall
North Atlantic right whale	*Eubalaena glacialis*	E/D	Common	Winter and spring
Sei whale	*Balaenoptera borealis*	E/D	Common	Spring and summer
Odontocetes				
Atlantic spotted dolphin	*Stenella frontalis*	None/N	Uncommon	Year-round
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	None/N	Common	Year-round
Blainville's beaked whale	*Mesoplodon densirostris*	None/N	Rare	N/A
Bottlenose dolphin	*Tursiops truncatus*	None/D, N	Common	Year-round
Common dolphin	*Delphinus delphis*	None/N	Common	Year-round
Clymene dolphin	*Stenella clymene*	None/N	Rare	N/A
Cuvier's beaked whale	*Ziphius cavirostris*	None/N	Rare	N/A
Dwarf sperm whale	*Kogia sima*	None/N	Rare	N/A
False killer whale	*Pseudorca crassidens*	None/N	Rare	N/A
Fraser's dolphin	*Lagenodelphis hosei*	None/N	Rare	N/A
Gervais' beaked whale	*Mesoplodon europaeus*	None/N	Rare	N/A
Harbor porpoise	*Phocoena phocoena*	None/N	Common	Year-round
Killer whale	*Orcinus orca*	None/N	Rare	N/A
Long-finned pilot whale	*Globicephala melas*	None/N	Uncommon	Year-round
Melon-headed whale	*Peponocephala electra*	None/N	Rare	N/A

Common Name	Scientific Name	ESA/ MMPA Status[1]	Relative Occurrence in the Lease Area[2]	Seasonal Occurrence in the Lease Area
Northern bottlenose whale	*Hyperoodon ampullatus*	None/N	Rare	N/A
Pantropical spotted dolphin	*Stenella attenuata*	None/N	Rare	N/A
Pygmy killer whale	*Feresa attenuate*	None/N	Rare	N/A
Pygmy sperm whale	*Kogia breviceps*	None/N	Rare	N/A
Risso's dolphin	*Grampus griseus*	None/N	Uncommon	Year-round
Rough-toothed dolphin	*Steno bredanensis*	None/N	Rare	N/A
Short-finned pilot whale	*Globicephala macrorhynchus*	None/N	Rare	N/A
Sowerby's beaked whale	*Mesoplodon bidens*	None/N	Rare	N/A
Sperm whale	*Physeter macrocephalus*	E/D	Uncommon	Summer and fall
Spinner dolphin	*Stenella longirostris*	None/N	Rare	N/A
Striped dolphin	*Stenella coeruleoalba*	None/N	Rare	N/A
True's beaked whale	*Mesoplodon mirus*	None/N	Rare	N/A
White-beaked dolphin	*Lagenorhynchus albirostris*	None/N	Rare	N/A
Pinnipeds				
Gray seal	*Halichoerus grypus*	None/N	Common	Year-round
Harbor seal	*Phoca vitulina*	None/N	Common	Year-round
Harp seal	*Cystophora cristata*	None/N	Uncommon	Winter and spring
Hooded seal	*Phoca groenlandica*	None/N	Rare	N/A

[1] E = endangered; T = threatened; D = depleted; N = non-strategic.
[2] Rare – records for some years but limited; Uncommon – occurring in low numbers or on an irregular basis; Common – occurring consistently in moderate to large numbers.

Table 4-6. Population information for marine mammals with common occurrence in the Lease Area

Common name	Stock	Population Estimate	Population Trend	Annual Human-Caused Mortality[1]	Reference
Fin whale	Western North Atlantic	6,802	Unavailable	1.8	Hayes et al. 2022
Humpback whale	Gulf of Maine	1,396	Increasing	12.15	Hayes et al. 2020
Minke whale	Canadian East Coast	21,968	Unavailable	10.6	Hayes et al. 2022
North Atlantic right whale	Western North Atlantic	338	Decreasing	31.2	Hayes et al. 2023
Sei whale	Nova Scotia	3,292	Unavailable	0.8	Hayes et al. 2022
Atlantic white-sided dolphin	Western North Atlantic	93,233	Unavailable	27	Hayes et al. 2022

Common name	Stock	Population Estimate	Population Trend	Annual Human-Caused Mortality[1]	Reference
Bottlenose dolphin	Western North Atlantic – Offshore	62,851	None	28	Hayes et al. 2020
	Western North Atlantic – Northern Coastal Migratory	6,639	None	12.2–21.5	Hayes et al. 2018
Common dolphin	Western North Atlantic	172,974	Unavailable	390	Hayes et al. 2022
Harbor porpoise	Gulf of Maine/Bay of Fundy	95,543	Unavailable	164	Hayes et al. 2022
Gray seal	Western North Atlantic	27,300 (U.S. waters)	Unavailable	4,453	Hayes et al. 2022
Harbor seal	Western North Atlantic	61,336 (U.S. waters)	None	339	Hayes et al. 2022

[1] Annual human-caused mortality is mean annual figure for the period 2016–2020, with the exception of NARW.

The best available information on marine mammal occurrence and distribution in the Lease Area is provided by a combination of visual sighting data from aerial and vessel surveys, which are routinely conducted near the Lease Area. Aerial surveys of the Lease Area were conducted monthly from October 2019 to October 2020 (Normandeau and APEM 2020), documenting marine mammal presence throughout the year. Protected Species Observers aboard site characterization survey vessels documented sightings of marine mammals in the Lease Area in 2020 and 2021 (COP Volume 2, Section 5.6, Table 5.6-2; AECOM 2023). Aerial surveys of the Massachusetts Wind Energy Area (WEA) and Massachusetts/Rhode Island WEA documented marine mammal presence in the region from 2011 through 2022 (Kraus et al. 2013, 2014, 2016; Leiter et al. 2017; O'Brien et al. 2020, 2021, 2022, 2023; Quintana et al. 2019; Stone et al. 2017). The Atlantic Marine Assessment Program for Protected Species has conducted shipboard and aerial surveys over a broad area off the U.S. East Coast, including the Lease Area, since 2011 to assess the abundance, distribution, ecology, and behavior of marine mammals in the U.S. Atlantic (NEFSC and SEFSC 2015, 2016, 2018, 2019, 2020, 2021, 2022; Palka et al. 2017). The North Atlantic Right Whale Survey conducts annual aerial line track surveys to document seasonal distribution of NARWs off the coast of the northeastern United States from Long Island, New York, to Eastport, Maine (Cole et al. 2007; Gatzke et al. 2017; Khan et al. 2018).

Additional sources of information to characterize marine mammal occurrence and distribution within the Lease Area include habitat-based modeling efforts that utilize multiple years of visual survey data and technical reports. A habitat-based cetacean density model for the U.S. Exclusive Economic Zone of the East Coast (eastern United States) and Gulf of Mexico was developed by the Duke University Marine Geospatial Ecology Lab in 2016 (Roberts et al. 2016). These models have been subsequently updated to include more recently available data (Roberts et al. 2017, 2018, 2020, 2022, 2023) and represent the best information currently available for marine mammal densities in the U.S. Atlantic. NMFS prepares marine mammal stock assessment reports each year presenting the most current description of the geographic range, minimum population estimate, population trend, net productivity rates, potential biological removals, status, estimate of human-caused mortality and serious injury by source, and descriptions of other factors contributing to population decline or inhibiting population recovery for each stock assessed in a given year (Hayes et al. 2017, 2018, 2019, 2020, 2021, 2022, 2023). Passive acoustic monitoring data, academic publications, and other technical reports were also used to characterize marine mammal occurrence in the Lease Area.

ESA-Listed Threatened and Endangered Marine Mammals

The ESA (16 U.S.C. §1531 et seq.) classifies certain species as threatened or endangered based on their overall population status and health. Three marine mammals that are likely to occur in the Lease Area are classified as endangered: fin whale, NARW, and sei whale. Of these marine mammal species listed under the ESA, critical habitat has only been designated for the NARW (NMFS 2016). Biologically Important Areas (BIAs) for fin whale, NARW, and sei whale have been identified within or in the vicinity of the Lease Area or north of the Lease Area, as described below.

Fin whales may occur in the Lease Area year-round; these individuals belong to the Western North Atlantic stock (**Table 4-6**). A BIA for fin whale feeding has been identified approximately 18 miles (29 kilometers) to the northwest of the Lease Area (Van Parjis et al. 2015).

NARWs may occur in the Lease Area year-round, though densities are expected to be highest in the winter and spring. Individuals in the Lease Area belong to the Western North Atlantic stock (**Table 4-6**). NARWs have been experiencing an unusual mortality event (UME) since 2017 attributed to vessel strikes and entanglement in fisheries gear (NMFS 2023c). In 2017, a total of 31 mortalities, serious injuries, and morbidities were documented. Between 2017 and October 2023, a total of 121 mortalities, serious injuries, and morbidities (sublethal injury and illness) of NARWs were documented (NMFS 2023c). As noted above, the closest designated NARW critical habitat area (Unit 1) is approximately 38 miles (61 kilometers) northeast of the Lease Area. A BIA for NARW migration overlaps with the Lease Area and surrounding waters for the months of March through April and November through December (Van Parjis et al. 2015). A BIA for NARW feeding has been identified approximately 59 miles (95 kilometers) northeast of the Lease Area. The Lease Area is adjacent to the Block Island Sound Seasonal Management Area for NARWs, which is in effect from November through April.

Sei whale may occur in the Lease Area year-round, and the highest densities of this species occur in the spring. Individuals occurring in the Lease Area belong to the Nova Scotia stock (**Table 4-6**). A BIA for sei whale feeding has been identified approximately 55 miles (89 kilometers) northeast of the Lease Area (Van Parjis et al. 2015).

Non-ESA-Listed Marine Mammals

As noted above, all marine mammals are protected pursuant to the MMPA (16 U.S.C. §1361 et seq.), and their populations are monitored by NMFS and USFWS.[2] Mysticetes that are not listed as endangered or threatened under the ESA and commonly occur in the Lease Area include the humpback whale (*Megaptera novaeangliae*) and minke whale (*B. acutorostrata*). Odontocetes that are not listed under the ESA and commonly occur in the Lease Area include Atlantic white-sided dolphin (*Lagenorhynchus acutus*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), and harbor porpoise (*Phocoena phocoena*). Pinnipeds that are not listed as endangered or threatened under the ESA and commonly or regularly occur in the Lease Area include gray seal (*Halichoerus grypus*) and

[2] Marine mammals under USFWS jurisdiction are not expected to occur in the Lease Area.

harbor seal (*Phoca vitulina*). BIAs for harbor porpoise, humpback whale, and minke whale have been identified north of the Lease Area, as described below.

Humpback whales could be found in the Lease Area year-round, and individuals that occur in the Lease Area belong to the Gulf of Maine stock, as identified in **Table 4-6**. Humpback whales in the Atlantic have been experiencing a UME since 2016. From 2016 through October 2023, 209 humpback whales have stranded coastwide (NMFS 2023a). The suspected cause of this event is vessel strikes. However, more research is necessary to be definitive. A BIA for humpback whale feeding has been identified approximately 60 miles (97 kilometers) north of the Lease Area (Van Parjis et al. 2015).

Minke whales could be found in the Lease Area in spring, summer, and fall, and minke whales that occur in the Lease Area belong to the Canadian East Coast stock, as identified in **Table 4-6**. This species is also experiencing a UME, declared in 2017. A total of 160 individuals have stranded from Maine to South Carolina from 2017 through October 2023. The suspected cause of this event is entanglement and disease based on preliminary necropsy results. However, these results are not conclusive (NMFS 2023b). A BIA for minke whale feeding has been identified approximately 35 miles (56 kilometers) north of the Lease Area (Van Parjis et al. 2015).

Atlantic white-sided dolphins, bottlenose dolphins, common dolphins, and harbor porpoise could be found in the Lease Area throughout the year. Stocks to which these species belong are identified in **Table 4-6**.

Gray seals and harbor seals have the potential to occur in the Lease Area year-round. Gray seals found in the Lease Area belong to the Western North Atlantic stock, and harbor seals occurring in the Lease Area belong to the Western North Atlantic stock (**Table 4-6**). There is an active UME for these species off the southern and central coast of Maine dating back to June 2022. Sixty-five gray seal strandings and 379 harbor seal strandings have been documented between June 1, 2022, and July 16, 2023 (NMFS 2023d). Preliminary testing has found some of the harbor and gray seals affected by the UME to be positive for highly pathogenic avian influenza (H5N1).

Impact Analysis of Alternative A

NMFS lists the long-term changes in climate as a threat for almost all marine mammal species (Hayes et al. 2020, 2021). Climate change is known to increase temperatures, alter ocean acidity, raise sea levels, and increase numbers and intensity of storms. Increased temperatures can alter habitat, modify species' use of existing habitats, change precipitation patterns, and increase storm intensity (Barton et al. 2016; Love et al. 2013; NASA 2023; USEPA 2022). Increase of the ocean's acidity has numerous effects on ecosystems, including reducing available carbon that organisms use to build shells and causing a shift in food webs offshore (Love et al. 2013; NASA 2023; USEPA 2022). This has the potential to affect the distribution and abundance of marine mammal prey. For example, between 1982 and 2018 the average center of biomass for 140 marine fish and invertebrate species along U.S. coasts shifted approximately 20 miles (32 kilometers) north. These species also migrated an average of 21 feet (6 meters) deeper (USEPA 2022). Shifts in abundance of their zooplankton prey will affect mysticetes who travel over large distances to feed (Hayes et al. 2020). The extent of these impacts is unknown; however, it is likely that marine mammal populations already stressed by other factors (e.g., NARWs) will likely be the most affected by the repercussions of climate change.

All marine mammal species in the geographic analysis area are also subject to ongoing anthropogenic threats. The primary threats to mysticetes include entanglement, vessel strike, and underwater noise. Habitat loss and degradation, pollution, and bycatch can also affect these species. Vessel strike, habitat loss and degradation, pollution, and fisheries interactions, including bycatch, are the primary threats to odontocetes. Entanglement and underwater noise are also threats to odontocetes. Primary threats for pinnipeds include entanglement and fisheries interactions.

Conclusion

Under the No Action Alternative, marine mammals would continue to be affected by existing environmental trends and ongoing activities. Ongoing activities and climate change described in the previous section are expected to result in **negligible** to **moderate** adverse impacts on mysticetes other than NARW, odontocetes, and pinnipeds. Because of the low population size for the NARW and continuing stressors, population-level effects on NARWs are occurring. Vessel activity (i.e., vessel collisions) and gear utilization associated with ongoing non-offshore wind activities would continue to result in long-term population-level impacts if serious injury and mortality continue from these activities. The effects of climate change would further exacerbate impacts on this species. For NARW, the No Action Alternative, considering baseline conditions, would result in **negligible** to **major** long-term impacts.

4.2.5 Sea Turtles

Description of the Affected Environment

Five species of sea turtles have been documented in U.S. waters of the northwest Atlantic Ocean, where the Lease Area occurs: green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and loggerhead (*Caretta caretta*). All five species are listed under the ESA; hawksbill, Kemp's ridley, and leatherback sea turtles are listed as endangered, and green (North Atlantic distinct population segment [DPS]) and loggerhead sea turtles are listed as threatened. Critical habitat has been designated for green, hawksbill, leatherback, and loggerhead sea turtles; however, critical habitat for these species is not within or in the vicinity of the Lease Area.

Although hawksbill sea turtles have been documented in OCS waters of the northwest Atlantic Ocean as far north as Massachusetts, they are rare in this region. This species occurs primarily in warmer waters to the south (Kenney and Vigness-Raposa 2010; NMFS and USFWS 1993). The individual hawksbill sea turtles that have occasionally been documented in and near the southern New England area have been stunned by exposure to unusual cold water events and subsequently transported northward into the region by the Gulf Stream (Lutz and Musick 1997; NMFS and USFWS 1993). These occurrences are not representative of normal behaviors or distribution. Therefore, hawksbill sea turtle will not be evaluated further in this EA.

The best available information on the occurrence and distribution of sea turtles in the Lease Area is provided by a combination of visual sighting data from aerial and vessel surveys. Aerial surveys of the Lease Area were conducted monthly from October 2019 to October 2020 (Normandeau and APEM 2020), documenting sea turtle occurrence throughout the year. Protected Species Observers aboard site characterization survey vessels documented sightings of sea turtles in the Lease Area in 2020 and 2021

(COP Volume 2, Section 5.6, Table 5.6-2; AECOM 2023). Aerial surveys of the Massachusetts WEA and Massachusetts/Rhode Island WEA documented sea turtle presence in the region from 2011 through 2022 (Kraus et al. 2013, 2014, 2016; Leiter et al. 2017; O'Brien et al. 2020, 2021, 2022, 2023; Quintana et al. 2019; Stone et al. 2017). The Atlantic Marine Assessment Program for Protected Species has conducted shipboard and aerial surveys over a broad area off the U.S. East Coast, including the Lease Area, since 2011 to assess the abundance, distribution, ecology, and behavior of marine megafauna in the U.S. Atlantic, including sea turtles (NEFSC and SEFSC 2015, 2016, 2018, 2019, 2020, 2021, 2022; Palka et al. 2017). Additional sources of information to characterize sea turtle occurrence and distribution within the Lease Area include stranding data from the Sea Turtle Stranding and Salvage Network (NMFS STSSN 2023); geospatial sighting data obtained from the Ocean Biodiversity Information System (OBIS SEAMAP 2023); occurrence information compiled for the Rhode Island Ocean Special Area Management Plan (Kenney and Vigness-Raposa 2010); density estimates from the U.S. Navy Northeast Operating Areas (DoN 2012, 2017); and other technical reports and academic publications.

Sea turtles generally migrate into or through the Lease Area as they travel between their northern-latitude feeding grounds and their nesting grounds in the southern United States, the Gulf of Mexico, and the Caribbean. As ocean waters warm in the spring, sea turtles migrate northward to feeding grounds in the Mid-Atlantic and in embayments and estuaries in the northeastern United States, including Cape Cod Bay. Sea turtles typically arrive in waters off New England in the spring or summer and remain through the fall, when sea surface temperatures range from 61 to 79 degrees Fahrenheit (°F; 16 to 26 degrees Celsius [°C]; CETAP 1982). As water temperatures cool, most sea turtles begin their return migration to the south. Historically, this southward migration begins in October, and most turtles have left by the end of November. Based on this seasonal migration pattern, sea turtles are generally expected to occur in the Lease Area between May and November (NMFS 2021b). Some individuals may remain into the winter when they could experience cold stunning as temperatures drop below 50°F (10°C; NMFS 2021a). Individuals occurring in the Lease Area are either migrating or foraging. Species occurrence in the Lease Area is summarized in **Table 4-7** and described in the following paragraphs.

Table 4-7. Sea turtles likely to occur in the Lease Area

Common Name	Scientific Name	Distinct Population Segment (DPS)/ Population	ESA Status	Relative Occurrence in the Lease Area[1]
Green sea turtle	*Chelonia mydas*	North Atlantic DPS	Threatened	Regular
Kemp's ridley sea turtle	*Lepidochelys kempii*	--	Endangered	Regular
Leatherback sea turtle	*Dermochelys coriacea*	Northwest Atlantic	Endangered	Regular
Loggerhead sea turtle	*Caretta caretta*	Northwest Atlantic DPS	Threatened	Regular

Source: COP Volume II, Section 5.7.1, Table 5.7-3; AECOM 2023.
[1] Regular = occurring regularly, inhabits at least seasonally, and has been documented within the Lease Area and export cable routes.

Sea turtles are likely to be found in the Lease Area seasonally (BOEM 2014). Green sea turtles that occur in the Lease Area belong to the North Atlantic DPS (**Table 4-7**) and are likely juveniles. Kemp's ridley sea turtles that occur in the Lease Area are also likely juveniles. Leatherback sea turtles that occur in the Lease Area belong to the Northwest Atlantic population of leatherbacks (**Table 4-7**) and could be juveniles or adults. Loggerhead sea turtles that occur in the Lease Area belong to the Northwest Atlantic

DPS (**Table 4-7**) and could be juveniles or adults, though juveniles are much more abundant in the region. All four species may transit through the region; Kemp's ridley and leatherback sea turtles may also potentially forage in the Lease Area.

Impact Analysis of Alternative A

Sea turtles are subject to regional, pre-existing threats. These threats include fisheries bycatch, loss or degradation of nesting and foraging habitat, entanglement in fishing gear, vessel strikes, dredging, anthropogenic noise, accidental releases, predation and harvest, disease, and climate change. Green, Kemp's ridley, and loggerhead sea turtles are also susceptible to cold stunning. Climate change has the potential to affect the distribution and abundance of prey due to changing water temperatures and ocean currents and increased acidity. As sea turtle migrations can cover long distances, these threats can have impacts on individuals over broad geographical scales.

Conclusion

Under the No Action Alternative, sea turtles would continue to be affected by existing environmental trends and ongoing activities. Ongoing activities and climate change described in the previous section are expected to result in **negligible** to **minor** adverse impacts on sea turtles as some impacts would be detectable and measurable but of low intensity, localized, and temporary or short term in duration.

4.3 Alternative B – Proposed Action

The Proposed Action alternative is analyzed alone and in combination with the changing baseline conditions as described for Alternative A (**Section 4.2**).

4.3.1 Benthic Resources

Up to 35 suction bucket foundation trials would occur over 10 to 15 days at 26 identified locations within the Lease Area. Activities related to suction bucket testing would cause localized, short-term (e.g., habitat alteration, injury) to permanent (e.g., mortality) impacts on benthic resources through direct contact and suction penetration of the suction bucket into the seafloor and the direct contact of the triangular reference frame with the seafloor, the establishment of a negative pressure within the confines of the suction bucket foundation, and sediment deposition. Each trial would result in a maximum temporary seabed disturbance (from the suction bucket and reference frame combined) of approximately 0.028 acre (114 square meters), for a total temporary seabed disturbance of 0.99 acre (3,990 square meters). Because 9 of the trials would occur at a location previously disturbed by a prior trial, 0.25 acre (1,026 square meters) of the total disturbance would occur in previously disturbed trial locations. Sessile epifauna and infauna would be crushed by contact of the suction bucket and reference frame with the seafloor. Because the suction bucket and reference frame would approach the seafloor at a slow, controlled rate of less than 13 inches (30 centimeters) per second, mobile epifauna may be able to move out of the trial footprint to avoid being crushed. Any organisms trapped inside the suction bucket footprint would experience direct mortality from crushing or the negative pressure conditions experienced during the trial.

The level of impacts caused by benthic disturbance could depend on the time of year that they occur, especially if these alterations overlap with times and places of high benthic organism abundance or reproductive activity. Invertebrate densities are generally lowest in the winter in the Mid-Atlantic Bight and reach maximum levels during the late spring and summer before declining in the fall; however, some species may experience secondary peaks in abundance during the winter (e.g., Schaffner and Boesch 1982; Slacum et al. 2010; Ramey 2008). For example, the amphipod *Erichthonius rubicornis* was most abundant off the coast of New Jersey during spring and summer months, and the amphipod *Unciola irrorate* was most abundant during spring months with a secondary peak during winter months, with both species' abundances being lowest during the fall (Schaffner and Boesch 1982). Slacum et al. (2010) found that fish and invertebrate species diversity, richness, and catch per unit effort in flat-bottom and shoal habitats offshore Maryland and Delaware were greatest during the spring, summer, and fall, and least during the winter months. Ramey (2008) found that the reproductive cycle of the polychaete *Polygordius jouinae* off the coast of New Jersey spans from May to August, with most individuals reaching sexual maturity in late May and recruitment beginning by July. Recolonization rates of benthic habitats are driven by the types of benthic communities inhabiting the area surrounding the affected region. Benthic communities that are well-adapted to disturbance within their habitats (e.g., mobile soft sediments) are likely to quickly recolonize a disturbed area. Currents, storms, and other oceanographic processes frequently disturb soft-bottom habitats, and native invertebrates are adapted to respond to such disturbances (Guida et al. 2017).

Suction bucket installation and removal may result in minor local sediment disturbance, which could slightly increase turbidity in the immediate area surrounding the trial location. The height of the suspended sediment above the bottom would be influenced by particle size and bottom currents. Adult and juvenile individuals, demersal eggs, and larvae could be buried by deposited sediments; however, measurable sediment deposition would be limited to areas immediately adjacent to each trial. As a result of consultation under the Magnuson-Stevens Fishery Conservation and Management Act (see Section 6.2.2), NMFS suggested in situ turbidity monitoring to quantify turbidity and sediment resuspension as a conservation recommendation for EFH, and BOEM adopted this recommendation (**Appendix F, Appendix G**).

The suction pump used to evacuate water from and return water to within the foundation will operate at a typical rate of approximately 392 cubic yards per hour (300 cubic meters per hour), with a maximum displaced volume of 1,775 cubic yards (1,357 cubic meters) evacuated per trial. An equivalent volume would be returned during suction bucket removal. As a result of consultation under the Magnuson-Stevens Fishery Conservation and Management Act (see Section 6.2.2), NMFS suggested in situ monitoring of the suction bucket pump flow rates to ground truth this intake volume as a conservation recommendation for EFH, and BOEM adopted this recommendation (**Appendix F, Appendix G**). While in use, the suction pump can entrain planktonic larvae of benthic fauna (e.g., larval polychaetes, mollusks, crustaceans) with assumed 100% mortality of entrained individuals. Due to the location of the intake at approximately 19 feet (6 meters) off the seafloor, water withdrawal could entrain pelagic eggs and larvae, but would not affect resources on the seafloor. During suction bucket removal, water would be withdrawn from the water column and pumped to the interior of the suction bucket, resulting in a hydraulic zone of influence (HZI) with a radial distance of 2.5 feet (0.76 meter), depth (linear distance) of 1 foot (0.30 meter), and an area of 20 square feet (1.9 square meters) under prevailing ambient current conditions in the fall, and a radial distance of 2 feet (0.61 meter), depth of 1 foot (0.30 meter), and an area of 13 square feet (1.2 square meters) under prevailing ambient current conditions in the winter, spring, and summer.[3] During suction bucket installation, water would only be withdrawn from within the suction bucket, and thus the HZI would be limited to the confines of the suction bucket. Because only a limited number of trials would be conducted, population-level impacts on any given benthic species are not anticipated.

The vessel, ROVs, suction pump, and imaging equipment inside the suction bucket used during Foundation Testing would generate underwater noise in the Lease Area. However, the imaging equipment inside the suction bucket would be operated at frequencies at or above 400 kHz, which is inaudible to marine organisms. Therefore, imaging equipment noise is not expected to affect benthic resources. Vessel noise includes non-impulsive sounds that arise from a vessel's engines, propellers, and thrusters. Sound levels emitted from vessels depend on the vessel's operational state (e.g., idling, in-transit) and are strongly weather dependent. Source levels for large vessels reported by McKenna et al. (2017) range from 177 to 188 decibels referenced to 1 micropascal (dB re 1 μPa) at 3 feet (1 meter) with most of the energy below 1 kHz and peaks in the 20 to 100 hertz (Hz) range. Zykov et al. (2013) and McPherson et al. (2019) report a maximum broadband source level of 192 dB re 1 μPa for numerous vessels with varying propulsion power. While there does seem to be some evidence that certain behaviors and stress biomarkers in invertebrates could be negatively affected by vessel noise (see Wale et al. 2013; Filiciotto et al. 2014; Hudson et al. 2022), it is difficult to draw conclusions from this work as it has been limited to the laboratory and, in most cases, did not measure particle motion as the relevant cue. Several studies have shown that planktonic larvae of fish and invertebrates are sensitive to acoustic cues (Montgomery et al. 2006; Simpson et al. 2005; Stanley et al. 2012; Staaterman et al. 2014) and thus may experience acoustic masking from continuous sound sources like vessels. However, given the short range of such biologically relevant signals for particle motion-sensitive animals (Kaplan and Mooney 2016), the spatial scale at which these cues are relevant is rather small. If vessel transit areas overlap with settlement habitat, it is possible that vessel noise could mask some biologically relevant sounds (e.g., Holles et al. 2013), but these effects are expected to be short term and would occur over a small spatial area. ROVs used to assist in positioning of the suction bucket foundations and reference frames as well as for data collection are not anticipated to generate significant levels of underwater noise and are not expected to disturb marine life (Equinor 2020; NMFS 2020a). Sound levels generated by the suction pump used to evacuate water from and return water to within the foundation are anticipated to fall below ambient noise levels within relatively short distances from the pump (i.e., 1,640 feet [500 meters]; Koschinski and Lüdemann 2020). Given the rapid attenuation of underwater vibrations with increasing distance from a sound source (Morley et al. 2014), it is unlikely that noise generated by Foundation Testing activities would cause more than short-term behavioral effects (e.g., flight or retraction), masking, or physiological (e.g., stress) responses. Overall, effects on benthic invertebrates from noise associated with suction bucket trials are expected to be short term and localized and are not anticipated to pose a risk to benthic invertebrates. Only a few individuals would be affected at any given time, and they are likely to return to normal behaviors after the noise is over.

[3] Stream function theory was used to model the zone of influence based on the pump flow rate and ambient ocean current data collected from the Lease Area by Beacon Wind during site assessment activities. Modeling results indicated that the zone of influence would have a radial distance of 2.5 feet (0.8 meter) and a depth of 1 foot (0.3 meter) in the fall, resulting in a total area of 20 square feet (1.9 square meters). In the other seasons, the radial distance of the zone of influence would be reduced to 2 feet (0.6 meter), resulting in a total area of 13 square feet (1.2 square meters).

Non-Routine Events

Accidental releases of trash and debris may occur from the vessel during suction bucket Foundation Testing. However, the Project vessel would comply with laws and regulations to properly dispose of marine debris and to minimize releases and BMPs detailed in the SAP and SAP Amendment. Beacon Wind would conduct marine debris awareness training and submit a training compliance report (**Appendix F**). In the event of a release, it would be an accidental, localized event in the vicinity of the vessel, and therefore Project-related marine debris would only have an indirect, short-term effect on benthic resources. Beacon Wind would recover marine trash and debris resulting from the Proposed Action that could cause undue harm or damage to natural resources (**Appendix F**). Foundation Testing would comply with all laws regulating at-sea discharges of vessel-generated waste, and the Project vessel will comply with USCG requirements relating to prevention and control of oil spills.

Only one vessel would be used to conduct the suction bucket testing, and no permanent structures would be left in place after the completion of each of the trials; therefore, collisions and allisions are considered unlikely. In the event that a vessel collision or allision does occur, most of the materials that would potentially spill tend to float in seawater and are unlikely to contact benthic resources. The chemicals with potential to sink or dissolve rapidly are predicted to dilute to non-toxic levels before they reach benthic resources.

Conclusion

Impacts of Foundation Testing would be short term and negligible. Because Foundation Testing is not anticipated to generate significant levels of underwater noise, the majority of impacts on benthic resources would occur through direct contact and suction penetration of the suction bucket into the seafloor and the direct contact of the triangular reference frame with the seafloor, the establishment of a negative pressure within the confines of the suction bucket foundation, and sediment deposition. These impacts would be localized to the 26 Foundation Testing footprint locations and the areas immediately surrounding them. Soft-bottom sediment communities recover fairly quickly from disturbance, generally within a few months to a year (Wilbur and Clarke 2007), and although estimates of recovery time following disturbance vary by region, species, and type of disturbance, disturbance associated with Foundation Testing would not prevent natural recovery of benthic communities. The duration of activity affecting benthic communities would be short term, and, given the limited area of disturbance associated with Foundation Testing, impacts on benthic resources from Foundation Testing are expected to be **negligible**.

4.3.2 Commercial and Recreational Fishing

The Proposed Action would involve suction bucket testing within the Lease Area. Deployment and removal of the suction bucket is expected to result in mortality of fish and invertebrates, including species that are harvested in fisheries. Sessile infaunal and epifaunal organisms (e.g., eggs, larvae, bivalves) within the suction bucket footprint are expected to experience lethal, localized impacts as contact with the suction bucket or pressure from embedding would cause crushing or other fatal injuries. Benthic and demersal fish and invertebrates inhabiting the 26 suction bucket testing locations could also potentially become crushed under the suction bucket or reference frame or become trapped inside the bucket once it reaches the seafloor, which is expected to result in mortality. Because the suction bucket and reference frame would approach the seafloor at a slow, controlled rate of less than 13 inches (30 centimeters) per second (i.e., approximately 0.7 mile [1.1 kilometer] per hour), mobile epifauna may be able to move out of the trial footprint to avoid being crushed. Benthic eggs and larvae of fish and invertebrate species inhabiting the immediate area of the suction pump when it is fully embedded in the seafloor may become entrained in the intake flow of the suction pump with conservatively assumed 100% entrainment mortality. However, mortality associated with suction bucket testing is not expected to result in fishery-level impacts because the relatively small amount of benthic habitat that would be impacted by suction bucket testing (0.996 acre [3,990 square meters]) and the relatively small volume of water that would be withdrawn over the course of 35 tests (up to 25.1 million gallons [94,900 cubic meters]) are not likely to result in a measurable increase in mortality relative to natural mortality levels for any species.

The installation and removal of the suction bucket at each test site would generate temporary increases in suspended sediment concentrations. Suspended sediment concentrations during suction bucket installation have not been measured or modeled. As a result of consultation under the Magnuson-Stevens Fishery Conservation and Management Act (see Section 6.2.2), NMFS suggested in situ turbidity monitoring to quantify turbidity and sediment resuspension as a conservation recommendation for EFH, and BOEM adopted this recommendation (**Appendix F, Appendix G**). Results of this monitoring would provide turbidity data for future impact evaluations of suction bucket installation. As described above, the reference frame and suction bucket would be lowered at a rate of 0.7 mile per hour (1.1 kilometers per hour), potentially limiting the size of sediment plumes and suspended sediment concentrations within the plume. Mobile finfish and invertebrates, including species that are targeted in fisheries, are expected to avoid sediment plumes if such plumes are severe enough to induce behavioral responses. The avoidance of sediment plumes could temporarily reduce the catchability of some species in the immediate area of the test.

The Proposed Action would involve the generation of underwater noise, which could influence the behavior and catchability of finfish and invertebrates that are targeted in fisheries. A single vessel would be used during each Foundation Test, exposing organisms to vessel-related noise generated by the main thrusters and dynamic positioning thrusters. Fish and invertebrate responses to vessel noise include avoidance, diving, and dispersal, especially in schooling fish species (De Robertis and Handegard 2013; Handegard 2003; Vabø et al. 2002). Operation of ROVs and the suction pump would also generate underwater noise during Foundation Testing. However, ROVs are not anticipated to generate levels of underwater noise that would disturb marine life (Equinor 2020; NMFS 2020a), and sound levels generated by the suction pump are anticipated to fall below ambient noise levels within relatively short distances from the pump (i.e., 1,640 feet [500 meters]; Koschinski and Lüdemann 2020). Behavioral responses to underwater noise could temporarily reduce the catchability of some species in the immediate area of the test, particularly in hook and line fisheries (Løkkeborg et al. 2012; Skalski et al. 1992).

Suction bucket testing would be conducted by a single vessel. This activity would result in the temporary exclusion of other vessels at testing locations during deployment and removal of the suction bucket to prevent conflicts and collisions with the vessel and equipment. The Proposed Action includes a series of 35 deployments and removals of a single suction bucket foundation at 26 locations in the Lease Area. At each testing location, activities would occur within a 984- by 984-foot (300- by 300-meter) square, which is centered on the location for the eventual proposed installation of wind turbines. Each suction bucket test is expected to take 6 to 9 hours. Exclusion of other vessels during each test is expected to be on a scale of hours and confined to the immediate area around the vessel. Commercial and recreational fishing vessels that are transiting or fishing within the Lease Area could use local notices to mariners to avoid the areas where suction bucket testing is occurring. Suction bucket testing activities are not expected to interfere with access to active fishing grounds beyond the Lease Area outside of the need to change transit routes slightly to avoid testing locations. Impacts on commercial fisheries and recreational fishing from suction bucket testing are expected to vary depending on the fishing gear type used. For instance, anglers using fixed gear such as lobster pots or gillnets may need to retrieve their gear if it is located in the area where suction bucket testing is about to occur.

Non-Routine Events

Non-routine events that could potentially have impacts on commercial fisheries and for-hire recreational fishing through temporary space-use conflicts include the recovery of lost equipment, allisions and collisions, and oil spills. The size of the lost equipment and/or the replacement cost would dictate the type of equipment deployed and the number of attempts made at recovery. The number of recovery attempts could affect the size of the resultant impact area and time spent searching. Additionally, the location of the lost equipment could affect the impact on other resources. Regardless, the potential for recovery operations to interact with vessel traffic is low, given that recovery operations would likely involve one vessel for a short period of time; therefore, impacts are not expected to disrupt the activity of other vessels. The potential for allisions and collisions would be minimized through adherence to USCG Navigation Rules and Regulations; therefore, risk of damage to vessels and equipment and other conflicts is considered unlikely. The size of a potential oil spill would be limited to the amount of oil held on the single vessel that would be utilized for Foundation Testing. The potential for and size of an oil spill, should one occur, would be minimized through compliance with USCG requirements relating to prevention and control of oil spills.

Conclusion

Overall, impacts on commercial fisheries and recreational fishing from the Proposed Action are expected to be **minor** based on multiple factors, including the relatively small spatial extent of impacts on fish and invertebrates from crushing, entrainment, turbidity, and noise associated with routine suction bucket testing activities, the small increase in vessel traffic (one vessel would be used to conduct testing) relative to existing traffic, and the relatively small spatial area and limited duration over which vessel exclusion would occur during a test. Impacts are expected to range from **negligible** to **minor** depending on the fishery, as effects would be noticeable for some fisheries, but the resource would be expected to recover completely without remedial or mitigating action. Communication and coordination between Beacon Wind and the fishing community would reduce the potential for conflict during vessel movement and suction bucket testing activities.

4.3.3 Finfish, Invertebrates, and Essential Fish Habitat

The Proposed Action is expected to generate a range of impacts on finfish, invertebrates, and EFH within the Beacon Wind Lease Area. Impacts of the Proposed Action are expected to primarily affect the immediate area of proposed activities (i.e., within the footprint of each planned Foundation Test). Impact-producing factors include physical interactions, benthic habitat disturbance, turbidity, entrainment, underwater noise, and vessel traffic. The Proposed Action includes measures to avoid or minimize impacts on marine mammals associated with these factors, described in **Section 4.3.4** and **Appendix F**, which also may benefit finfish species including ESA-listed species.

Under the Proposed Action, tests of suction bucket foundation installations would be done at 26 locations of the 157 positions proposed by Beacon Wind. A maximum of 35 suction bucket Foundation Tests could include repeat testing at some of the 26 WTG positions.

The swimming capabilities of most finfish, including benthic-associated species (e.g., flatfishes and sand lances), are sufficient to avoid being crushed by the reference frame or being trapped within the foundation bucket. Some invertebrate species, especially infaunal invertebrates, are not mobile enough to avoid being trapped within the bucket. Those organisms would be injured or killed during the installation process. Other potential organisms that would not be able to avoid the installation of buckets during testing include demersal eggs of finfish and invertebrates. Examples of finfish and invertebrates that produce demersal eggs include winter flounder and longfin squid (Griswold and Prezioso 1981; Saila 1961; Perlmutter 1947).

The maximum seafloor disturbance area per Foundation Test would be approximately 0.028 acre (114 square meters). The approximate total area disturbed for a maximum number of 35 tests would be 0.99 acre (3,990 square meters). The installation process is expected to impact benthic finfish and invertebrates while disturbing specific soft-bottom EFH habitat within the suction bucket footprint to a sub-sediment depth of 33 to 39 feet (10 to 12 meters). After the completion of the Proposed Action, benthic communities are expected to recover relatively quickly, within a few months following disturbances to soft-bottom habitats (Wilbur and Clarke 2007).

The installation and removal of the suction bucket at each test site would generate temporary increases in suspended sediment concentrations. Suspended sediment concentrations during suction bucket installation have not been measured or modeled. As a result of consultation under the Magnuson-Stevens Fishery Conservation and Management Act (see Section 6.2.2), NMFS suggested in situ turbidity monitoring to quantify turbidity and sediment resuspension as a conservation recommendation for EFH, and BOEM adopted this recommendation (**Appendix F, Appendix G**). Results of this monitoring would provide turbidity data for future impact evaluations of suction bucket installation. As suction bucket foundations require less benthic disturbance compared to other offshore wind foundation types (Horwath et al. 2021), for the purposes of this evaluation, it was assumed that suspended sediment plumes from each test would be similar to or lesser than those associated with site preparation activities for other foundation types (e.g., dredging for sand bedform clearing). Modeling results of cutterhead dredging indicate that suspended sediment concentrations above background levels would be present throughout the bottom 6 feet (1.8 meters) of the water column for a distance of approximately 1,000 feet (305 meters; NMFS 2020b citing USACE 1983). Elevated suspended sediment levels are expected to be present only within a 984- to 1,640-foot (300- to 500-meter) radius of the cutterhead dredge (NMFS 2020b citing USACE 1983; NMFS 2020b citing Hayes et al. 2000; NMFS 2020b citing LaSalle 1990). Suspended sediment concentrations associated with cutterhead dredge sediment plumes typically range from 11.5 to 282.0 milligrams per liter with the highest levels (550.0 milligrams per liter) detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (NMFS 2020b citing USACE 2005, 2010, 2015; NMFS 2020b citing Nightingale and Simenstad 2001). Based on this information, the localized sediment plume generated by the Proposed Action may extend

984 to 1,640 feet (300 to 500 meters) along the seabed, with suspended sediment concentrations of 282 milligrams per liter or less, and higher concentrations possible immediately adjacent to the suction bucket upon removal. The plume is expected to dissipate rapidly. The reference frame and suction bucket would be lowered at a rate of 0.7 mile per hour (1.1 kilometers per hour), potentially limiting the size of sediment plumes and suspended sediment concentrations within the plume.

Mobile finfish and invertebrate species, including Atlantic sturgeon (Wilkens et al. 2015), are expected to avoid sediment plumes if such plumes are severe enough to induce behavioral responses. Less mobile organisms (e.g., filter feeding bivalves) are more vulnerable to suspended sediment plume impacts. Physiological stress in these organisms may occur at high suspended sediment concentrations, but impacts from lower concentrations are mediated by filter feeding organisms by evacuation or decreases in filtration rates (Bergstrom et al. 2013; NYSERDA 2017).

Entrainment of eggs and larvae of finfish and invertebrates would occur during installation and removal of the suction bucket. The suction pump used for this process would be rated as a low-flow pump with a flow rate of 1,320 gallons per minute (5 cubic meters per minute) and a pump velocity of 5.2 feet per second (1.6 meters per second). Entrainment survival rates have not been studied for suction pumps associated with suction bucket foundations. Therefore, entrainment mortality was conservatively assumed to be 100% for the purposes of this evaluation.

During suction bucket installation, organisms trapped under the bucket would be entrained through the pump. During removal of the suction bucket, water would be pumped into the bucket from the water column. Entrainment of organisms from the water column would occur during this process. The total volume of water removed from within the bucket for each test would be 1,775 cubic yards (1,357 cubic meters). An equivalent amount of water would be pumped into the bucket during removal. As a result of consultation under the Magnuson-Stevens Fishery Conservation and Management Act (see Section 6.2.2), NMFS suggested in situ monitoring of the suction bucket pump flow rates to ground truth this intake volume as a conservation recommendation for EFH, and BOEM adopted this recommendation (**Appendix F, Appendix G**). Based on these assumed volumes, potential entrainment numbers were estimated using ichthyoplankton densities collected during the Ecosystem Monitoring (EcoMon) survey program between 1977 and 2019 (**Table 4-8**). Estimated larval fish entrainment per test ranged from 459 in May to 9,289 in August (**Table 4-9**) with no discernible patterns other than that the lowest entrainment numbers would occur in April and May. Estimates of total entrainment for the 35 proposed tests are provided in **Table 4-10**. These entrainment numbers are very low compared to the high egg and larval fish production and subsequent adult recruitments that are documented for these fish taxa, and population-level impacts are not expected.

Table 4-8. Mean monthly larval density estimates in Lease Area OCS-A 0520[1,2]

Species	Mean Monthly Density Estimates Larvae/3,531 Cubic Feet (100 Cubic Meters)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
American plaice	0	0	0.2	0	0.4	0.5	0	0	0	0	0	0
Atlantic cod	2	1.5	2.3	2	0.2	0	0	0	0	0	0.6	3.8
Atlantic croaker	0	0	0	0	0.3	0	0	0	0	<0.1	<0.1	0
Atlantic herring	13.3	4.7	3.6	0	0	0	0	0	0	0.1	260.2	202.7
Atlantic mackerel	0	0	0	0	0.6	1.2	0.3	0	0	0	0	0
Atlantic menhaden	0	0	0	0	0	0	0	0	0	<0.1	9.2	0
Bluefish	0	0	0	0	0	0.1	0	0.7	0	0	0	0
Bristlemouths	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	0	1.1	17.2	1.2	0.1	<0.1	0
Cunner	0	0	0	0	0	0	0.7	0.5	0	0	0	0
Fourbeard rockling	0	0	0	0	0.2	2.8	1.4	0	0	0.2	<0.1	0.2
Fourspot flounder	0	0	0	0	0	0	1.4	34.6	4.8	1.1	0	0.1
Frigate tunas	0	0	0	0	0	0	0	4.7	0	0	0	0
Grubby	0	0	<0.1	0	0	0	0	0	0	0	0	0
Gulf Stream flounder	0	0	0	0	0	0	0.3	145.8	190.2	4.4	0.1	0
Haddock	0	<0.1	0.4	0	0.9	0.8	0	0	0	0	0	0
Hakes	0	0	0	0	0	0.3	14.4	114	80.4	25.4	3.2	0
Lanternfishes	0	0	0	0	0	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0	0	2.2	0.3	<0.1	0
Lefteye flounders	0	0	0	0	0	0	0	0	<0.1	0.2	0	0
Longhorn sculpin	0	0.4	1.1	0.2	0	0	0	0	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0	0	0	0.1	0	0
Monkfish	0	0	0	0	0	0.1	0	0.1	<0.1	0	0	0

Species	Mean Monthly Density Estimates Larvae/3,531 Cubic Feet (100 Cubic Meters)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Offshore hake	0	0	0	0	0	0	0	0	0	0.4	0	0
Pollock	<0.1	0.7	1.2	0	0	0	0	0	0	0	0	0
Rock gunnel	0	0.1	<0.1	0	0	0	0	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0	0	0	0	0	0
Sand lances	24.7	236.9	90.1	29.6	0.1	0.1	0	0	0	0	0	0
Sea robins	0	0	<0.1	0	0	0	0	0.8	<0.1	0	0	0
Silver hake	<0.1	0	0	0	0	0.3	5.3	21.2	4.5	16.8	3.7	1.1
Summer flounder	0	<0.1	<0.1	0	0	0	0	0	26.2	12.5	11.7	1.3
Windowpane flounder	0	0	0	0	0.8	2.6	0	1.9	9.5	1.8	1.3	0
Winter flounder	0	<0.1	1.6	0	9.2	2.5	0	0	0	0	0	0
Witch flounder	0	0	0	0	0.9	0.4	0.4	0.1	0	0	0	0
Wolffishes	0	0	0	0	0	0	0	0	0	0	0	0
Yellowtail flounder	0	0	<0.1	0	3.1	25.9	1.1	0.1	0	0	0	0
Total	**40.1**	**244.6**	**100.8**	**31.7**	**16.7**	**37.6**	**26.3**	**342**	**319.1**	**63.5**	**290.1**	**209.2**

Source: NCEI 2023.

[1] For abundant fish taxa collected in the EcoMon survey program from 1977 to 2019.

[2] Based on survey stations located within a 10-nautical mile (18.5-kilometer) radius of the center point of the Lease Area.

Table 4-9. Estimates of larval entrainment for each suction bucket test by month

Species	Estimated Entrainment (Number of Larvae)[1]											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
American plaice	0	0	5	0	11	13	0	0	0	0	0	0
Atlantic cod	56	41	64	54	7	0	0	0	0	0	16	103
Atlantic croaker	0	0	0	0	8	0	0	0	0	3	2	0
Atlantic herring	360	128	98	0	0	0	0	0	0	4	7,062	5,503
Atlantic mackerel	0	0	0	0	18	34	10	0	0	0	0	0
Atlantic menhaden	0	0	0	0	0	0	0	0	0	2	250	0
Bluefish	0	0	0	0	0	4	0	20	0	0	0	0
Bristlemouths	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	0	29	467	32	5	2	0
Cunner	0	0	0	0	0	0	19	15	0	0	0	0
Fourbeard rockling	0	0	0	0	6	75	39	0	0	6	2	6
Fourspot flounder	0	0	0	0	0	0	39	941	130	31	0	4
Frigate tunas	0	0	0	0	0	0	0	129	0	0	0	0
Grubby	0	0	2	0	0	0	0	0	0	0	0	0
Gulf Stream flounder	0	0	0	0	0	0	9	3,957	5,163	119	3	0
Haddock	0	2	11	0	25	23	0	0	0	0	0	0
Hakes	0	0	0	0	0	8	390	3,096	2,184	690	88	0
Lanternfishes	0	0	0	0	0	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0	0	60	7	1	0
Lefteye flounders	0	0	0	0	0	0	0	0	2	5	0	0
Longhorn sculpin	0	12	29	5	0	0	0	0	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0	0	0	4	0	0
Monkfish	0	0	0	0	0	4	0	4	2	0	0	0
Offshore hake	0	0	0	0	0	0	0	0	0	11	0	0

Species	Estimated Entrainment (Number of Larvae)[1]											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pollock	2	19	32	0	0	0	0	0	0	0	0	0
Rock gunnel	0	4	2	0	0	0	0	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0	0	0	0	0	0
Sand lances	670	6,430	2,447	804	3	4	0	0	0	0	0	0
Sea robins	0	0	3	0	0	0	0	23	2	0	0	0
Silver hake	3	0	0	0	0	8	144	576	122	456	100	30
Summer flounder	0	3	2	0	0	0	0	0	711	339	318	36
Windowpane flounder	0	0	0	0	23	72	0	53	259	50	35	0
Winter flounder	0	2	44	0	249	68	0	0	0	0	0	0
Witch flounder	0	0	0	0	25	12	10	4	0	0	0	0
Wolffishes	0	0	0	0	0	0	0	0	0	0	0	0
Yellowtail flounder	0	0	2	0	84	704	29	4	0	0	0	0
Total	**1,091**	**6,641**	**2,741**	**863**	**459**	**1,029**	**718**	**9,289**	**8,667**	**1,732**	**7,879**	**5,682**

[1] Based on larval densities provided in **Table 4-8** and a maximum volume of displaced seawater of 716,963 gallons (2,714 cubic meters).

Table 4-10. Estimates of total larval entrainment for all suction bucket tests by month

Species	Estimated Entrainment (Number of Larvae)[1]											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
American plaice	0	0	175	0	385	455	0	0	0	0	0	0
Atlantic cod	1,960	1,435	2,240	1,890	245	0	0	0	0	0	560	3,605
Atlantic croaker	0	0	0	0	280	0	0	0	0	105	70	0
Atlantic herring	12,600	4,480	3,430	0	0	0	0	0	0	140	247,170	192,605
Atlantic mackerel	0	0	0	0	630	1,190	350	0	0	0	0	0
Atlantic menhaden	0	0	0	0	0	0	0	0	0	70	8,750	0
Bluefish	0	0	0	0	0	140	0	700	0	0	0	0
Bristlemouths	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	0	1,015	16,345	1,120	175	70	0
Cunner	0	0	0	0	0	0	665	525	0	0	0	0
Fourbeard rockling	0	0	0	0	210	2,625	1,365	0	0	210	70	210
Fourspot flounder	0	0	0	0	0	0	1,365	32,935	4,550	1,085	0	140
Frigate tunas	0	0	0	0	0	0	0	4,515	0	0	0	0
Grubby	0	0	70	0	0	0	0	0	0	0	0	0
Gulf Stream flounder	0	0	0	0	0	0	315	138,495	180,705	4,165	105	0
Haddock	0	70	385	0	875	805	0	0	0	0	0	0
Hakes	0	0	0	0	0	280	13,650	108,360	76,440	24,150	3,080	0
Lanternfishes	0	0	0	0	0	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0	0	2,100	245	35	0
Lefteye flounders	0	0	0	0	0	0	0	0	70	175	0	0
Longhorn sculpin	0	420	1,015	175	0	0	0	0	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0	0	0	140	0	0
Monkfish	0	0	0	0	0	140	0	140	70	0	0	0
Offshore hake	0	0	0	0	0	0	0	0	0	385	0	0

Species	Estimated Entrainment (Number of Larvae)[1]											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pollock	70	665	1,120	0	0	0	0	0	0	0	0	0
Rock gunnel	0	140	70	0	0	0	0	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0	0	0	0	0	0
Sand lances	23,450	225,050	85,645	28,140	105	140	0	0	0	0	0	0
Sea robins	0	0	105	0	0	0	0	805	70	0	0	0
Silver hake	105	0	0	0	0	280	5,040	20,160	4,270	15,960	3,500	1,050
Summer flounder	0	105	70	0	0	0	0	0	24,885	11,865	11,130	1,260
Windowpane flounder	0	0	0	0	805	2,520	0	1,855	9,065	1,750	1,225	0
Winter flounder	0	70	1,540	0	8,715	2,380	0	0	0	0	0	0
Witch flounder	0	0	0	0	875	420	350	140	0	0	0	0
Wolffishes	0	0	0	0	0	0	0	0	0	0	0	0
Yellowtail flounder	0	0	70	0	2,940	24,640	1,015	140	0	0	0	0
Total	**38,185**	**232,435**	**95,935**	**30,205**	**16,065**	**36,015**	**25,130**	**325,115**	**303,345**	**60,620**	**275,765**	**198,870**

[1] Based on entrainment estimates per test provided in **Table 4-9** and a maximum of 35 tests conducted during Foundation Testing (i.e., a maximum volume of 25.1 million gallons [94,900 cubic meters]).

During suction bucket removal, there is the potential to impinge larger fish on the suction pump, which would have an opening with a maximum diameter of 7 inches (18 centimeters). As noted above, the pump velocity for the suction pump is estimated at 5.2 feet per second (1.6 meters per second), which is likely to exceed sustained swimming speeds of many species. However, adults of some larger species have burst speeds in excess of the pump velocity (e.g., sturgeon [Kelly and Klimley 2012]). Based on the anticipated location of the pump (i.e., 19 feet [6 meters] above the seabed), demersal species would not be at risk of impingement. Pelagic species may be vulnerable to impingement, but given the small HZI (i.e., 20 square feet [1.8 square meters] or less), an individual fish would have to be in close proximity to the pump to potentially experience impingement. Therefore, impingement on the suction pump is unlikely to occur.

A single vessel would be used during each Foundation Test exposing organisms to vessel-related noise. All fishes sense the particle motion component of a sound wave (Fay and Popper 2000). Finfishes with swim bladders, particularly those with complex swim bladders involved in hearing, are more vulnerable to noise than others (Wiernicki et al. 2020; Halverson et al. 2011). Invertebrates also have organs that detect particle motion (Mooney et al. 2010; Budelmann 1992). Noise sources from vessels include sounds from main thrusters and dynamic positioning thrusters. Noise levels and frequencies from main thrusters vary considerably depending on vessel size (McKenna et al. 2013).

Source levels for large vessels reported by McKenna et al. (2017) range from 177 to 188 dB re µPa at 3 feet (1 meter) with most of the energy below 1 kHz and peaks in the 20 to 100 Hz range. Zykov et al. (2013) and McPherson et al. (2019) report a maximum broadband source level of 192 dB re 1 µPa for numerous vessels with varying propulsion power.

Fish and invertebrate responses to vessel noise include avoidance, diving, and dispersal, especially in schooling fish species (De Robertis and Handegard 2013; Handegard 2003; Vabø et al. 2002). Physiological stress in response to vessel noise has been reported in some species (Celi et al. 2016; Nichols et al. 2015; Wysocki et al. 2006); however, it is thought that handling of test subjects during these studies may have confounded results (Harding et al. 2020; Staaterman et al. 2020). Subtle impacts such as masking of behavioral responses to other stimuli are also possible (Haver et al. 2021; Ferrari et al. 2018; Holmes et al. 2017; Nedelec et al. 2017; Simpson et al. 2016). Habituation (i.e., eventual lack of response) to vessel sound has also been documented after prolonged exposure to vessel sound (Nedelec et al. 2016).

Jimenez-Arranz et al. (2019) measured dynamic positioning noise generated by a Mobile Offshore Drilling Unit and, based on these measurements, estimated source levels produced by dynamic positioning would peak at approximately 188 dB re 1 µPa in the 31.5 Hz one-third octave band. Warner and McCrodan (2011) measured vessel self-noise during dynamic positioning of a geophysical and geotechnical survey vessel at less than 145 dB re 1 µPa approximately 361 feet (110 meters) from the vessel and observed that frequencies generated by the dynamic positioning thrusters varied between 110 and 140 Hz; based on measured root mean square sound levels, Warner and McCrodan (2011) estimated that sound levels generated by the vessel during dynamic positioning would fall below the 150 dB re 1 µPa behavioral disturbance threshold for fish at approximately 60 feet (18 meters) from the vessel. Impacts of noise from dynamic positioning systems on marine organisms have been poorly studied. Dynamic positioning thrusters may run up to 9 hours per test during the Proposed Action, inclusive of installation and removal procedures.

Operation of ROVs and the suction pump would also generate underwater noise during Foundation Testing. ROVs are not anticipated to generate significant levels of underwater noise and are not expected to disturb marine life (Equinor 2020; NMFS 2020a). Sound levels generated by the suction pump are anticipated to fall below ambient noise levels within relatively short distances from the pump (i.e., 1,640 feet [500 meters]; Koschinski and Lüdemann 2020).

Acoustic imaging will be conducted within the confines of the suction bucket frame. However, the imaging equipment inside the suction bucket would be operated at frequencies at or above 400 kHz, which is inaudible to marine organisms. Therefore, imaging equipment noise is not expected to affect finfish or invertebrates.

A single vessel would be used during Foundation Testing activities under the Proposed Action. Furthermore, all Foundation Tests would be conducted during a single mobilization, limiting the number of trips to ports when vessel collisions with large fish (e.g., Atlantic sturgeon) are more likely due to the shallower water depth. Vessel collisions are possible during vessel transits between test sites but less likely. The increased risk of vessel collisions due to the single Foundation Testing vessel would be very minimal compared to risks associated with existing vessel traffic.

In the unlikely event that weather conditions make onboarding the suction bucket at the end of the test hazardous, the suction bucket may be suspended under the vessel as it transits to the next testing site, posing an opportunity for potential physical interactions with large fish in the water column during transit. However, the transit would be conducted at low speed (i.e., 1 to 2 knots [2 to 4 kilometers per hour]) and a fish would have to be in the water column directly in front of the suction bucket. Therefore, physical interactions with the suspended suction bucket during transit are unlikely to occur.

Non-Routine Events

The risk of non-routine events is expected to be very low. Potential non-routine events include lost equipment, severe weather events, and accidental spills. Lost equipment could potentially require retrieval efforts such as video surveillance and/or grappling. Severe weather events could prevent testing and change the activities schedule, possibly extending the testing period. Although the risks of accidental spills are low, especially for a single vessel, extreme weather events would increase those risks.

Conclusion

The impacts of the Proposed Action on finfish, invertebrates, and EFH would be short term and range from **negligible** to **minor** adverse across individual impact-producing factors. Factors with **negligible** adverse impacts include physical interactions, turbidity, underwater noise, and vessel traffic. Impacts due to benthic habitat disturbance and entrainment would be **minor** adverse. These **minor** adverse impacts would affect individuals and would not have population-level impacts. The affected environment and impacted communities are expected to recover relatively quickly following the completion of activities from the Proposed Action.

4.3.4 Marine Mammals

Factors that could have an impact on marine mammals from the Proposed Action include benthic habitat disturbance, turbidity, entrainment and impingement, underwater noise, vessel traffic, and physical interactions. The Proposed Action includes measures to avoid or minimize potential impacts on marine mammals associated with these factors, which are discussed with the relevant factor in the impact assessment in this section and identified in **Appendix F**.

The installation and removal of the suction bucket and the placement and removal of the reference frame would result in temporary benthic disturbance of up to approximately 0.7 acre (2,873 square meters) in the Lease Area. The Project vessel would utilize dynamic positioning thrusters to maintain position (**Appendix F**), and therefore no anchoring impacts would occur. However, benthic disturbance associated with suction bucket testing under the Proposed Action would result in a temporary reduction in prey availability for benthic foragers. This reduction would be localized and short term. Recolonization and recovery of prey species is expected to occur within a few months to a year (Wilbur and Clarke 2007). As mysticete species expected to occur in the Lease Area are pelagic foragers, effects of a reduction in prey availability associated with benthic habitat disturbance are expected to be negligible for mysticetes. Though some odontocetes and pinnipeds may consume benthic prey, the area of habitat disturbance would be very small relative to soft-bottom foraging habitats available in the Lease Area, and effects on foraging would be non-measurable.

The installation and removal of the suction bucket and the placement and removal of the reference frame will result in temporary increases in suspended sediment concentrations at the testing sites. Suspended sediment concentrations during suction bucket installation have not been measured or modeled. As a result of consultation under the Magnuson-Stevens Fishery Conservation and Management Act (see Section 6.2.2), NMFS suggested in situ turbidity monitoring to quantify turbidity and sediment resuspension as a conservation recommendation for EFH, and BOEM adopted this recommendation (**Appendix F, Appendix G**). Results of this monitoring would provide turbidity data for future impact evaluations of suction bucket installation. As the design and installation of suction bucket foundations require relatively few bottom-disturbing activities compared to other offshore wind foundation types (Horwath et al. 2021), suspended sediment concentrations associated with installation and removal of the suction bucket and reference frame would be expected to be similar to or lesser than suspended sediment concentrations associated with site preparation activities for other foundation types (e.g., dredging for sand bedform clearing). Modeling results of cutterhead dredging indicate that suspended sediment concentrations above background levels would be present throughout the bottom 6 feet (1.8 meters) of the water column for a distance of approximately 1,000 feet (305 meters; NMFS 2020b citing USACE 1983). Elevated suspended sediment levels are expected to be present only within a 984- to 1,640-foot (300- to 500-meter) radius of the cutterhead dredge (NMFS 2020b citing USACE 1983; NMFS 2020b citing Hayes et al. 2000; NMFS 2020b citing LaSalle 1990). Suspended sediment concentrations associated with cutterhead dredge sediment plumes typically range from 11.5 to 282.0 milligrams per liter with the highest levels (550.0 milligrams per liter) detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (NMFS 2020b citing USACE 2005, 2010, 2015; NMFS 2020b citing Nightingale and Simenstad 2001). Based on this information, the localized sediment plume generated by the proposed Foundation Testing may extend 984 to 1,640 feet (300 to 500 meters) along the seabed, with suspended sediment concentrations of 282 milligrams per liter or less, and higher concentrations possible immediately adjacent to the suction bucket upon removal. The plume is expected to dissipate rapidly.

As described in Johnson (2018), NMFS has determined that elevated turbidity could result in effects on marine mammal species under specific circumstances (e.g., high turbidity levels over long periods during dredging operations). In general, marine mammals are not subject to impact mechanisms that injure fish (e.g., gill clogging, smothering of eggs and larvae), so physiological effects are unlikely. Behavioral impacts, including avoidance or changes in behavior, increased stress, and temporary loss of foraging opportunity, could occur but only at high suspended sediment concentrations (Johnson 2018). The small increase in suspended sediment concentrations due to installation and removal of the suction bucket and placement and removal of the reference frame are not expected to be sufficient to result in behavioral impacts on marine mammals. Therefore, effects of turbidity associated with Foundation Testing are unlikely to occur. If marine mammals were to avoid the small sediment plumes generated by the Proposed Action, effects of the behavioral reaction would be temporary and non-measurable.

Operation of the suction pump would pull ambient water through the pump, potentially resulting in entrainment or impingement of marine organisms. Marine mammals could potentially be affected by entrainment of their prey as a result of the Foundation Testing. Entrainment during suction pump operation is not expected to result in measurable impacts on plankton or fish populations and is therefore not expected to measurably reduce prey availability for marine mammals. Marine mammals are too large to be vulnerable to impingement on the suction pump.

The Foundation Testing vessel, the ROVs, the suction pump, and the imaging equipment inside the suction bucket would produce noise during Foundation Testing activities. Vessels generate low frequency, non-impulsive noise that could affect marine mammals. Source levels for large vessels range from 177 to 188 dB re 1 µPa at 3 feet (1 meter) with most of the energy below 1 kHz and peaks in the 20–100 Hz range (McKenna et al. 2017). Jimenez-Arranz et al. (2019) measured dynamic positioning noise generated by a Mobile Offshore Drilling Unit and, based on these measurements, estimated source levels produced by dynamic positioning would peak at approximately 188 dB re 1 µPa in the 31.5 Hz one-third octave band. Warner and McCrodan (2011) measured vessel self-noise during dynamic positioning of a geophysical and geotechnical survey vessel at less than 145 dB re 1 µPa approximately 361 feet (110 meters) from the vessel and observed that frequencies generated by the dynamic positioning thrusters varied between 110 and 140 Hz approximately; based on measured root mean square sound levels, Warner and McCrodan (2011) estimated that sound levels generated by the vessel during dynamic positioning would fall below the 120 dB re 1 µPa behavioral disturbance threshold for marine mammals at approximately 1 mile (1,600 meters) from the vessel. Vessel noise overlaps with the hearing range of marine mammals and may cause behavioral responses (e.g., startle responses, behavioral changes, and avoidance), stress responses, and masking (Erbe et al. 2018, 2019; Nowacek et al. 2007; Southall et al. 2007). In NARW, vessel noise is known to increase stress hormone levels, which may contribute to suppressed immunity and reduced reproductive rates and fecundity (Hatch et al. 2012; Rolland et al. 2012). Masking may interfere with detection of prey and predators and reduce communication distances (e.g., Hatch et al. 2012).

Noise associated with survey ROVs equipped with acoustic imaging equipment was previously evaluated for site characterization surveys in the Lease Area (Equinor 2020), and NMFS (2020) determined that the likelihood of marine mammal take resulting from operation of the survey ROV was so low as to be discountable. Therefore, operation of the ROVs under the Proposed Action, which would not utilize acoustic imaging equipment, is not expected to result in behavioral disturbance of marine mammals. Suction pump noise is not anticipated to exceed injury thresholds for marine mammals, but source levels may exceed the 120 dB re 1 μPa behavioral disturbance threshold for non-impulsive noise (Koschinski and Lüdemann 2020). Sound levels produced by the suction pump are anticipated to fall below ambient noise levels within relatively short distances from the pump (i.e., 1,640 feet [500 meters]; Koschinski and Lüdemann 2020). Therefore, if source levels exceed the behavioral disturbance threshold, they would be expected to attenuate to non-disturbing levels within a relatively short distance. The imaging equipment inside the suction bucket would be operated at frequencies at or above 400 kHz, which would be above the hearing range of marine mammals. Therefore, imaging equipment noise does not have the potential to affect marine mammals.

Noise produced during Foundation Testing is not expected to exceed injury thresholds for marine mammals but could exceed the behavioral disturbance threshold. Short-term, localized behavioral responses may occur to animals near the testing sites, but behavior would be expected to return to normal once the test is complete and/or when a marine mammal leaves the area. Given the temporary nature of the effects, the short duration of individual tests (i.e., up to 9 hours), and the short overall duration of Foundation Testing (i.e., up to 15 days), any effects of behavioral disturbance on marine mammals would be non-measurable.

A single vessel would be utilized to carry out Foundation Testing under the Proposed Action. As the vessel is expected to exceed 65 feet (20 meters) in length, the Foundation Testing vessel would be subject to a 10-knot (18.5-kilometer per hour) speed restriction from November 1 through July 31 (**Appendix F**). If the proposed Foundation Testing were to take place outside this time period, the Foundation Testing vessel would comply with any Dynamic Management Area or Slow Zone in effect during Foundation Testing activities and would utilize a trained lookout anytime the vessel would be operating at speeds of 10 knots (18.5 kilometers per hour) or greater (**Appendix F**). Additionally, the vessel would comply with measures to minimize vessel interactions with protected species, as described in *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* (BOEM 2021), including the following measures that are also identified in **Appendix F**:

- The vessel captain and crew will maintain a vigilant watch for all protected species and reduce speed, stop the vessel, or alter course, as appropriate, to avoid striking any listed species.
- Anytime the vessel is underway, the vessel will maintain a 1,640-foot (500-meter) separation distance from ESA-listed species, including unidentified large whales, and a trained lookout will monitor a Vessel Strike Avoidance Zone of at least 1,640 feet (500 meters).
- If the trained lookout is a vessel crew member, this will be their designated role and primary responsibility, and they will receive training on protected species identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements.
- All vessel crew members will be briefed in the identification of protected species that may occur in the action area and in regulations and best practices for avoiding vessel collisions. Reference materials for identification of ESA-listed species will be available on board the vessel, and Beacon

Wind will clearly communicate, and post in highly visible locations, the expectation and process for reporting of protected species sightings.

- If an ESA-listed whale or unidentified large whale is observed within 1,640 feet (500 meters) of the forward path of the vessel, the operator will steer a course away from the whale at 10 knots (18.5 kilometers per hour) or less until the 1,640-foot (500-meter) minimum separation distance has been established. The vessel operator may also shift to idle if feasible.
- If a large whale is sighted within 656 feet (200 meters) of the forward path of a vessel, the vessel operator will reduce speed and shift the engine to neutral. Engines will not be engaged until the whale has moved outside of the vessel's path and beyond 1,640 feet (500 meters). If stationary, the vessel will not engage engines until the large whale has moved beyond 1,640 feet (500 meters).
- If a sea turtle or manta ray is sighted at any distance within the operating vessel's forward path, the vessel operator will slow down to 4 knots (7.4 kilometers per hour) and steer away (unless unsafe to do so). The vessel may resume normal vessel operations once the vessel has passed the individual.
- During times of year when sea turtles are known to occur in the action area, the vessel will avoid transiting through areas of visible jellyfish aggregations or floating vegetation (e.g., sargassum lines or mats). In the event that operational safety prevents avoidance of such areas, the vessel will slow to 4 knots (7.4 kilometers per hour) while transiting through such areas.
- A trained lookout will be posted at all times to avoid interactions with ESA-listed species when a vessel is underway (transiting or surveying) by monitoring in all directions; during any nighttime transits, the lookout will be equipped with night vision and/or infrared equipment to aid in detection of ESA-listed species.
- All crew members responsible for navigation duties will receive site-specific training on ESA-listed species sighting/reporting and vessel strike avoidance measures.
- The vessel will not divert course to approach any ESA-listed species or other marine mammal species.
- The vessel will reduce speed to 10 knots (18.5 kilometers per hour) or less while operating in any Slow Zone triggered by visual detections of NARWs, except in areas within a portion of a visually designated Dynamic Management Area or Slow Zone where it is not reasonable to expect the presence of NARWs (e.g., Long Island Sound, shallow harbors).
- The vessel operator will check for information regarding mandatory or voluntary ship strike avoidance (Seasonal Management Areas and Dynamic Management Areas [or Slow Zones that are also designated as Dynamic Management Areas]) and daily information regarding NARW sighting locations. These media may include, but are not limited to: NOAA weather radio, USCG NAVTEX and channel 16 broadcasts, Notices to Mariners, the Whale Alert app, or WhaleMap website.

Vessel strikes are a major source of mortality and injury for many marine mammal species (Hayes et al. 2021; Laist et al. 2001; Moore and Clarke 2002), including NARW (Kite-Powell et al. 2007). Almost all sizes and classes of vessels have been involved in collisions with marine mammals around the world (Dolman et al. 2006). Marine mammals are expected to be most vulnerable to vessel strikes when within the vessel's draft and not detectable by visual observers (e.g., animal below the surface or poor visibility conditions such as bad weather or low light), and probability of vessel strike increases with increasing vessel speed (Pace and Silber 2005; Vanderlaan and Taggart 2007). NARWs are at highest risk for vessel strike when vessels travel in excess of 10 knots (Vanderlaan and Taggart 2007); serious injury to cetaceans due to vessel collision rarely occurs when vessels travel below 10 knots (Laist et al. 2001). Given that a single vessel will be used for the Proposed Action and the mitigation measures to avoid vessel strike described above and in **Appendix F**, including vessel speed restrictions, use of trained lookouts, minimum separation distances, and vessel strike avoidance procedures, a collision between the vessel and a marine mammal is extremely unlikely to occur.

There is the potential for the frame or suction bucket to come into contact with a marine mammal while being lowered to the seabed. However, the structures would be lowered at a low speed (0.7 mile per hour [1.1 kilometers per hour]) and in a controlled manner. A marine mammal would have to be directly below the suction bucket or reference frame as it is being lowered to experience a physical interaction. Additionally, the slow rate of lowering the bucket and frame at each testing site should allow marine mammals to avoid interaction. To minimize the risk of a physical interaction between the frame or suction bucket and a marine mammal, a trained lookout would monitor for marine mammals in the area prior to and during deployment, and lowering of the equipment would be stopped if a marine mammal is sighted within 1,640 feet (500 meters) of the vessel (**Appendix F**).

In the unlikely event that weather conditions make onboarding the suction bucket at the end of the test hazardous, the suction bucket may be suspended under the vessel as it transits to the next testing site, posing an opportunity for potential physical interactions with marine mammals during transit. However, the transit would be conducted at low speed (i.e., 1 to 2 knots [2 to 4 kilometers per hour]). A marine mammal would have to be in the water column immediately in front of the suction bucket during vessel transit to experience a physical interaction. Additionally, the slow transit speed during suspended transit of the suction bucket should allow marine mammals to avoid interaction. Given the low probability of a marine mammal occurring directly in the path of lowering or transiting equipment and the slow lowering and suspended transit speeds under the Proposed Action, physical interactions are not expected to occur.

Non-Routine Events

Non-routine events that could potentially have impacts on marine mammals include accidental releases or discharges and recovery of lost equipment. Accidental releases of trash and debris may occur from the vessel during suction bucket Foundation Testing. About half of all marine mammal species worldwide have been documented to ingest trash and debris (Werner et al. 2016), which can result in death. Based on stranding data, mortality rates associated with debris ingestion range from 0 to 22%. Ingestion may also result in sublethal effects, including digestive track blockage, disease, injury, and malnutrition (Baulch and Perry 2014). Linkages between impacts on individual marine mammals associated with debris ingestion and population-level effects are difficult to establish (Browne et al. 2015). BOEM assumes the Project vessel would comply with laws and regulations to properly dispose of marine debris and to minimize releases. Additionally, Beacon Wind would conduct marine debris awareness training and submit a training compliance report (**Appendix F**). In the event of a release, it would be an accidental, localized event in the vicinity of the vessel. Beacon Wind would recover marine trash and debris resulting from the Proposed Action that could cause undue harm or damage to natural resources (**Appendix F**).

An accidental discharge from the vessel could also occur during Foundation Testing. Marine mammal exposure to releases through aquatic contact or inhalation of fumes can result in death or sublethal effects, including but not limited to adrenal effects, hematological effects, hepatological effects, poor body condition, and dermal effects (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). BOEM assumes the Project vessel would comply with all laws regulating at-sea discharges of vessel-generated waste and USCG requirements relating to prevention and control of oil spills. Any spill associated with the Proposed Action would be an isolated event with rapid dissipation and low risk of exposure to marine mammals.

The recovery of lost equipment could affect marine mammals through the potential impact from entanglement stemming from the dragging of grapnel lines. Entanglement is a threat to all taxa of marine mammals (Hayes et al. 2020, 2021). The extent of impacts from the grapnel lines would be dependent upon the type of lost equipment, which would dictate the number of attempts made at recovery. Regardless, the potential for marine mammals to interact with the grapnel line and to become entangled is extremely unlikely given the low probability of a marine mammal encountering the line in the Lease Area. Impacts from additional vessel traffic and noise associated with recovery of lost equipment likely would be from a single vessel and are therefore not expected to disrupt the normal or routine functions of marine mammals.

Conclusion

Overall, impacts from Foundation Testing activities on marine mammals are expected to be **negligible,** because based on the scale and nature of activities proposed, any impacts would have little to no effect or no measurable impacts on individuals. If a vessel strike were to occur, effects on individual mysticetes other than the NARW, odontocetes, and pinnipeds would be detectible and measurable, but the viability of the species would not be threatened, whereas severe population-level effects that compromise the viability of NARW would be possible. However, the likelihood of a vessel strike as a result of the Proposed Action is considered very low given the use of a single vessel and the expected limited total extent and duration of activities considered. Furthermore, implementation of the proposed mitigation measures (**Appendix F**) would minimize potential impacts on marine mammals.

4.3.5 Sea Turtles

Factors that could have an impact on sea turtles from the Proposed Action include benthic habitat disturbance, turbidity, entrainment and impingement, underwater noise, vessel traffic, and physical interactions. The Proposed Action includes measures to avoid or minimize potential impacts on sea turtles associated with these factors, which are discussed in the impact assessment in this section and in **Appendix F**.

The installation and removal of the suction bucket and the placement and removal of the reference frame would result in temporary benthic disturbance of up to approximately 0.7 acre (2,873 square meters) in the Lease Area. The Project vessel would utilize dynamic positioning thrusters to avoid anchoring disturbance of additional area within the Lease Area (**Appendix F**). Benthic disturbance associated with the Proposed Action would result in a temporary reduction in prey availability for benthic foragers. This reduction would be localized and short term. Recolonization and recovery of prey species is expected to occur within a few months to a year (Wilbur and Clarke 2007).

As green sea turtles, leatherback sea turtles, and loggerhead sea turtles do not forage in the soft-bottom habitats present in the Lease Area, benthic habitat disturbance would not reduce prey availability or foraging opportunities for these species. Juvenile Kemp's ridley sea turtles that may occur in the Lease Area do forage in this type of habitat and may therefore experience a reduction in prey availability or foraging opportunities due to benthic habitat disturbance associated with Foundation Testing. However, this reduction would be temporary and would be localized to a very small portion of the Lease Area. Given the temporary, short-term nature of the prey reduction and the large area of soft-bottom habitat that would remain available for foraging, any effect of a reduction in prey availability or foraging opportunities for Kemp's ridley sea turtle due to benthic habitat disturbance as a result of Foundation Testing would be non-measurable.

The installation and removal of the suction bucket and the placement and removal of the reference frame will result in temporary increases in suspended sediment concentrations at the testing sites. Suspended sediment concentrations during suction bucket installation have not been measured or modeled. As a result of consultation under the Magnuson-Stevens Fishery Conservation and Management Act (see Section 6.2.2), NMFS suggested in situ turbidity monitoring to quantify turbidity and sediment resuspension as a conservation recommendation for EFH, and BOEM adopted this recommendation (**Appendix F, Appendix G**). Results of this monitoring would provide turbidity data for future impact evaluations of suction bucket installation. As suction bucket foundations require relatively few bottom-disturbing activities compared to other offshore wind foundation types (Horwath et al. 2021), suspended sediment concentrations associated with installation and removal of the suction bucket and reference frame would be expected to be similar to or lesser than suspended sediment concentrations associated with site preparation activities for other foundation types (e.g., dredging for sand bedform clearing). Modeling results of cutterhead dredging indicate that suspended sediment concentrations above background levels would be present throughout the bottom 6 feet (1.8 meters) of the water column for a distance of approximately 1,000 feet (305 meters; NMFS 2020b citing USACE 1983). Elevated suspended sediment levels are expected to be present only within a 984- to 1,640-foot (300- to 500-meter) radius of the cutterhead dredge (NMFS 2020b citing USACE 1983; NMFS 2020b citing Hayes et al. 2000; NMFS 2020b citing LaSalle 1990). Suspended sediment concentrations associated with cutterhead dredge sediment plumes typically range from 11.5 to 282.0 milligrams per liter with the highest levels (550.0 milligrams per liter) detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (NMFS 2020b citing USACE 2005, 2010, 2015; NMFS 2020b citing Nightingale and Simenstad 2001). Based on this information, the localized sediment plume generated by the proposed Foundation Testing may extend 984 to 1,640 feet (300 to 500 meters) along the seabed, with suspended sediment concentrations of 282 milligrams per liter or less, and higher concentrations possible immediately adjacent to suction bucket upon removal. The plume is expected to dissipate rapidly.

There are no data to indicate that suspended sediment has physiological effects on sea turtles. However, elevated suspended sediment may cause alterations to normal movements or behavioral disruption as sea turtles would be expected to avoid the area of elevated suspended sediment. Given the localized nature of the sediment plume and the rapid dissipation of the plume, any effects of behavioral reactions in sea turtles due to turbidity associated with Foundation Testing would be non-measurable.

Elevated suspended sediment concentrations can affect benthic communities, which could impact Kemp's ridley sea turtle as this species forages in soft-bottom habitats. Suspended sediment concentrations high enough to result in adverse impacts on the benthic community (i.e., above 390 milligrams per liter [USEPA 1986]) are not expected throughout most of the plume. Based on plumes generated by hydraulic dredging, it may be possible that suspended sediment concentrations would exceed this threshold immediately adjacent to the suction bucket upon removal. If this threshold were exceeded, prey availability or foraging opportunities for Kemp's ridley sea turtles may be temporarily reduced in the area immediately outside the footprint of the suction bucket. Given the temporary, short-term nature of the prey reduction, the small scale of the reduction, and the large area of soft-bottom habitat that would remain available for foraging, any effect of a reduction in prey availability or foraging opportunities for Kemp's ridley sea turtle due to increased turbidity as a result of Foundation Testing would be non-measurable.

Operation of the suction pump would pull ambient water through the pump, potentially resulting in entrainment or impingement of marine organisms. However, entrainment during suction pump operation is not expected to result in measurable impacts on plankton or fish populations and is therefore not expected to measurably reduce prey availability for sea turtles.

The pump velocity for the suction pump is estimated at 5.2 feet per second (1.6 meters per second). Sea turtles are capable of cruising (i.e., sustained swimming) at speeds of 3.3 to 4.4 feet per second (1 to 1.3 meters per second), and juveniles are known to forage in areas with currents of up to 3.4 feet per second (1 meter per second; NMFS 2023e). However, sea turtles may be capable of burst speeds of up to 6.6 feet per second (2 meters per second) for a few seconds (Prange 1976), indicating that sea turtles would be able to escape the pump. Additionally, the HZI of the pump would be 20 square feet (1.9 square meters) or less. A sea turtle is unlikely to occur within the radius (up to 2.5 feet [0.8 meter]) of the hydraulic zone of influence while the suction pump is in operation. Therefore, effects of impingement on the suction pump on sea turtles are unlikely to occur.

The Foundation Testing vessel, the ROVs, the suction pump, and the imaging equipment inside the suction bucket would produce noise during Foundation Testing activities. Vessels generate low frequency, non-impulsive noise that could affect sea turtles. Source levels for large vessels range from 177 to 188 dB re 1 µPa at 3 feet (1 meter) with most of the energy below 1 kHz and peaks in the 20–100 Hz range (McKenna et al. 2017). Jimenez-Arranz et al. (2019) measured dynamic positioning noise generated by a Mobile Offshore Drilling Unit and, based on these measurements, estimated source levels produced by dynamic positioning would peak at approximately 188 dB re 1 µPa in the 31.5 Hz one-third octave band. Warner and McCrodan (2011) measured vessel self-noise during dynamic positioning of a geophysical and geotechnical survey vessel at less than 145 dB re 1 µPa approximately 361 feet (110 meters) from the vessel and observed that frequencies generated by the dynamic positioning thrusters varied between 110 and 140 Hz; based on measured root mean square sound levels, Warner and McCrodan (2011) estimated that sound levels generated by the vessel during dynamic positioning would fall below 170 dB re 1 µPa at 3 feet (1 meter) from the vessel, indicating that source levels generated during dynamic positioning were likely below the recommended behavioral disturbance threshold for sea turtles of 175 dB re 1 µPa. Based on anticipated sound levels for vessels, noise from the Foundation Testing vessel may elicit behavioral responses in sea turtles, including startle responses and changes in diving patterns, or a temporary stress response (NSF and USGS 2011; Samuel et al. 2005).

Noise associated with survey ROVs equipped with acoustic imaging equipment was previously evaluated for site characterization surveys in the Lease Area (Equinor 2020), and NMFS (2020) determined that the likelihood of behavioral disturbance resulting from operation of the survey ROV was so low as to be discountable. Therefore, operation of the ROVs under the Proposed Action, which would not utilize acoustic imaging equipment, is not expected to result in behavioral disturbance of sea turtles.

Suction pump noise is not anticipated to exceed the injury threshold or the 175 dB re 1 μPa behavioral disturbance threshold for sea turtles (Koschinski and Lüdemann 2020). The imaging equipment inside the suction bucket would be operated at frequencies at or above 400 kHz, which is above the hearing range of sea turtles. Therefore, imaging equipment noise does not have the potential to affect sea turtles.

Any behavioral responses to Foundation Testing noise would be short term and localized to the area around the testing site or the transiting Foundation Testing vessel; effects of any elicited behavioral response would dissipate once the test is complete and the vessel or sea turtle leaves the area. Given the temporary nature of the effects, the short duration of individual tests, and the short overall duration of Foundation Testing, any effects of behavioral disturbance on sea turtles due to noise associated with Foundation Testing would be non-measurable.

A single vessel would be utilized to carry out Foundation Testing under the Proposed Action. As the vessel is expected to exceed 65 feet (20 meters) in length, the Foundation Testing vessel would be subject to a 10-knot (18.5-kilometer per hour) speed restriction from November 1 through July 31 (**Appendix F**). If the proposed Foundation Testing were to take place outside this time period, the Foundation Testing vessel would comply with any Dynamic Management Area or Slow Zone in effect during Foundation Testing activities and would utilize a trained lookout anytime the vessel would be operating at speeds of 10 knots or greater (**Appendix F**). Additionally, the vessel would comply with measures to minimize vessel interactions with protected species from *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* (BOEM 2021), as described in **Section 4.3.4** and **Appendix F.**

Vessel strikes are a known source of injury and mortality for sea turtles (Chaloupka et al. 2008). Though sea turtles spend a majority of their time (greater than 90%) submerged (Lutcavage and Lutz 1997), most of their submerged time (60 to 75%) occurs within 32 feet (10 meters) of the surface for hard-shelled species (i.e., green, Kemp's ridley, and loggerhead sea turtles; Borcuk et al. 2017; Watwood and Buonantony 2012), indicating that these species may be vulnerable to vessel strike, particularly by deep draft vessels, approximately 66 to 81% of the time. Leatherback sea turtles spend less time within 32 feet (10 meters) of the surface (approximately 20%; Borcuk et al. 2017; Watwood and Buonantony 2012), indicating that this species may be less vulnerable to vessel strike than the other sea turtle species in the Lease Area. Sea turtles are expected to be most vulnerable to vessel strikes in coastal foraging areas and may not be able to avoid collisions when vessel speeds exceed 2 knots (4 kilometers per hour; Hazel et al. 2007). Given that a single vessel would be used for the Proposed Action and the mitigation measures to avoid vessel strike described above and in **Appendix F**, including use of trained lookouts, minimum separation distances, and vessel strike avoidance procedures, a collision between the vessel and a sea turtle is unlikely to occur.

There is the potential for the frame or suction bucket to come into contact with a sea turtle while being lowered to the seabed. However, the structures would be lowered at a low speed (0.7 mile per hour [1.1

kilometers per hour]) and in a controlled manner. A sea turtle would have to be directly below the suction bucket or reference frame as it is being lowered to experience a physical interaction. Additionally, the slow rate of lowering the bucket and frame at each testing site should allow sea turtles to avoid interaction. To minimize the risk of a physical interaction between the frame or suction bucket and a sea turtle, a trained lookout would monitor for sea turtles in the area prior to and during deployment, and lowering of the equipment would be stopped if a sea turtle is sighted within 1,640 feet (500 meters) of the vessel (**Appendix F**).

In the unlikely event that weather conditions make onboarding the suction bucket at the end of the test hazardous, the suction bucket may be suspended under the vessel as it transits to the next testing site, posing an opportunity for potential physical interactions with sea turtles during transit. However, the transit would be conducted at low speed (i.e., 1 to 2 knots [2 to 4 kilometers per hour]). A sea turtle would have to be in the water column immediately in front of the suction bucket during vessel transit to experience a physical interaction. Additionally, the slow transit speed during suspended transit of the suction bucket should allow sea turtles to avoid interaction. Given the low probability of a sea turtle occurring directly in the path of lowering or transiting equipment and the slow lowering and suspended transit speeds under the Proposed Action, physical interactions are not expected to occur.

Non-Routine Events

Non-routine events that could potentially have impacts on sea turtles include accidental releases or discharges and recovery of lost equipment. Accidental releases of trash and debris may occur from the vessel during suction bucket Foundation Testing. All sea turtle species are known to ingest trash and debris, including plastic fragments, tar, paper, polystyrene foam, hooks, lines, and net fragments (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014; Thomás et al. 2002). Such ingestion can occur accidentally or intentionally when individuals mistake the debris for potential prey items (Gregory 2009; Hoarau et al. 2014; Thomás et al. 2002). Ingestion of trash and debris can result in death or sublethal effects, including but not limited to dietary dilution, chemical contamination, depressed immune system, poor body condition, reduced growth rates, reduced fecundity, and reduced reproductive success (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). BOEM assumes the Project vessel would comply with laws and regulations to properly dispose of marine debris and to minimize releases. Additionally, Beacon Wind would conduct marine debris awareness training and submit a training compliance report (**Appendix F**). In the event of a release, it would be an accidental, localized event in the vicinity of the vessel. Beacon Wind would recover marine trash and debris resulting from the Proposed Action that could cause undue harm or damage to natural resources (**Appendix F**).

An accidental discharge from the vessel could also occur during Foundation Testing. Sea turtle exposure to oil spills through aquatic contact or inhalation of fumes can result in death (Shigenaka et al. 2010, 2021) or sublethal physical or chemical effects. Physical effects limit basic functionality for most turtles exposed as oil interferes with surface breathing, movement, and vision, which limits their ability to forage or evade predators (Shigenaka et al. 2021). Chemical effects are less apparent and, therefore, less understood. Documented chemical effects include but are not limited to adrenal effects, dehydration, hematological effects, increased disease incidence, hepatological effects, poor body condition, dermal effects, skeletomuscular effects, and oxidative stress (Bembenek-Bailey et al. 2019; Camacho et al. 2013; Mitchelmore et al. 2017; Shigenaka et al. 2010, 2021; Vargo et al. 1986). BOEM assumes the Project vessel would comply with all laws regulating at-sea discharges of vessel-generated waste and USCG requirements relating to prevention and control of oil spills. Any spill associated with the Proposed Action would be an isolated event with rapid dissipation and low risk of exposure to sea turtles.

The recovery of lost equipment could affect sea turtles through the potential impact from entanglement stemming from the dragging of grapnel lines. The extent of impacts from the grapnel lines would be dependent upon the type of lost equipment, which would dictate the number of attempts made at recovery. Regardless, the potential for sea turtles to interact with the grapnel line and to become entangled is extremely unlikely given the low probability of a sea turtle encountering the line in the Lease Area. Impacts from additional vessel traffic and noise associated with recovery of lost equipment likely would be from a single vessel and are therefore not expected to disrupt the normal or routine functions of sea turtles.

Conclusion

Overall, impacts from Foundation Testing activities on sea turtles are expected to be **negligible** because potential impacts on individuals from the scale and nature of activities proposed would have little to no effect or no measurable impacts. Implementation of the mitigation measures provided in **Section 4.3.4** would minimize potential impacts on sea turtles.

5 Standard Operating Conditions

The Proposed Action includes SOCs to reduce or eliminate potential risks to or conflicts with specific environmental resources. BOEM will require the Lessee to comply with the SOCs throughout Foundation Testing activities. The Lessee's SAP and SAP Amendment contain a description of environmental protection features or measures that the Lessee will use.

For offshore cultural resources and biologically sensitive habitats, BOEM's primary mitigation strategy has been and will continue to be avoidance. For example, the exact locations of Foundation Tests have been and would be adjusted to avoid adverse effects on offshore cultural resources or biologically sensitive habitats, if present.

The Beacon Wind Lease contains specific stipulations to minimize risk to marine species that must be followed. Foundation Testing will not require pile driving; accordingly, mitigations to reduce adverse impacts on protected species from pile driving do not apply to the proposed Foundation Testing. All activities associated with the Foundation Testing will comply with the applicable lease stipulations.

During Foundation Testing, Beacon Wind will use many of the BMPs identified in the *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan* (BOEM 2019) and *Establishment of an OCS Alternative Energy and Alternate Use Program, Record of Decision, December 2007* (BOEM 2007). Additionally, Beacon Wind will adhere to the BOEM programmatic consultation with NOAA Fisheries, most recently revised as of November 22, 2021, detailing Project Design Criteria (PDCs) and BMPs for Protected Species Associated with Offshore Wind Data Collection (NMFS 2021), as applicable. **Appendix F** provides an overview of the PDCs and BMPs within the programmatic consultation that are applicable to the proposed Foundation Testing.

In addition, all vessels, regardless of length, will observe a 10-knot (18.5-kilometer per hour) speed restriction in specific areas designated by NOAA Fisheries for the protection of NARW, the Block Island Sound Seasonal Management Area (in effect from November 1 through April 30), and any Dynamic Management Areas when in effect (**Appendix F**). A trained lookout would monitor for marine mammals in the area prior to and during deployment, and lowering of the equipment would be stopped if a marine mammal or sea turtle is sighted within 1,640 feet (500 meters) of the vessel (**Appendix F**).

More specific information on the SOCs is available in **Appendix F**.

6 Consultation and Coordination

This section discusses public involvement and consultations in the preparation of this EA, including a summary of public scoping comments and formal consultations.

6.1 Public Involvement

6.1.1 Notice of Intent to Prepare an Environmental Assessment

BOEM initiated an environmental assessment process by publishing a NOI in the *Federal Register* on November 7, 2023 (https://www.federalregister.gov/documents/2023/11/07/2023-24610/notice-of-intent-to-prepare-an-environmental-assessment-for-additional-site-assessment-activities-on). The NOI signaled the commencement of a 30-day public comment period, providing an opportunity for interested parties to contribute their perspectives and insights. During the 30-day comment period, BOEM received 9 comments from a variety of stakeholders, including renewable and other businesses and associations; environmental and other public-interest groups; federal, state, and local governmental entities; and the general public. Some commenters expressed general support or opposition, but most raised specific areas of concern on the Proposed Action, Alternatives, the NEPA process and timeline to complete, access to testing data, public involvement and engagement, cumulative impacts, mitigation and monitoring including implementing protected species observers clearance and shutdown zones, vessel speed restrictions, and the need for more detail on benthic resources and habitat and noise impacts for finfish, invertebrates, essential fish habitat, marine mammals, and recreational and commercial fishing. These are summarized and responded to in **Appendix E** of the EA. The comments can be viewed at www.regulations.gov by searching for docket ID **BOEM-2023-0062**.

6.1.2 Notice of Availability of a Draft EA

On February 2, 2024, BOEM published a Notice of Availability of the Draft EA for possible commercial wind energy leasing on the OCS offshore the U.S. Atlantic coast in the *Federal Register*. The Draft EA was available for public comment through March 4, 2024. During the comment period, BOEM held two virtual public meetings for the Draft EA on February 23 and February 28, 2024. During the 30-day comment period, BOEM received 17 unique comment submissions from representatives of federal and state agencies, environmental organizations and nongovernmental organizations, and individuals, including 5 comments made verbally during the virtual public meetings. The comments are available for viewing at www.regulations.gov under docket ID BOEM-2024-0006.

6.2 Consultations

6.2.1 ESA

Section 7(a)(2) of the ESA of 1973, as amended (16 U.S.C. §1531 et seq.), requires that each federal agency ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of those species. When the action of a federal agency may affect a protected species or its critical habitat, that agency is required to consult with either NMFS or USFWS, depending upon the protected species that may be affected.

For the activities addressed in this EA that could potentially affect protected species, BOEM has engaged in informal consultation with both USFWS and NMFS, as per their respective jurisdictions. The current status of consultations with each of these services is described in the following sections, and the consultation documents are provided in **Appendix G**.

USFWS

BOEM prepared a BA using the USFWS Information for Planning and Consultation (IPaC) Consultation Package Builder to address the species and critical habitat that may be affected by activities associated with the approval of the proposed Foundation Testing activities within the Beacon Wind Lease Area. BOEM submitted the BA (Project Code: 2024-0013543) to USFWS on December 21, 2023, with BOEM's determination that the impacts of the proposed activities will have no effect on ESA-listed species. On December 22, 2023, USFWS provided a response to BOEM's BA, indicating USFWS' concurrence with BOEM's not likely to adversely affect determinations and acknowledging BOEM's no effect determinations.

NMFS

BOEM prepared a BA evaluating species and critical habitat under jurisdiction of NMFS that could be affected by the Proposed Action. BOEM submitted the BA to NMFS on December 21, 2023, and NMFS provided a Letter of Concurrence agreeing with BOEM's determination that the impacts of the Proposed Action may affect, but are not likely to adversely affect, any listed species under NOAA Fisheries' jurisdiction.

6.2.2 Magnuson-Stevens Fishery Conservation and Management Act

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act of 1976, federal agencies are required to consult with NMFS on any action that may result in adverse effects on EFH. NMFS regulations implementing the EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act can be found at 50 CFR Part 600. BOEM submitted the EFH Assessment to NMFS on December 20, 2023, and requested concurrence with BOEM's determination that the impacts of the Proposed Action would not significantly affect the quality and quantity of EFH. NMFS suggested conservation recommendations to minimize impacts from site assessment and site characterization activities on EFH and sensitive habitats. The EFH consultation concluded on February 27, 2024.

6.2.3 Coastal Zone Management Act

The Coastal Zone Management Act requires that federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of the state's federally approved coastal management program (15 CFR Part 930 Subpart C). Beacon Wind prepared a Consistency Determination (CD) under 15 CFR § 930.36(a) to determine whether Foundation Testing activities in the Beacon Wind Lease Area are fully consistent with the provisions identified as enforceable by the Coastal Zone Management

Programs of New York, Massachusetts, and Rhode Island. BOEM submitted the CD to the States on January 17, 2024, for review. The State of New York concurred with the CD by letter dated March 4, 2024, and Rhode Island by letter dated March 15, 2024. No concurrence or objection letter was received from Massachusetts, but because the 60-day review period has ended, concurrence is presumed pursuant to 15 CFR § 930.41(a), and consultation is deemed complete.

This EA provides the comprehensive data and information required under 15 CFR Part 930 Subpart C to support the CD.

6.2.4 National Historic Preservation Act (Section 106)

Section 106 of the National Historic Preservation Act (NHPA; 54 U.S.C. §306108; NHPA Section 106) and its implementing regulations (36 CFR Part 800) require federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. BOEM determined the lease issuance and approval of the original SAP both constituted undertakings with the potential to affect historic properties and were subject to the NHPA Section 106 review and consultation process pursuant to a programmatic agreement (PA; *Programmatic Agreement among the U.S. Department of the Interior, Bureau of Ocean Energy Management; the State Historic Preservation Officers of Massachusetts and Rhode Island; the Mashpee Wampanoag Tribe; the Narragansett Indian Tribe; the Wampanoag Tribe of Gay Head [Aquinnah]; and the Advisory Council on Historic Preservation Regarding the "Smart from the Start" Atlantic Wind Energy Initiative: Leasing and Site Assessment Activities Offshore Massachusetts and Rhode Island*; BOEM 2012). BOEM executed the Massachusetts and Rhode Island PA on May 23, 2012, with the State Historic Preservation Officers (SHPOs) of Massachusetts and Rhode Island, the ACHP, the Mashpee Wampanoag Tribe, The Narragansett Indian Tribe, and the Wampanoag Tribe of Gay Head (Aquinnah).

BOEM implemented this PA pursuant to 36 CFR 800.14(b) to fulfill its obligations under NHPA Section 106 for the undertakings of lease issuance and approval of site assessment activities on the OCS offshore Rhode Island and Massachusetts. The PA expired on May 12, 2022. BOEM concluded the NHPA Section 106 process with Findings of No Historic Properties Affected for commercial wind lease issuance and site assessment activities offshore Massachusetts in June 2014, and for the SAP for Lease OCS-A 0520 on July 26, 2021.

BOEM has determined that approval of the additional site assessment activities within Lease Area OCS-A 0520, proposed as an amendment to the SAP by Beacon Wind, also constitutes an NHPA Section 106 undertaking (the present undertaking) subject to review and consultation as the activities proposed in the original SAP did not encompass those that are proposed in the SAP Amendment.

On November 14, 2023, BOEM initiated consultations via letters sent to 10 federally recognized Tribes (i.e., Delaware Tribe of Indians, Eastern Shawnee Tribe of Oklahoma, Mashantucket [Western] Pequot Tribe, Mashpee Wampanoag Tribe, Mohegan Tribe of Indians of Connecticut, Stockbridge-Munsee Community Band of Mohican Indians, The Delaware Nation, The Narragansett Indian Tribe, The Shinnecock Indian Nation, and Wampanoag Tribe of Gay Head [Aquinnah]) and six federal agencies (i.e., ACHP; USACE, New York District; Bureau of Safety and Environmental Enforcement [BSEE]; National Park Service [NPS]; Naval Facilities Engineering Systems Command [NAVFAC] HQ; and Naval History and Heritage Command [Underwater Archaeology Branch]). These Tribes and federal agencies were determined to be existing consulting parties to the NHPA Section 106 review of the Beacon Wind COP for Lease Area OCS-A 0520, which is being evaluated by BOEM as a separate but related NHPA Section 106 undertaking currently undergoing review and consultations. As such, BOEM assumed the continued participation of the aforementioned Tribes and federal agencies as consulting parties to the NHPA Section 106 review of the present undertaking.

On November 15, 2023, the SHPOs of Delaware, Massachusetts, New York, and Rhode Island were notified of the present undertaking due to BOEM's concurrent NHPA Section 106 consultations with these SHPOs on separate activities proposed to occur within Lease Area OCS-A 0520. Though the area of potential effects (APE) is limited to the OCS (i.e., not within any state lands or waters), SHPOs were extended an invitation to consult on the undertaking. The New York SHPO accepted BOEM's invitation to consult on November 29, 2023. The Delaware, Massachusetts, and Rhode Island SHPOs did not respond to BOEM's invitation.

BOEM prepared a Finding of No Historic Properties Affected (Finding), consistent with 36 CFR §800.4(d)(1), which was provided to the consulting parties on January 30, 2024, as a notification of its Finding. NHPA Section 106 review and consultations concluded with a Finding of No Historic Properties Affected for the undertaking on February 29, 2024. The Finding is available on BOEM's website at: https://www.boem.gov/renewable-energy/state-activities/beacon-wind.

7 Preparers

Table 7-1. BOEM contributors

Name	Role/Resource Area
NEPA Coordinator	
Wolfson, Laura Lee	NEPA Compliance
Resource Scientists and Contributors	
Ajilore, Ololade	Navigation and Vessel Traffic
Baker, Kyle	Marine Mammals, Sea Turtles and NMFS BA
Bigger, David	Birds; Bats; USFWS BA
Bucatari, Jennifer	Marine Minerals Use and Ocean Dredged Material Disposal
Chaky, Sindey	Coastal Zone Management Act Compliance
Christianson, Justine	Cultural Resources; Tribal Nation Coordination
Gange, Joshua	Project Coordinator
Hooker, Brian	Marine Mammals, Sea Turtles NMFS BA, Benthic Resources, Finfish, Invertebrates, and EFH
Jensen, Brandon	Benthic Resources, Finfish, Invertebrates, and EFH
Jensen, Mark	Socioeconomics; Recreation and Tourism
Monroe, Lori	Solicitor
Slayton, Ian	Air Quality, Climate Change, Cumulative Scenarios/Planned Action Scenario
Hogan, Charissa	Air Quality
Stromberg, Jessica	Chief, Environment Branch for Renewable Energy; NEPA Compliance
Lewis, Joanne	Navigation and Vessel Traffic
Draher, Jennifer	Water Quality

Table 7-2. Consultants

Name	Role/Resource Area
ICF	
Cwalinski, Emma	Project Coordinator
Ernst, David	Air Quality Lead
Gleaton, Soniya	Comment Processing
Ha, Anthony	Publications Specialist
Hallman, Ryan	Air Quality Support
Hartfelder, Kelsey	Air Quality Support
Hatfield, Teresa	Navigation and Vessel Traffic Lead
Healy, Erin	Project Director
Hoelzer, Tara	Geographic Information Systems

Name	Role/Resource Area
Lin, Clay	Recreation and Tourism Lead
Lundstrom, Kristen	Technical Editor
Muntz, Alice	Section 106 and Cultural Resources Lead
Nally, Dan	QA/QC; NEPA
O'Donnell, Megan	Project Manager
Read, Brent	Geographic Information Systems
Slankard, Scott	Water Quality
Williams, Drew	Administrative Record
Zedaker, Dylan	Section 106 and Cultural Resources Support
AKRF	
Baggett, Lesley	Benthic Resources
Krebs, Justin	QA/QC; NMFS BA; EFH Assessment
Lozano, Carlos	Finfish, Invertebrates, and Essential Fish Habitat
Manhard, Chris	Commercial Fisheries and For-Hire Recreational Fishing; EFH Assessment
Manhard, Rachael	Biological Resources Lead; Marine Mammals; Sea Turtles; NMFS BA

APPENDIX A: Assessment of Resources with Negligible Impacts

A.1 Introduction

On June 3, 2014, Bureau of Ocean Energy Management (BOEM) issued a Finding of No Significant Impact (FONSI) based on a Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts (BOEM 2014; referred to herein as the "2014 EA"). The 2014 EA concluded that the Proposed Action would have negligible impact on the following resources: Air Quality, Birds, Bats, Coastal Habitat, Cultural Resources, Demographics and Employment, Environmental Justice, Recreation and Visual, Military Use, and Commercial Fisheries (Section 4.2, BOEM 2014). Because these resources have been described in the 2014 EA (BOEM 2014), **Section 3.3** of the Environmental Assessment (EA) describes the resources eliminated from further consideration.

This appendix provides an assessment of resources with negligible impacts from implementation of the Proposed Action. **Section 4.1** of the EA provides the assessment methodology used to determine impact levels.

A.2 Alternative A – No Action Alternative and Affected Environment

A.2.1 Air Quality and Greenhouse Gas Emissions

Air quality is characterized by comparing the ambient air concentrations of criteria pollutants to the National Ambient Air Quality Standards (NAAQS), which have been established by the U.S. Environmental Protection Agency (USEPA) to be protective of human health and welfare. The NAAQS have been established in 40 Code of Federal Regulations (CFR) Part 50 for each of the six criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$: particulate matter with a diameter less than or equal to 10 and 2.5 micrometers [µm], respectively), and lead (Pb). Ozone forms in the atmosphere from precursor pollutants such as nitrogen oxides (NO_X) and volatile organic compounds (VOCs). The USEPA has also established emission standards for Hazardous Air Pollutants (HAPs).

When the monitored pollutant levels in an area exceed the NAAQS for any pollutant, USEPA designates the area as being in "nonattainment" for that pollutant, requiring the development of a State Implementation Plan (SIP) to improve air quality in the area. USEPA will redesignate a nonattainment area as a "maintenance area," once it meets the standards and additional redesignation requirements in the Clean Air Act (CAA). The designated onshore areas nearest the Lease Area include parts of Connecticut, Massachusetts, New York, and New Jersey. The following onshore designated areas occur near the Lease Area (listed with their respective nonattainment or maintenance designations; USEPA 2023a):

- New York-Northern New Jersey-Long Island Area, NY-NJ-CT Severe/Moderate Ozone Nonattainment Area (2008/2015 NAAQS)

- New York-Northern New Jersey-Long Island Area, NY-NJ-CT Carbon Monoxide Maintenance Area (1971 NAAQS)
- New York County, NY PM_{10} Moderate Nonattainment Area (1987 Annual NAAQS)
- New York-Northern New Jersey-Long Island Area, NY-NJ-CT $PM_{2.5}$ Maintenance Area (1997 Annual NAAQS)
- New York-Northern New Jersey-Long Island Area, NY-NJ-CT $PM_{2.5}$ Maintenance Area (2006 24-Hour NAAQS)

All of southeastern Massachusetts is currently designated as unclassifiable or attainment for all criteria pollutants, except for Dukes County (primarily Martha's Vineyard), which is designated as marginal nonattainment for the 2008 ozone NAAQS of 75 parts per billion (ppb). In August 2018, USEPA designated Dukes County as attainment for the more stringent 2015 ozone standard of 70 ppb. Though monitored ozone levels in Dukes County have remained below the NAAQS of 70 ppb since 2018, the nonattainment designation for the 2008 ozone standard remains in effect. The entirety of Rhode Island is classified attainment for all criteria pollutants.

Conclusion

Under Alternative A, BOEM would not approve the proposed Foundation Testing activities, including trials of a suction bucket within the Lease Area, and there would be no effects on air quality. However, BOEM expects ongoing and reasonably foreseeable planned actions, such as other wind energy development activities and global climate change, to have continuing regional air quality impacts over the timeframe considered in the EA (**Appendix B**). Over the timeframe considered in this EA, local impacts on air quality from climate change are likely to be small, incremental, and difficult to discern from effects of other ongoing actions. The largest ongoing contributors to impacts on air quality stem from vessel traffic.

Ongoing and reasonably foreseeable planned wind energy development actions could result in increased vessel traffic resulting in increased air emissions and impacts on regional air quality and could also lead to reduced emissions from fossil-fuel power-generating facilities and result in beneficial impacts on regional air quality. However, fossil-fuel energy facilities may increase in number and level of pollution-generating activities or remain operational to meet future increases in power demand and would likely be fired by natural gas, oil, or coal. Considering all the impact-producing factors (IPFs) together, BOEM anticipates that the ongoing and reasonably foreseeable planned actions in the geographic analysis area may result in **minor** adverse impacts due to criteria pollutant emissions.

A.2.2 Cultural, Historical, and Archaeological Resources

The geographic analysis area for cultural, historical, and archaeological resources comprises the depth and breadth of the seabed potentially impacted by any bottom-disturbing activities defined as the area of potential effects (APE) pursuant to 36 CFR § 800.16(d) and Section 106 of the National Historic Preservation Act (NHPA Section 106; BOEM 2020). Moreover, the visual APE consists of the viewshed where aboveground historic properties would be visually adversely affected as a result of the testing activities. Due to the distance and temporary nature of the proposed activities from shore, no visual effects on aboveground historic properties are anticipated and they are therefore not considered in the delineation of the visual APE.

Based on information from Beacon Wind's Archaeological Site Characterization Report completed for the SAP Amendment application (Appendix D, Tetra Tech 2023), no cultural, historical, or archaeological resources that are historic properties listed or potentially eligible for listing in the National Register of Historic Places (NRHP) are located in the APE.

Conclusion

There are no ongoing and reasonably foreseeable planned wind energy development actions occurring within the geographic analysis area for cultural, historical, and archaeological resources. Bottom-disturbing activities generally have the potential to affect cultural, historical, and archaeological resources, including historic properties. However, impacts of Alternative A (No Action) on cultural, historical, and archaeological resources would be **negligible** as none of the resources that are historic properties are located within the geographic analysis area.

A.3 Alternative B – Proposed Action

A.3.1 Air Quality and Greenhouse Gas Emissions

Sources of air emissions associated with the Proposed Action are Foundation Testing activities, which will consist of trials of a suction bucket within the Lease Area, and associated vessel transit. It is anticipated that Foundation Testing activities would be completed over a single vessel trip spanning approximately 10 to 15 days. Vessel traffic due to Foundation Testing activities would add to current vessel traffic levels within the geographic analysis area and the existing port in eastern Canada used by the vessel. The additional vessel activity associated with the Proposed Action over a 10- to 15-day span would be temporary and negligible as compared with existing vessel traffic levels in the region and at the existing ports.

Impacts from criteria pollutant, HAP, and greenhouse gas (GHG) emissions associated with Foundation Testing activities would be localized within the geographic analysis area and in the vicinity of the existing port used to support vessel activity. The SAP Amendment prepared by Beacon Wind (Tetra Tech 2023) provided estimates of criteria pollutant, HAP, and GHG emissions associated with the Proposed Action, and the results are provided in **Appendix B** of this EA. Parameters for the Foundation Testing and vessel activities associated with the Proposed Action, upon which the air emissions calculations are based, are also provided in **Appendix B**. Air pollutant emissions from onshore activities associated with the Proposed Action are expected to be negligible in comparison with the existing onshore activities because an existing port would be utilized, and no expansion would be needed of these facilities to accommodate the Proposed Action.

Major source thresholds are defined in the CAA for purposes of permitting stationary emission sources on land. The major source thresholds do not apply to the Proposed Action, which would not site stationary sources of emissions on land. Still, they are used here as screening levels for assessing potential air quality impacts. Major source thresholds for the onshore areas closest to the Lease Area are as follows (USEPA 2023b):

- 25 tons/year of VOCs (O_3 precursor)
- 25 tons/year of NO_X (O_3 precursor)
- 100 tons/year of CO
- 100 tons/year of PM
- 100 tons/year of SO_2
- 10 tons/year for any single HAP or 25 tons/year for any combination of HAPs

As indicated in **Appendix B**, estimated annual air emissions from the Proposed Action are expected to be less than major source thresholds and are not expected to lead to any violation of the NAAQS and, therefore, are expected to be negligible.

Non-Routine Events

Non-routine events associated with the Proposed Action that could affect air quality consist of the recovery of lost equipment through additional vessel traffic. Traffic associated with non-routine activities would likely be from a single vessel for a short duration; impacts are expected to be negligible.

Federal Class I Areas

Section 162(a) of the CAA establishes air quality protections for designated Federal Class I areas such as national parks, national wilderness areas, and national monuments. The Class I area closest to the Lease Area is Brigantine Wilderness Area in New Jersey, which is approximately 204 miles (328 kilometers) from the Lease Area. Federal Land Managers must be notified of facilities that will be located within 62 miles (100 kilometers) of a Class I area. It is not anticipated that Proposed Action activities in the Lease Area and in the vicinity of existing ports will impact visibility or acidic deposition in the Brigantine Wilderness Area.

Climate Change

Climate change is a global issue that results from the increase in GHGs in the atmosphere. The most recent available data on GHG emissions in the United States indicate that annual emissions in 2021 were an estimated 6,340.2 million metric tons (USEPA 2023c). Additional information about the impacts of climate change is presented in **Appendix B.**

Conclusion

As shown in **Appendix B**, air emissions from the Proposed Action are not expected to lead to any violation of the NAAQS. Foundation Testing activities constitute the main impact driver for the Proposed Action. Although the estimated air pollutant and GHG emissions from the Proposed Action are measurable, they would be minor relative to other air emissions onshore or offshore. Criteria pollutant, HAP, and GHG emissions associated with the Proposed Action are thus expected to be **negligible**, though the GHG emissions would contribute incrementally to global climate change.

The incremental impacts under the Proposed Action resulting from individual IPFs are expected to be **negligible** for air quality. BOEM anticipates that the combined overall impacts associated with the Proposed Action and with ongoing and reasonably foreseeable planned actions would be minor for air quality in the geographic analysis area because impacts are unavoidable; however, the overall effect is expected to be small, and planned wind projects could generate long-term, beneficial impacts by providing energy to the region from a renewable resource and reducing health events due to onshore criteria pollutant emissions.

A.3.2 Cultural, Historical, and Archaeological Resources

As described in **Section A.2.2** for Alternative A, no cultural, historical, or archaeological resources that are historic properties are located in the geographic analysis area. Based on information from Beacon Wind's *Archaeological Site Characterization Report* completed for the SAP Amendment application (Tetra Tech 2023, Appendix D), no cultural, historical, or archaeological resources that are historic properties listed or potentially eligible for listing in the NRHP are located in the APE. Unanticipated or post-review discoveries of marine archaeological resources could occur during the proposed additional site assessment activities and result in impacts on a discovered resource; however, such discoveries and impacts are considered unlikely based on the extent of known information generated from Beacon Wind's site characterization efforts and implementation of a post-review discovery plan (PRDP) developed for the undertaking. As such, the proposed additional site assessment activities would have similar negligible impacts on cultural, historical, or archaeological resources as Alternative A. Please refer to **Section 6.2.4** in the EA and BOEM's Finding of No Historic Properties Affected for additional information on BOEM's review and consultations pursuant to NHPA Section 106. The Finding is available on BOEM's website at: https://www.boem.gov/renewable-energy/state-activities/beacon-wind.

Non-Routine Events

Due to existing regulatory measures, information generated from Beacon Wind's initial site characterization activities, and implementation of a PRDP, reasonably foreseeable non-routine and low-probability events and hazards are unlikely to have impacts on cultural, historical, or archaeological resources.

Conclusion

Bottom-disturbing activities associated with the proposed Foundation Testing are the types of activities to affect cultural, historical, and archaeological resources, including historic properties. However, impacts of the Proposed Action on cultural, historical, and archaeological resources would be **negligible** as none of these resources that are historic properties are located within the geographic analysis area, and proposed bottom-disturbing activities avoid known locations of these resources.

A.4 References

Bureau of Ocean Energy Management (BOEM). 2014. *Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf offshore Massachusetts*. Revised environmental assessment. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 674 p. Report No.: OCS EIS/EA BOEM 2014-603.

BOEM. 2020. Guidelines for providing archaeological and historic property information pursuant to 30 CFR Part 585. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 23 p.

Tetra Tech Inc. 2023. Site Assessment Plan Amendment Beacon Wind Massachusetts Wind Energy Lease Areas OCS-A 0520. Available: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/BW-Foundation-Testing-SAP-Amendment.pdf.

U.S. Environmental Protection Agency (USEPA). 2023a. Details of Criteria Pollutant Nonattainment Area Summary Report. Available: https://www3.epa.gov/airquality/greenbook/ancl2.html. Accessed: November 2023.

USEPA. 2023b. De Minimis Tables. Available: https://www.epa.gov/general-conformity/de-minimis-tables. Accessed: November 2023.

USEPA. 2023c. Inventory of U.S. Greenhouse Gas Emissions and Sinks. Available: https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Main-Text.pdf. Accessed: November 2023.

APPENDIX B: Beacon Wind Site Assessment Plan Amendment Air Emissions Calculations

Emission summary - suction bucket trials

Activity	VOC (tpy)	NO_X (tpy)	CO (tpy)	PM/PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	HAPs (tpy)	GHG (tpy CO_2e)
Vessel Transit	0.18	0.24	0.46	0.02	0.02	0.04	0.02	61.46
Vessel Non-Transit Activities	12.51	16.25	31.28	1.17	1.07	2.51	1.03	4,167.67
Suction Pump Engine	8.21E-03	0.30	0.22	1.30E-02	1.26E-02	2.70E-04	9.30E-04	29.80
Total Emissions (tons)	12.71	16.79	31.96	1.20	1.10	2.54	1.05	4,258.92

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

CO_2e = carbon dioxide equivalent; tpy = tons per year

Transit fuel consumption

Vessels/ Equipment	No. of Engines per Vessel	1. DP 2. Anchored 3. Spuds	Dimensions (ft) length x width x depth (draft)	Emission Factor Used (see EFs worksheet)	Engine Rating (hp)	Fuel Type	Transit Round Trips[1]	Transit Duration (hours/ round trip)[2]	Offshore Operating Days	Transit Average load (%)	Transit Fuel Usage Gallons (per vessel)
Work Boat		**1**	**515 x 89 x 39 (28)**								
Main Generators	4			3	4,424	Diesel	1	6	25	1	3,237
Main Generators	2			3	5,898	Diesel	1	6	25	1	2,158
Emergency Dive Generator	1			1	1,193	Diesel	0	0	0	0	0
Emergency Vessel Generator	1			1	493	Diesel	0	0	0	0	0
Suction Pump		**N/A**	**N/A**								
Main Engine	1			2	150	Diesel	0	0	25	0	0
Totals											**5,396**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

[1] A single round trip from an overseas port to the Lease Area is assumed.

[2] Trip time constitutes the roundtrip transit time to and from the Project site, when located within 25 nm of the Lease Area boundary. The number of hours per trip were estimated based on an assumed transit speed of 10 knots. Round trip distance is estimated to be 60 nm.

Non-transit fuel consumption

Vessels/ Equipment	No. of Engines per Vessel	1. DP 2. Anchored 3. Spuds	Dimensions (feet) length x width x depth (draft)	Emission Factor Used[1]	Engine Rating (hp)	Fuel Type	Non-Transit Operating Hours (per day)[2]	Non-Transit Total Operating Hours	Non-Transit Average load (%)	Non-Transit Fuel Usage Gallons (per vessel)
Work boat[3]		**1**	**515 x 89 x 39 (28)**							
Main Generators	4			3	4,424	Diesel	24	600	0	219,543
Main Generators	2			3	5,898	Diesel	24	600	0	146,362
Emergency Dive Generator	1			1	1,193	Diesel	0	0	0	0
Emergency Vessel Generator	1			1	493	Diesel	0	0	0	0
Suction Pump		**N/A**	**N/A**							
Main Engine	1			2	150	Diesel	14	350	1	2,626
TOTALS										**368,531**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

[1] See Emission Factors worksheet.

[2] Operating hours/day assumes that the vessel will operate continuously in the Lease Area during the suction bucket trials.

[3] Work boat main engine load during transit is based on Equation 3.6 in the USEPA 2022, with an assumed vessel speed equal to 82% of the maximum speed. Work boat main engine load during non-transit activities is based on the default auxiliary engine load factor in Table 4.4 of USEPA 2022. The suction pump engine is assumed to operate at 100% load when in use.

Non-transit emissions

Vessels/ Equipment	Total Non-Transit Emissions (tons)										
	VOC	NO_X	CO	PM_{10}	$PM_{2.5}$	SO_2	HAPs	CO_2	CH_4[4]	N_2O[4]	CO_2e[4]
Work Boat											
Main Generators[1]	7.51	9.75	18.77	0.7	0.64	1.5	0.62	2,467.22	0.04	0.11	2,500.60
Main Generators[1]	5.01	6.5	12.51	0.47	0.43	1	0.41	1,644.81	0.03	0.07	1,667.07
Emergency Dive Generator[2]	0	0	0	0	0	0	0	0	0	0	0
Emergency Vessel Generator[2]	0	0	0	0	0	0	0	0	0	0	0
Suction Pump[3]											
Main Engine	8.21E-03	0.3	0.22	1.30E-02	1.26E-02	2.70E-04	9.30E-04	29.36	3.54E-04	1.44E-03	29.8
Total	**12.52**	**16.55**	**31.5**	**1.18**	**1.09**	**2.51**	**1.03**	**4,141.39**	**0.06**	**0.18**	**4,197.46**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

1 Work boat main generator engines are assumed to meet MARPOL and/or USEPA Tier 3 emission standards for Category 3 engines for NO_X, CO, and HC. An engine speed of 500 rpm was assumed for all Category 3 engines. For PM, the value for Category 3 propulsion engines in USEPA 2022 was used since USEPA has not established a PM standard for Category 3 engines. (For standards presented as a combined NO_X + HC total, the HC fraction was assumed to equal 0.19 g/kWh.) Emission factors for SO_2, CO_2, CH_4, and N_2O are from USEPA 2022. (See emission factors summary page.)

2 Emission factors for marine vessel emergency engines are from USEPA 2022.

3 The suction pump engine is assumed to meet the USEPA Tier 2 standards for Category 1 engines in 40 CFR 1042 for NO_X, CO, and HC (displacement 0.9-1.2 L/cylinder, model year 2004+). (For standards presented as a combined NO_X + THC total, the THC fraction was assumed to equal 0.19 g/kWh.) Emission factors for SO_2, CO_2, CH_4, and N_2O are from USEPA 2022.

4 CO_2e emission rates use the following carbon equivalence factors: 25 for CH_4, and 298 for N_2O.

Transit emissions

Vessels/ Equipment	Total Transit Emissions (tons)										
	VOC	NO_X	CO	PM_{10}	$PM_{2.5}$	SO_2	HAPs	CO_2	CH_4[4]	N_2O[4]	CO_2e[4]
Work Boat											
Main Generators[1]	0.11	0.14	0.28	1.03E-02	9.51E-03	0.02	9.13E-03	36.38	5.54E-04	1.61E-03	36.87
Main Generators[1]	0.07	0.1	0.18	6.89E-03	6.34E-03	1.48E-02	6.09E-03	24.25	3.69E-04	1.07E-03	24.58
Emergency Dive Generator[2]	0	0	0	0	0	0	0	0	0	0	0
Emergency Vessel Generator[2]	0	0	0	0	0	0	0	0	0	0	0
Suction Pump[3]											
Main Engine	0	0	0	0	0	0	0	0	0	0	0
Total	**0.18**	**0.24**	**0.46**	**0.02**	**0.02**	**0.04**	**0.02**	**60.64**	**9.23E-04**	**2.68E-03**	**61.46**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

1 Work boat main generator engines are assumed to meet MARPOL and/or USEPA Tier 3 emission standards for Category 3 engines for NO_X, CO, and HC. An engine speed of 500 rpm was assumed for all Category 3 engines. For PM, the value for Category 3 propulsion engines in USEPA 2022 was used since USEPA has not established a PM standard for Category 3 engines. (For standards presented as a combined NO_X + HC total, the HC fraction was assumed to equal 0.19 g/kWh.) Emission factors for SO_2, CO_2, CH_4, and N_2O are from USEPA 2022. (See emission factors summary page.)

2 Emission factors for marine vessel emergency engines are from USEPA 2022.

3 The suction pump engine is assumed to meet the USEPA Tier 2 standards for Category 1 engines in 40 CFR 1042 for NO_X, CO, and HC (displacement 0.9-1.2 L/cylinder, model year 2004+). (For standards presented as a combined NO_X + THC total, the THC fraction was assumed to equal 0.19 g/kWh.) Emission factors for SO_2, CO_2, CH_4, and N_2O are from USEPA 2022.

4 CO_2e emission rates use the following carbon equivalence factors: 25 for CH_4, and 298 for N_2O.

Commercial marine vessels

Engine Type		Commercial Marine Vessel Emission Factors (g/kWh)[1, 2, 3]									Fuel Consumption (gal/kWh)[6]
		VOC	NO_x	CO	PM/ PM_{10}[4]	$PM_{2.5}$[4]	SO_2[5]	CO_2	CH_4	N_2O	
1.11	USEPA default, Cat 1, Tier 1/2, kW ≥ 37, all displacement ranges (propulsion)	0.43	9.8	1.8	0.43	0.42	0.0062	679	0.0082	0.0332	0.067
1.12	USEPA default, Cat 1, Tier 1/2, kW ≥ 37, all displacement ranges (auxiliary)	0.43	9.8	1.8	0.73	0.71	0.0062	679	0.0082	0.0332	0.067
1.21	USEPA default, Cat 2, Tier 1/2, all kW ranges, all displacement ranges (all)	0.14	10.55	2.48	0.31	0.3	0.0062	679	0.0027	0.0332	0.067
1.31	USEPA default, Cat 3, 1999 and earlier, MSD engines, MGO/MDO fuel (propulsion)	0.53	13.2	1.1	0.19	0.17	0.401	657	0.01	0.029	0.064
1.32	USEPA default, Cat 3, 1999 and earlier, MSD engines, MGO/MDO fuel (auxiliary)	0.42	13.8	1.1	0.19	0.17	0.424	696	0.008	0.029	0.068
2.01	USEPA Tier 2 (Category 1 engines 2004+)	0.19	7.01	5	0.3	0.29	0.0062	679	0.0082	0.0332	0.067
3.03	MARPOL/USEPA Tier 3 (Category 3 engines 2016+)	2	2.6	5	0.19	0.17	0.401	657	0.01	0.029	0.064

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

g/kWh = grams per kilowatt hour; gal/kWh = gallons per kilowatt hour

[1] Default emission factors for NO_X, VOC, CO, PM_{10}, $PM_{2.5}$, SO_2, CO_2, and CH_4 from Category 1 and Category 2 engines (when age is unknown) are based on the worst case of either the Tier 1 or Tier 2 values in the following sections of USEPA 2022: Table H.1 for NO_X; Table H.2 for PM_{10} and $PM_{2.5}$; Table H.3 for VOC and CH_4; Table H.4 for CO; Table H.7 for $SO_2$and CO_2; and Equation 4.3 for N_2O.

[2] Default emission factors for Category 3 engines are based on the values for 1999 and earlier engines in the following sections of USEPA 2022: Table 3.5 for NO_X; Equation 3.3 for PM_{10}; Table 3.8 for VOC, CO, and CH_4; Equation 3.4 for CO_2; Equation 3.5 for SO_2; and Table 3.9 for N_2O. Brake specific fuel consumption (BSFC) for Category 3 engines is from Table 3.6 of USEPA 2022. $PM_{2.5}$ for Category 3 engines is assumed to be 92% of the PM_{10} value, based on Section 3.5.3 of USEPA 2022.

[3] For Category 1 engines assumed to be subject to USEPA Tier 2, the appropriate emission standards from 40 CFR 1042 were used for NO_X, CO, and HC. (For standards presented as a combined NO_X + THC total, the THC fraction was assumed to equal 0.19 g/kWh.) For Category 3 engines assumed to be subject to MARPOL and/or USEPA Tier 3, the appropriate emission standards from 40 CFR 1042 were used for NO_X, CO, and HC. An engine speed of 500 rpm was assumed for all Category 3 engines. For PM, the value for Category 3 propulsion engines in USEPA 2022 was used, since USEPA has not established a PM standard for Category 3 engines. (For standards presented as a combined NO_X + HC total, the HC fraction was assumed to equal 0.19 g/kWh.)

[4] All PM is assumed to less than 10 µm in diameter; therefore, PM emission factor is equivalent to PM_{10} emission factor. For Category 1 and 2 engines, $PM_{2.5}$ is estimated to be 97 % of PM_{10}, per Section 4.5.3 of USEPA 2022; for Category 3 engines, $PM_{2.5}$ is assumed to be 92% of PM_{10}, per Section 3.5.3 of USEPA 2022.

[5] SO_2 emission factors assume a fuel sulfur content of: 0.0015 percent by weight for Category 1 and 2 engines (Table H.7 of USEPA 2022); and 0.1 percent by weight for Category 3 engines (Equation 3.5 of USEPA 2022).

[6] Fuel consumption for Category 1 and 2 marine engines was based on the brake specific fuel consumption (BSF) value provided in Section 4.5.2 of USEPA 2022 for engines≥ 37 kW, with an assumed fuel density of 3.18 kg/gallon. Fuel consumption for Category 3 marine engines was based on the BSFC values (g/kWh) provided in USEPA 2022, with an assumed fuel density of 3.18 kg/gallon.

USEPA NEI HAP emission factors for commercial marine vessels

Pollutant	HAP?[1]	Fraction of[2]	Fraction (all engines Cat 1/2/3, all fuel types, all operating modes)[2]
Ammonia	No	$PM_{2.5}$	0.019247
Antimony	Yes	$PM_{2.5}$	0.000615
Arsenic	Yes	$PM_{2.5}$	2.59E-05
Benz[a]Anthracene	Yes	$PM_{2.5}$	8.82E-06
Benzo(g,h,i)Perylene	Yes	$PM_{2.5}$	0.000132
Benzo[a]Pyrene	Yes	$PM_{2.5}$	4.18E-06
Benzo[b]Fluoranthene	Yes	$PM_{2.5}$	8.35E-06
Benzo[k]Fluoranthene	Yes	$PM_{2.5}$	4.18E-06
Cadmium	Yes	$PM_{2.5}$	0.000236
Chromium (VI)	Yes	$PM_{2.5}$	7.24E-09
Chrysene	Yes	$PM_{2.5}$	1.63E-05
Dibenzo[a,h]anthracene	Yes	$PM_{2.5}$	8.65E-06
Fluoranthene	Yes	$PM_{2.5}$	8.97E-05
Indeno[1,2,3-c,d]Pyrene	Yes	$PM_{2.5}$	8.35E-06
Lead	Yes	$PM_{2.5}$	0.000125
Manganese	Yes	$PM_{2.5}$	3.22E-06
Mercury	Yes	$PM_{2.5}$	4.18E-08
Nickel	Yes	$PM_{2.5}$	0.000687
Polychlorinated Biphenyls	Yes	$PM_{2.5}$	4.18E-07
Pyrene	Yes	$PM_{2.5}$	3.37E-05
Selenium	Yes	$PM_{2.5}$	4.38E-08
Total HAP (ratioed to $PM_{2.5}$)			**0.0213**
1,3-Butadiene	Yes	VOC	0.001013

Pollutant	HAP?[1]	Fraction of[2]	Fraction (all engines Cat 1/2/3, all fuel types, all operating modes)[2]
2,2,4-Trimethylpentane	Yes	VOC	0.00712
Acenaphthene	Yes	VOC	5.09E-05
Acenaphthylene	Yes	VOC	0.000118
Acetaldehyde	Yes	VOC	0.009783
Acrolein	Yes	VOC	0.001848
Anthracene	Yes	VOC	0.000344
Benzene	Yes	VOC	0.004739
Ethyl Benzene	Yes	VOC	0.000439
Fluorene	Yes	VOC	0.000164
Formaldehyde	Yes	VOC	0.042696
Hexane	Yes	VOC	0.00279
Naphthalene	Yes	VOC	0.00273
o-Xylene	Yes	VOC	0.000513
Phenanthrene	Yes	VOC	0.001356
Propionaldehyde	Yes	VOC	0.001517
Toluene	Yes	VOC	0.002035
Xylenes (Mixed Isomers)	Yes	VOC	0.001422
Total HAP (ratioed to VOC)			**0.0807**

Source: Beacon Wind LLC 2023 *Site Assessment Plan Amendment*.

[1] For completeness, all of the pollutants in USEPA's database are shown, but not all are HAP as defined in Section 112 of the Clean Air Act and as updated in 40 CFR 63 Subpart C.

[2] HAP emission factors for commercial marine vessels were determined using the methodology identified by USEPA 2020; i.e., they are calculated as percentages of the $PM_{2.5}$ or VOC emissions from the CMVs.
HAP speciation profiles for Category 1 and 2 engines are from Table 8 of USEPA 2019 for Category 1 and 2 vessels. HAP speciation profiles for Category 3 and 2 engines are from Table 15 of USEPA 2019 for Category 3 vessels.

References

Beacon Wind LLC (Beacon Wind). 2023. Site Assessment Plan Amendment, Massachusetts Wind Energy Lease Area OCS-A 0520.

U.S. Environmental Protection Agency (USEPA). 2019. Methodology Documentation for USEPA's Commercial Marine Emissions Estimates. Available: https://www.epa.gov/sites/default/files/2019-11/cmv_methodology_documentation.zip. Accessed: December 2023.

U.S. Environmental Protection Agency (USEPA). 2020. 2017 National Emissions Inventory (NEI) Data. April. Available: https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data. Accessed: December 2023.

U.S. Environmental Protection Agency (USEPA). 2022. Ports Emissions Inventory Guidance: Methodologies for Estimating Port-Related and Goods Movement Mobile Source Emissions. USEPA-420-B-22-011. April. Available: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1014J1S.pdf. Accessed: December 2023.

APPENDIX C: Planned Action Scenario

C.1 Introduction

This appendix discusses resource-specific ongoing and reasonably foreseeable planned actions that could occur, and for which impacts from the Proposed Action could occur in the same location and timeframe as impacts from these other actions. The Proposed Action is approval of site assessment activities proposed by Beacon Wind LLC (Beacon Wind) in its Site Assessment Plan (SAP) Amendment (Tetra Tech 2023) within the Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0520, approximately 20 miles (32 kilometers) south of Nantucket, Massachusetts, and 60 miles (97 kilometers) east of Montauk, New York.

BOEM used a localized geographic scope to evaluate impacts from planned actions for resources that are fixed in nature (i.e., their location is stationary such as benthic and archaeological resources) or for resources where impacts from the Proposed Action would only occur in waters in the Lease Area (e.g., water quality). Although some resources are mobile, and, in some cases, migratory (e.g., marine mammals, sea turtles, and fish/fishing), impacts from the Proposed Action are anticipated to remain within the Lease Area, and, as a result, the geographic analysis area will remain the same.

BOEM has not defined onshore areas from which the Proposed Action would be visible as part of the analysis area because BOEM has concluded that the equipment and vessels performing these activities would be indistinguishable from existing lighted vessel traffic for an observer onshore.

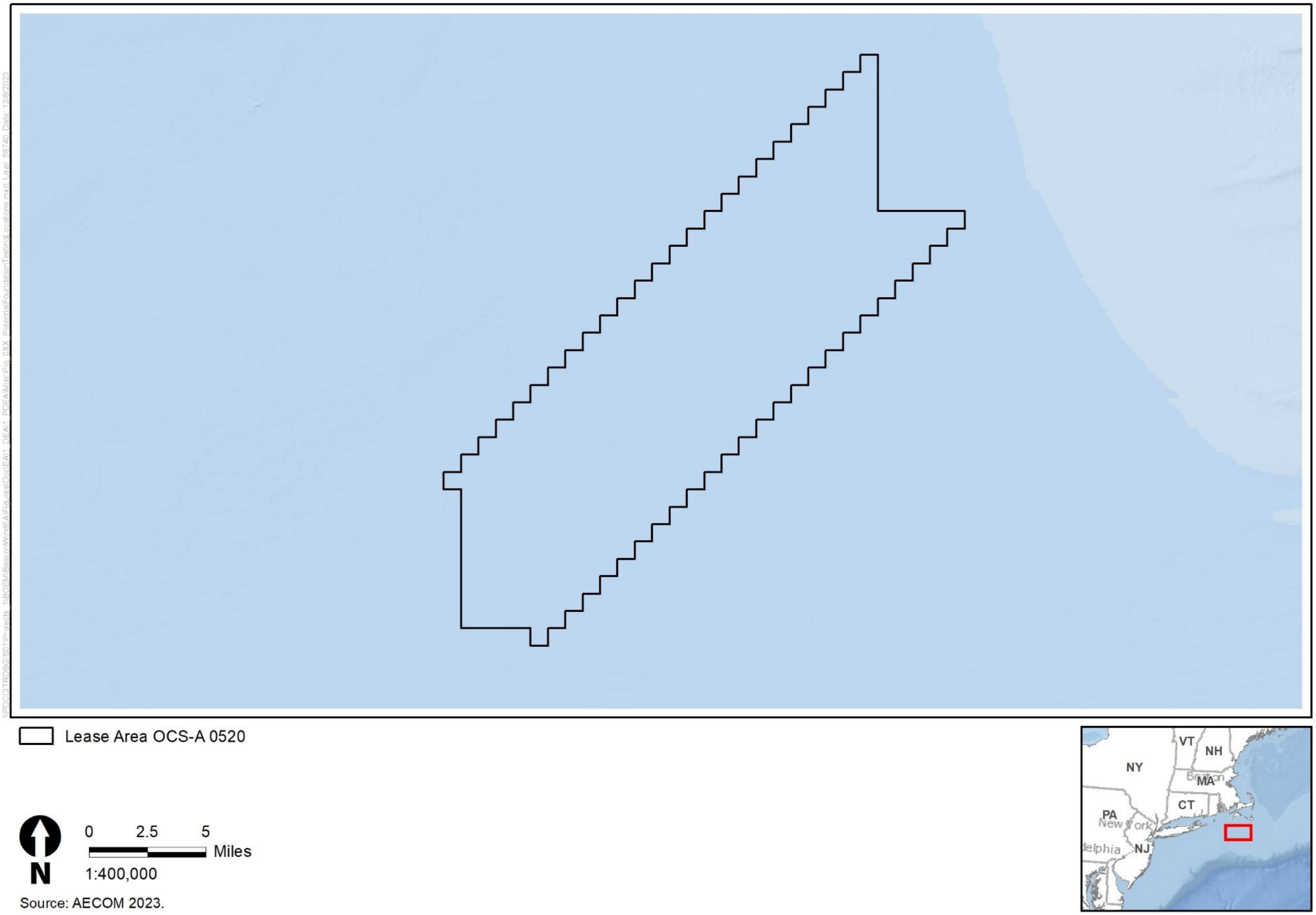

Figure C-1. Beacon Wind Lease Area geographic analysis area

C.2 Ongoing and Reasonably Foreseeable Planned Actions

This section includes a list of the projects and the impact-producing factors (IPFs) that BOEM has identified as potentially contributing to reasonably foreseeable impacts when combined with impacts from the Proposed Action over the geography described in **Section C.1**. Reasonably foreseeable planned actions, which are discussed in the following subsections, include eight types of actions: (1) other wind energy development activities, such as site characterization surveys, site assessment activities, and construction, operation, and decommissioning of wind energy facilities; (2) marine minerals use and ocean-dredged material disposal; (3) military use; (4) marine transportation; (5) fisheries use and management; and (6) global climate change.

IPFs associated with the Proposed Action include:

- Increased vessel presence and traffic resulting in associated noise, air emissions, lighting, vessel discharges, and the potential for strikes and spills.
- Space-use conflicts during survey activities.

The six types of actions listed are anticipated to all result in IPFs that overlap both spatially and temporally with the Proposed Action and that would affect the same resources. BOEM (2019) provides additional information about the IPFs associated with each action. The six types of activities that make up the Planned Actions Scenario are described in **Sections C.2.1** through **C.2.6**.

C.2.1 Other Wind Energy Development Activities

These activities would include site assessment activities (similar to the Proposed Action), as well as construction and operation of wind turbines for any other wind energy projects in the timeframe that overlaps with the Proposed Action (2024 through 2026). **Table C-1** provides a list of these Atlantic offshore wind development projects.

Table C-1. Ongoing and planned wind energy development in the geographic analysis area within the timeframe of the Proposed Action

Lease	Lease/Project/Lease Remainder	Status	Estimated Offshore Construction Schedule
Block Island (Rhode Island state waters)	Block Island	Five turbines	Built
OCS-A 0501	Vineyard Wind 1, part of OCS-A 0501	Existing and ongoing	2023–2025
OCS-A 0517	South Fork	Existing and ongoing	2021–2023
OCS-A 0486	Revolution Wind	Existing and ongoing	2023–2025
OCS-A 0487	Sunrise Wind, part of OCS-A 0487	Planned	2023–2025
OCS-A 0534	New England Wind OCS-A 0534 and portion of OCS-A-501 (Phase 1 [i.e., Park City Wind])	Planned	2025–2026

C.2.2 Marine Minerals Use and Ocean-Dredged Material Disposal

To help meet the sand resource needs of coastal communities, BOEM-funded reconnaissance or design-level Outer Continental Shelf (OCS) studies along the East Coast from Rhode Island to Florida have identified potential future sand resources in many areas. No sand resources were identified within the Project Lease Area. Sand resources identified nearest the Project include OCS locations offshore Massachusetts and Rhode Island; many of these potential sand resources are within 5 miles of the Project Lease Area and associated planned infrastructure (e.g., export cables; Mabee and Woodruff 2016, King et al. 2016).

U.S. Environmental Protection Agency (USEPA) Region 1 is responsible for designating and managing ocean disposal sites for all materials except dredged material in the region of the Project. The U.S. Army Corps of Engineers (USACE) is the permitting agency for ocean disposal of dredged material; all ocean sites for the disposal of dredged material are permitted or authorized under the Marine Protection, Research, and Sanctuaries Act (16 United States Code [U.S.C.] § 1431 et seq. and 33 U.S.C. § 1401 et seq.). There is one active disposal site along the southern Massachusetts/Rhode Island Coast, the Rhode Island Sound Disposal Site (RISDS) located approximately 10 miles (16 kilometers) northeast of Block Island. The RISDS was first used in 2003 and was last used in 2019 (USACE 2022). The Eastern Long Island Sound Disposal Site (ELDS) offshore New London, Connecticut, is permitted for offshore disposal but has not been used (USACE 2022).

C.2.3 Military Use

The Lease Area is within the Narragansett Bay Operations Area. The Narragansett Bay Operations Area extends from the shoreline seaward to approximately 180 nautical miles (nm; 333 kilometers) from land at its farthest point; the subsurface portion of the Narragansett Bay Operations Area has the same boundaries as the surface water portion. The offshore Narragansett Bay Range Complex provides infrastructure for U.S. Atlantic Fleet training and testing exercises (U.S. Navy 2018). The offshore Narragansett Bay Range Complex also supports training and testing by other services (Ecology & Environment 2016).

Military activities with the Narragansett Bay Range Complex can include various vessel training exercises, submarine and antisubmarine training, and U.S. Air Force exercises. The U.S. Navy, the U.S. Coast Guard (USCG), and other military entities have numerous facilities in the region. Major onshore regional facilities include Joint Base Cape Cod, Naval Station Newport, Newport Naval Undersea Warfare Center, Naval Submarine Base New London, and the USCG Academy (BOEM 2013; Rhode Island Coastal Resources Management Council 2010). The U.S. Atlantic Fleet also conducts training and testing exercises in the Narraganset Bay Operations Area, and the Newport Naval Undersea Warfare Center routinely performs testing in the area (BOEM 2013).

C.2.4 Marine Transportation

Marine transportation in the region is diverse and sourced from many ports and private harbors. Commercial vessel traffic in the region includes research, tug/barge, tankers (such as those used for liquid petroleum), cargo, cruise ships, smaller passenger vessels, and commercial fishing vessels. Recreational vessel traffic includes private motor and sailboats. A number of federal agencies, state agencies, educational institutions, and environmental nongovernmental organizations participate in ongoing research offshore—including oceanographic, biological, geophysical, and archaeological surveys. Most vessel traffic, excluding recreational vessels, tends to travel within established vessel traffic routes, and the number of trips, as well as the number of unique vessels, has remained consistent since 2017 (USCG 2021). In response to future offshore wind projects in the New York Bight, multiple additional fairways and a new anchorage may be established to route existing vessel traffic around wind energy projects (USCG 2021). Two Maritime Highway Routes are designated in the Atlantic Coast by the U.S. Department of Transportation Maritime Administration: Marine Highway M-95 (Atlantic Ocean Coastal Waters), which extends from Florida to Maine, and Marine Highway M-295, which includes the East River (New York Harbor) and Long Island Sound (New York and Connecticut) to Block Island Sound (Rhode Island; USDOT 2022).

C.2.5 Fisheries Use and Management

The National Marine Fisheries Service (NMFS) implements regulations to manage commercial and recreational fisheries in federal waters, including those within which the Project would be located; the State of Massachusetts regulates commercial fisheries in state waters (within 3 nm [5.6 kilometers] of the coastline). The Project (including landfall and potential marshalling and operations and maintenance [O&M] port locations) overlaps two of NMFS's eight regional councils to manage federal fisheries: Mid-Atlantic Fishery Management Council (MAFMC), which includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina; and NEFMC, which includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (NEFMC 2022). The councils manage species with many Fishery Management Plans (FMPs) that are frequently updated, revised, and amended and coordinate with each other to jointly manage species across jurisdictional boundaries (MAFMC 2022). Many of the fisheries managed by the councils are fished for in state waters or outside of the Mid-Atlantic region, so the council works with the Atlantic States Marine Fisheries Commission (ASMFC). The ASMFC is composed of the 15 Atlantic coast states and coordinates the management of marine and anadromous resources found in the states' marine waters. In addition, the states and NMFS, under the framework of ASMFC's *Amendment 3 to the Interstate Fishery Management Plan for American Lobster* cooperatively manage the American lobster resource and fishery (NOAA 1997).

The FMPs of the councils and ASMFC were established, in part, to manage fisheries to avoid overfishing. They accomplish this through an array of management measures, including annual catch quotas, minimum size limits, and closed areas. These various measures can reduce (or increase) the size of landings of commercial fisheries in the Northeast and Mid-Atlantic regions.

NMFS also manages highly migratory species, such as tuna and sharks, that can travel long distances and cross domestic boundaries. **Table C-2** summarizes other FMPs and actions in the region.

Table C-2. Other fishery management plans

Area	Plan and Projects
ASMFC	ASMFC *Five-Year Strategic Plan 2019–2023* (ASMFC 2019) ASMFC 2022 Action Plan (ASMFC 2021) *Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change* (ASMFC 2018).
Massachusetts	Massachusetts Shellfish Initiative 2021–2025 Strategic Plan (MSI 2021).
Rhode Island	Rhode Island 2018 Shellfish Sector Management Plan (RIDEM 2018) Rhode Island Department of Environmental Management Division of Marine Fisheries Strategic Plan (2021–2025; RIDEM 2021).

C.2.6 Global Climate Change

Climate change results primarily from the increasing concentration of greenhouse gas (GHG) emissions in the atmosphere, which causes planet-wide physical, chemical, and biological changes, substantially affecting the world's oceans and lands. Changes include increases in global atmospheric and oceanic temperature, shifting weather patterns, rising sea levels, and changes in atmospheric and oceanic chemistry (Blunden and Arndt 2020). Section 7.6.1.4 of the *Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Activities on the Outer Continental Shelf* (MMS 2007b) describes global climate change with respect to assessing renewable energy development. Key drivers of climate change are increasing atmospheric concentrations of carbon dioxide (CO_2) and other GHGs, such as methane (CH_4) and nitrous oxide (N_2O). These GHGs reduce the ability of solar radiation to reradiate out of Earth's atmosphere and into space. Although all three of these GHGs have natural sources, the majority of these GHGs are released from anthropogenic activity. Since the Industrial Revolution, the rate at which solar radiation is reradiated back into space has slowed due to increasing GHG concentrations in the atmosphere, resulting in a net increase of energy in the Earth's system (Solomon et al. 2007). This energy increase presents as heat, raising the planet's temperature and causing climate change.

Fluorinated gases are a type of GHG released in trace amounts but are highly efficient at preventing solar radiation from being reradiated back into space. They have a much longer lifespan than CO_2, CH_4, and N_2O. Fluorinated gases have no natural sources, are either a product or byproduct of manufacturing, and can have 23,000 times the warming potential of an equal amount of CO_2. These gases include hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and sulfur hexafluoride. These gases are currently being phased out; however, sulfur hexafluoride is still used in wind turbine generator (WTG) switchgears and offshore substation platform (OSP) high-voltage and medium-voltage gas-insulated switchgears.

The Intergovernmental Panel on Climate Change released a special report in October 2018 that compared risks associated with an increase of global warming of 1.5 degrees Celsius (°C) and an increase of 2°C. The report found that climate-related risks depend on the rate, peak, and duration of global warming, and that an increase of 2°C was associated with greater risks due to climatic changes such as extreme weather and drought; global sea level rise; impacts on terrestrial ecosystems; impacts on marine biodiversity, fisheries, and ecosystems and their functions and services to humans; and impacts on health, livelihoods, food security, water supply, and economic growth (IPCC 2018). Higher global temperatures increase the chances of sea level rise by the end of the century, with a projected relative sea level rise of 2 to 7.2 feet (0.6 to 2.2 meters) along the contiguous U.S. coastline by 2100 (NOAA 2022). Expected relative sea level rise would cause tide and storm surge heights to increase, leading to a shift in the U.S. coastal flood regimes by 2050 with major and moderate high tide flood events occurring as frequently as moderate and minor high tide flood events occur today (NOAA 2022).

Global emissions of GHGs have impacts whose local effects are being increasingly elucidated through research. For example, a recent study concerning the North Atlantic right whale provides evidence that the whale's feeding area moved north following relocation of its food source related to climate change, and whale mortality may have increased because of fewer controls on fishing activities in the new, more northerly area (Meyer-Gutbrod et al. 2021). Climate change is predicted to affect Northeast fishery species in different ways (Hare et al. 2016), and the NMFS biological opinion discusses in detail the potential impacts of global climate change on protected species that occur within the Proposed Action area (NMFS 2013).

Local emissions, such as those from maintenance of and accidental chemical leaks from wind energy projects, would contribute incrementally to global GHG emissions. However, the largest climate impact from wind energy projects is expected to be beneficial: the energy generated by wind energy projects is expected to displace energy generated by combustion of fossil fuels, which would lead to reductions in regional emissions of air pollutants and GHGs from fossil-fueled power plants.

C.3 References

Atlantic States Marine Fisheries Commission (ASMFC). 2018. Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change. February. Available: http://www.asmfc.org/files/pub/ClimateChangeWorkGroupGuidanceDocument_Feb2018.pdf. Accessed: November 2023.

Atlantic States Marine Fisheries Commission (ASMFC). 2019. *ASMFC Five-Year Strategic Plan 2019–2023*. Available: http://www.asmfc.org/files/pub/2019-2023StrategicPlan_Final.pdf. Accessed: November 2023.

Atlantic States Marine Fisheries Commission (ASMFC). 2021. *Atlantic States Marine Fisheries Commission 2022 Action Plan*. Available: http://www.asmfc.org/files/pub/2022ActionPlan.pdf. Accessed: November 2023.

Blunden, J., and D. S. Arndt. 2020. State of the climate in 2019. Bulletin of the American Meteorological Society 101(8):S1–S429.

Bureau of Ocean Energy Management (BOEM). 2013. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts Revised Environmental Assessment*. OCS EIS/EA BOEM 2013-1131. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs.

Bureau of Ocean Energy Management (BOEM). 2019.National Environmental Policy Act documentation for impact-producing factors in the offshore wind cumulative impacts scenario on the North Atlantic continental shelf. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 201 p. Report No.: OCS Study BOEM 2019-036.

Ecology & Environment. 2016. Military Range Complex - Environmental Common Operating Picture (COP) GIS metadata. Finalized 04/15/2016. Prepared for: Naval Facilities Engineering Command (NAVFAC) Atlantic, Norfolk, Virginia. Available: https://portal.midatlanticocean.org/static/data_manager/metadata/pdf/NationalSecurityMidA Military_Range_Complex.pdf. Accessed: November 2023.

Hare, J. A., W. E. Morrison, M. W. Nelson, M. M. Stachura, E. J. Teeters, and R. B. Griffis. 2016. A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf. *PLoS ONE* 11(2): e0146756. DOI:10.1371/journal.pone.0146756.

Intergovernmental Panel on Climate Change (IPCC). 2018. IPCC Special Report on Impacts of Global Warming of 1.5 Degrees Celsius Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty: Summary for Policymakers. Available: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf. Accessed: November 2023.

King, J.W., J. Boothroyd, B. Oakley, G. Fugate, and C. Gibson. 2016. Summary Report, Cooperative Agreement: M14AC00011 University of Rhode Island Identification of Sand/Gravel Resources in Rhode Island Waters While working Toward a Better Understanding of Storm Impacts on Sediment Budgets. Available: https://www.boem.gov/sites/default/files/mm-research/2021-05/RI-M14AC00011-Summary-Report-FINAL.pdf. Accessed: November 2023.

National Marine Fisheries Service (NMFS). 2013. Endangered Species Act Section 7 consultation biological opinion. Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf in Massachusetts, Rhode Island, New York and New Jersey Wind Energy Areas. Gloucester (MA): National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Greater Atlantic Region.

National Oceanic and Atmospheric Administration (NOAA). 1997. *Amendment 3 to the Interstate Fishery Management Plan for American Lobster*. Available: http://www.asmfc.org/uploads/file/lobsterAmendment3.pdf. Accessed: November 2023.

National Oceanic and Atmospheric Administration (NOAA). 2022. *Global and Regional Sea Level Rise Scenarios for the United States*. Available: https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report-sections.html. Accessed: November 2023.

New England Fishery Management Council (NEFMC). 2022. “About NEFMC.” Available: https://www.nefmc.org/about. Accessed: November 2023.

Mabee, S., and J. D. Woodruff. 2016. Agreement: M14AC00006 Massachusetts Geological Survey/University of Massachusetts; Sand Resource Assessment at Critical Beaches on the Massachusetts Coast. July 22, 2016. Available: https://www.boem.gov/sites/default/files/mm-research/2021-05/MA-BOEM-Final-Summary-Report-opt.pdf. Accessed: November 2023.

Massachusetts Shellfish Initiative (MSI). 2021. 2021-2025 Strategic Plan. Available: http://www.massshellfishinitiative.org/uploads/1/0/4/9/104987295/msi_strategic_plan.pdf. Accessed: November 2023.

Meyer-Gutbrod, E. L., C. H. Greene, K. T. A. Davies, and D. G. Johns. 2021. Ocean Regime Shift is Driving Collapse of the North Atlantic Right Whale Population. *Oceanography* 34(3):22–31 (September 2021). Available: https://tos.org/oceanography/assets/docs/34-3_meyer-gutbrod.pdf. Accessed: November 2023.

Mid-Atlantic Fishery Management Council (MAFMC). 2022. “About the Council.” Available: http://www.mafmc.org/about/. Accessed: November 2023.

Minerals Management Service (MMS). 2007. Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement. October. OCS EIS/EA MMS 2007-046. Available: https://www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/Alt_Energy_FPEIS_VolIIFrontMatter.pdf. Accessed: November 2023.

Rhode Island Coastal Resources Management Council. 2010. *Rhode Island Ocean Special Area Management Plan: Ocean SAMP – Volumes 1 and 2.* Report by Rhode Island Coastal Resources Management Council. Available: https://seagrant.gso.uri.edu/oceansamp/documents.html. Accessed: November 2023.

Rhode Island Coastal Resources Management Council. 2018. Rhode Island Shoreline Change Special Area Management Plan (Beach SAMP) Volume I. Approved: June 12, 2018. Available: http://www.beachsamp.org/wp-content/uploads/2018/09/BeachSAMP_Cover_JCBTribute_Cred-Ack_TOC_FINAL.pdf. Accessed: November 2023.

Rhode Island Department of Environmental Management (RIDEM). 2018. *2018 Shellfish Sector Management Plan*. Available: https://dem.ri.gov/sites/g/files/xkgbur861/files/pubs/regs/regs/fishwild/mpshell.pdf. Accessed: November 2023.

Rhode Island Department of Environmental Management (RIDEM). 2021. *Division of Marine Fisheries Strategic Plan (2021-2025)*. Available: https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/bnatres/marine/pdf/DMFStratPlan2021.pdf. Accessed: November 2023.

Solomon, S., D. Qin, M. Manning, R. B. Alley, T. Berntsen, et al. 2007. Technical Summary. Climate Change 2007: The Physical Science Basis. In Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller, editors. *Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. P. 75.

Tetra Tech Inc. 2023. Site Assessment Plan Amendment Beacon Wind Massachusetts Wind Energy Lease Areas OCS-A 0520. Available: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/BW-Foundation-Testing-SAP-Amendment.pdf.

U.S. Army Corps of Engineers (USACE). 2022. Ocean Dredged Material Disposal Site Database. Available: https://odd.el.erdc.dren.mil/ODMDSSearch.cfm. Accessed: November 2023.

U.S. Coast Guard (USCG). 2021. *Port Access Route Study: Northern New York Bight.* USCG-2020-0278. December 2021. Available: https://www.regulations.gov/document/USCG-2020-0278-0067. Accessed: November 2023.

U.S. Department of Transportation (DOT). 2022. America's Marine Highway Route Designations. U.S. Department of Transportation Maritime Administration. Available: https://cms.marad.dot.gov/sites/marad.dot.gov/files/2021-08/Route%20Designation%20one-pagers%20Aug%202021.pdf. Accessed: November 2023.

U.S. Navy. 2018. Final Environmental Impact Statement/Overseas Environmental Impact Statement Atlantic Fleet Training and Testing. September 2018. Available: https://media.defense.gov/2020/May/13/2002299472/-1/-1/1/2.0%20AFTT%20FEIS%20DESCRIPTION%20OF%20PROPOSED%20ACTION%20AND%20ALTERNATIVES.PDF. Accessed: November 2023.

APPENDIX D: Literature Cited

AECOM. 2023. *Beacon Wind Project: Beacon Wind 1 and Beacon Wind 2, Construction and Operations Plan*. Prepared for Beacon Wind LLC. Submitted to Bureau of Ocean Energy Management. Pocasset (MA): AECOM. 1457 p. Available: https://www.boem.gov/renewable-energy/state-activities/beacon-wind-farm-construction-and-operations-plan.

ASMFC. 2023. *Fisheries Management*. Available: http://www.asmfc.org/fisheries-management/program-overview. Accessed: October 2023.

Auster, P. J., and L. L. Stewart. 1986. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (North Atlantic). *Sand Lance*. U.S. Fish and Wildlife Service. Biological Report 82:11.66. 20 pp.

Avanti Corporation, Industrial Economics Inc. 2019. *National Environmental Policy Act documentation for impact-producing factors in the offshore wind cumulative impacts scenario on the North Atlantic continental shelf*. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 201 p. Report No.: OCS Study BOEM 2019-036.

Baker, K., and U. Howson. 2021. *Data collection and site survey activities for renewable energy on the Atlantic Outer Continental Shelf*. Biological assessment. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 152 p.

Balazik, M. T., K. J. Reine, A. J. Spells, C. A. Fredrickson, M. L. Fine, G. C. Garman, and S. P. McInich. 2012. The Potential for Vessel Interactions with Adult Atlantic Sturgeon in the James River, Virginia. *North American Journal of Fisheries Management* 32:1062–1069.

Barton, A. D., A. J. Irwin, Z. V. Finkel, and C. A. Stock. 2016. Anthropogenic Climate Change Drives Shift and Shuffle in North Atlantic Phytoplankton Communities. *PNAS* 113:2964–2969.

Baulch, S., and C. Perry. 2014. Evaluating the Impacts of Marine Debris on Cetaceans. *Marine Pollution Bulletin* 80:210–221.

Beacon Wind, LLC (Beacon Wind). 2023. *Beacon Wind Project: Beacon Wind 1 and Beacon Wind 2, Construction and Operations Plan*. Available: https://www.boem.gov/renewable-energy/state-activities/beacon-wind-farm-construction-and-operations-plan.

Bembenek-Bailey, S. A., J. N. Niemuth, P. D. McClellan-Green, M. H. Godfrey, C. A. Harms, H. Gracz, and M. K. Stoskopf. 2019. NMR Metabolomics Analysis of Skeletal Muscle, Heart, and Liver of Hatchling Loggerhead Sea Turtles (*Caretta caretta*) Experimentally Exposed to Crude Oil and/or Corexit. *Metabolites* 9. DOI: 10.3390/metabo9020021.

Bergstrom, L., F. Sundqvist, and U. Bergstrom. 2013. Effects of an Offshore Wind Farm on Temporal and Spatial Patterns in the Demersal Fish Community. *Marine Ecology Progress Series* 485:199–210.

Berrien, P., and J. Sibunka. 1999. *Distribution Patterns of Fish Eggs in the U.S. Northeast Continental Shelf Ecosystem 1977–1987*. NOAA Technical Report NMFS 145. 310 pp.

Bonzek, C. F., J. Gartland, D. J. Gauthier, and R. J. Latour. 2017. *Northeast Area Monitoring and Assessment Program (NEAMAP) 2016 Data Collection and Analysis in Support of Single and Multispecies Stock Assessments in the Mid-Atlantic: Northeast Area Monitoring and Assessment Program Near Shore Trawl Survey*. Virginia Institute of Marine Science, William & Mary.

Borcuk, J. R., G. H. Mitchell, S. L. Watwood, T. E. Moll, E. M. Oliveira, and E. R. Robinson. 2017. *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-Southern California Training and Testing Study Areas*. NUWC-NPT Technical Report 12,243. June 2017. 121 pp.

Browne, M. A., A. J. Underwood, M. G. Chapman, R. Williams, R. C. Thompson, and J. A. van Franeker. 2015. Linking Effects of Anthropogenic Debris to Ecological Impacts. *Proceedings of the Royal Society B* 282:20142929.

Bruggeman, G., P. Middleton, and B. Barnhart. 2023. *Supporting National Environmental Policy Act Documentation for Offshore Wind Energy Development Related to Glauconite Sand*. Washington (DC): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2023-011. 16 p. Available: https://www.boem.gov/sites/default/files/documents/renewable-energy/studies/GlauconiteSand_WhitePaper.pdf.

Budelmann, B. U. 1992. Hearing in Crustacea. Pages 131–139 in D. B. Webster, R. R. Fay, and A. N. Popper (eds.), *The Evolutionary Biology of Hearing*. Springer-Verlag, New York.

Bugoni, L., L. Krause, and M. V. Petry. 2001. Marine Debris and Human Impacts on Sea Turtles in Southern Brazil. *Marine Pollution Bulletin* 42:1330–1334.

Bureau of Ocean Energy Management (BOEM). 2012. *Programmatic Agreement Among the U.S. Department of the Interior, Bureau of Ocean Energy Management; State Historic Preservation Officers of Massachusetts and Rhode Island; The Mashpee Wampanoag Tribe; The Narragansett Indian Tribe; The Wampanoag Tribe of Gay Head (Aquinnah); and The Advisory Council on Historic Presercation; Regarding the "Smart from the Start" Atlantic Wind Energy Initiative: Leasing Site Assessment Activities Offshore Massachusetts and Rhode Islands*. Available: https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/HP/MA-RI-PA_Executed.pdf.

Bureau of Ocean Energy Management (BOEM). 2014. *Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf offshore Massachusetts*. Revised environmental assessment. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 674 p. Report No.: OCS EIS/EA BOEM 2014-603.

Bureau of Ocean Energy Management (BOEM). 2016. *Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf offshore New York*. Revised environmental assessment. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. 449 p. Report No.: OCS EIS/EA BOEM 2016-070.

Bureau of Ocean Energy Management (BOEM). 2021. *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection.* Available: https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%2011222021.pdf. Accessed: September 2022.

Camacho, M., O. P. Luzardo, L. D. Boada, L. F. L. Jurado, M. Medina, M. Zumbado, and J. Orós. 2013. Potential Adverse Health Effects of Persistent Organic Pollutants on Sea Turtles: Evidence from a Cross-Sectional Study on Cape Verde Loggerhead Sea Turtles. *Science of the Total Environment* 458–460:283–289.

Cargnelli, L. M., S. J. Griesbach, D. B. Packer, and E. Weissberger. 1999. Essential Fish Habitat Source Document: Atlantic Surfclam, *Spisula solidissima*, Life History and Habitat Characteristics. Woods Hole, Massachusetts. 22 pp.

Celi, M., F. Filiciotto, G. Maricchiolo, L. Genovese, E. M. Quinci, V. Maccarrone, S. Mazzola, M. Vazzana, and G. Buscaino. 2016. Vessel Noise Pollution as a Human Threat to Fish: Assessment of the Stress Response in Gilthead Sea Bream (*Sparus aurata*, Linnaeus 1758). *Fish Physiology and Biochemistry* 42:631–641.

Cetacean and Turtle Assessment Program (CETAP). 1982. *A Characterization of Marine Mammals and Turtles in Mid- and North-Atlantic Areas of the U.S. Outer Continental Shelf. Annual Report for 1980.*

Chaloupka, M., T. M. Work, G. H. Balazs, S. K. K. Murakawa, and R. Morris. 2008.Cause-specific Temporal and Spatial Trends in Green Sea Turtle Strandings in the Hawaiian Archipelago (1982–2003). *Marine Biology* 154:887–898.

Cole, T. V. N., A. Stimpert, L. Pomfret, K. Houle, and M. Niemeyer. 2007. *North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2002 Results Summary.* Northeast Fisheries Science Center Reference Document 07-18a.

Condon, R. H., C. M. Duarte, K. A. Pitt, K. L. Robinson, C. H. Lucas, K. R. Sutherland, H. W. Mianzan, M. Bogeberg, J. E. Purcell, M. B. Decker, S. Uye, L. P. Madin, R. D. Brodeur, S. H. D. Haddock, A. Malej, G. D. Parry, E. Eriksen, J. Quiñones, M. Acha, M. Harvey, J. M. Arthur, and W. M. Graham. 2013. Recurrent Jellyfish Blooms Are a Consequence of Global Oscillations. *Proceedings of the National Academy of Sciences of the United States of America* 110:1000–1005.

Cross, J. N., C. A. Zetlin, P. L. Berrien, D. L. Johnson, and C. McBride. 1999. Essential Fish Habitat Source Document: Butterfish, *Peprilus triacanthus*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-145. 50 pp.

CSA Ocean Sciences, Inc. (CSA Ocean Sciences). 2021. *Assessment of Impacts to Marine Mammals, Sea Turtles, and Sturgeon.* Appendix P1 to the South Fork Wind Farm Construction and Operations Plan.

Available: https://www.boem.gov/sites/default/files/documents/oil-gas-energy/MarineMammalSeaTurtleSturgeon_Report.pdf.

Department of the Navy (DoN). 2012. *Commander Task Force 20, 4th, and 6th Fleet Navy Marine Species Density Database*. Technical report for Naval Facilities Engineering Command Atlantic, Norfolk, VA.

Department of the Navy (DoN). 2017. *U.S. Navy Marine Species Density Database Phase III for the Atlantic Fleet Training and Testing Study Area.* NAVFAC Atlantic Final Technical Report. Naval Facilities Engineering Command Atlantic, Norfolk, VA.

De Robertis, A., and N. O. Handegard. 2013. Fish Avoidance of Research Vessels and the Efficacy of Noise-Reduced Vessels: A Review. *ICES Journal of Marine Science* 70:34–45.

Dolman, S., V. Williams-Grey, R. Asmutis-Silvia, and S. Isaac. 2006. *Vessel Collisions and Cetaceans: What Happens when They Don't Miss the Boat*. A WDCS Science Report.

Equinor. 2020. Letter of Concurrence Request for Site Characterization Surveys in the Area of Leases OCS-A 0520 and OCS-A 0512. March 11, 2020. 4 pp.

Erbe, C., R. Dunlop, and S. Dolman. 2018. Effects of Noise on Marine Mammals. Pages 277–309 in H. Slabbekoorn, R. J. Dooling, A. N. Popper, and R. R. Fay (eds.), *Effects of Anthropogenic Noise on Animals*. New York, NY: Springer.

Erbe, C., S. A. Marley, R. P. Schoeman, J. N. Smith, L. E. Trigg, and C. B. Embling. 2019. The Effects of Ship Noise on Marine Mammals—A Review. *Frontiers in Marine Science* 6: Article 606.

Fahay, M. P., P. L. Berrien, D. L. Johnson, and W. W. Morse. 1999. Essential Fish Habitat Source Document: Atlantic Cod, *Gadus morhua*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-124.

Farmer, N. A., L. P. Garrison, C. Horn, M. Miller, T. Gowan, R. D. Kenney, M. Vukovich, J. R. Willmott, J. Pate, D. H. Webb, T. J. Mullican, J. D. Stewart, K. Bassos-Hull, C. Jones. D. Adams, N. A. Pelletier, J. Waldron, and S. Kajiura. 2022. The Distribution of Manta Rays in the Western North Atlantic Ocean off the Eastern United States. *Scientific Reports* 22:6544.

Fay, R. R., and A. N. Popper. 2000. Evolution of Hearing in Vertebrates: The Inner Ears and Processing. *Hearing Research* 149:1–10.

Ferrari, M. C. O., M. I. McCormick, M. G. Meekan, S. D. Simpson, S. L. Nedelec, and D. P. Chivers. 2018. School Is Out on Noisy Reefs: The Effect of Boat Noise on Predator Learning and Survival of Juvenile Coral Reef Fishes. *Proceedings of the Royal Society B* 285:rsb.2018.003.

Filiciotto, F., M. Vazzana, M. Celi, V. Maccarrone, M. Ceraulo, G. Buffa, V. Di Stefano, S. Mazzola, and G. Buscaino. 2014. Behavioural and Biochemical Stress Responses of *Palinurus elephas* After Exposure to Boat Noise Pollution in Tank. *Marine Pollution Bulletin* 84:104–114. doi:10.1016/j.marpolbul.2014.05.029.

Gall, S. C., and R. C. Thompson. 2015. The Impact of Marine Debris on Marine Life. *Marine Pollution Bulletin* 92:170–179.

Gatzke, J., C. Khan, A. Henry, L. Crowe, P. Duley, and T. Cole. 2017. *North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2015 Results Summary.* Northeast Fisheries Science Center Reference Document 17-11.

Gregory, M. R. 2009. Environmental Implications of Plastic Debris in Marine Settings – Entanglement, Ingestion, Smothering, Hangers-On, Hitch-Hiking, and Alien Invasion. *Philosophical Transactions of the Royal Society B* 364:2013–2025.

Griswold, C. A., and J. Prezioso. 1981. In situ observations on reproductive behavior of the long-finned squid, *Loligo pealei*. *Fishery Bulletin* 78:945–947.

Guida, V., A. Drohan, H. Welch, J. McHenry, D. Johnson, V. Kentner, J. Brink, D. Timmons, and E. Estela-Gomez. 2017. *Habitat Mapping and Assessment of Northeast Wind Energy Areas*. Sterling, VA. U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088: 312 pp.

Halvorsen, M. B., B. M. Casper, C. M. Woodley, T. J. Carlson, and A. N. Popper. 2011. *Hydroacoustic Impacts on Fish From Pile Installation*. National Cooperative Highway Research Program Transportation Research Board. 25 pp.

Handegard, N. O., K. Michalsen, and Tjøstheim. 2003. Avoidance Behaviour in Cod (*Gadus morhua*) to a Bottom-Trawling Vessel. *Aquatic Living Resources* 16:265–270.

Harding, H. R., T. A. C. Gordon, K. Wong, M. I. McCormick, S. D. Simpson, and A. N. Radford. 2020. Condition-Dependent Responses of Fish to Motorboats. *Biology Letters* 16:20200401.

Hatch, L. T., C. W. Clark, S. M. van Parijs, A. S. Frankel, and D. M. Ponirakis. 2012. Quantifying Loss of Acoustic Communication Space for Right Whales in and around a U.S. National Marine Sanctuary. *Conservation Biology* 26:983–994.

Haver, S. M., J. D. Adams, L. T. Hatch, S. M. Van Parijs, R. P. Dziak, J. Haxel, S. A. Heppell, M. F. McKenna, D. K. Mellinger, and J. Gedamke. 2021. Larve Vessel Activity and Low-Frequency Underwater Sound Benchmarks in United States Waters. *Frontiers in Marine Science* 8:669528.

Hayes, S. A., E. Josephson, K. Maze-Foley, and P. E. Rosel. 2017. *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2016* (Second Edition). NOAA Tech. Mem. NMFS-NE-241. 274 pp.

Hayes, S. A., E. Josephson, K. Maze-Foley, and P. E. Rosel. 2018. *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2017* (Second Edition). NOAA Tech. Mem. NMFS-NE-245. 371 pp.

Hayes, S. A., E. Josephson, K. Maze-Foley, and P. E. Rosel. 2019. *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2018.* NOAA Tech. Mem. NMFS-NE-258. 298 pp.

Hayes, S. A., E. Josephson, K. Maze-Foley, and P. E. Rosel. 2020. *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2019.* NOAA Tech. Mem. NMFS-NE-264. 479 pp.

Hayes, S. A., E. Josephson, K. Maze-Foley, P. E. Rosel, and J. Turek. 2021. *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2020.* NOAA Tech. Mem. NMFS-NE-271. 394 pp.

Hayes, S. A., E. Josephson, K. Maze-Foley, P. E. Rosel, and J. Wallace. 2022. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2021. 380 pp.

Hayes, S. A., E. Josephson, K. Maze-Foley, P. E. Rosel, J. McCordic, and J. Wallace. 2023. *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2022*. 257 pp.

Hazel, J., I. R. Lawler, H. Marsh, and S. Robson. 2007. Vessel Speed Increases Collision Risk for the Green Turtle *Chelonia mydas*. *Endangered Species Research* 3:105–113.

Hoarau, L., L. Ainley, C. Jean, and S. Ciccione. 2014. Ingestion and Defecation of Marine Debris by Loggerhead Sea Turtles, from By-Catches in the South-West Indian Ocean. *Marine Pollution Bulletin* 84:90–96.

Holles, S., S. D. Simpson, A. N. Radford, L. Berten, and D. Lecchini. 2013. Boat Noise Disrupts Orientation Behaviour in a Coral Reef Fish. *Marine Ecology Progress Series* 485:295-300. doi:10.3354/meps10346.

Holmes, L. J., J. McWilliam, M. C. O. Ferrari, and M. I. McCormick. 2017. Juvenile Damselfish Are Affected But Desensitize to Small Motor Boat Noise. *Journal of Experimental Marine Biology and Ecology* 494:63–68.

Horwath, S., J. Hassrick, R. Grismalda, E. Diller, J. Krebs, and R. Manhard. 2021. *Comparison of Environmental Effects from Different Offshore Wind Turbine Foundations*. OCS Study BOEM 2021-053. 48 pp.

Hudson, D. M., J. S. Krumholz, D. L. Pochtar, N. C. Dickenson, G. Dossot, G. Phillips, E.P. Baker, and T.E. Moll. 2022. Potential Impacts from Simulated Vessel Noise and Sonar on Commercially Important invertebrates. *PeerJ* 10:e12841. doi:10.7717/peerj.12841.

Jimenez-Arranz, G., D. Hedgeland, S. Cook, N. Banda, P. Johnston, and E. Oliver. 2019. Acoustical characterization of a Mobile Offshore Drilling Unit. *Proceedings of Meetings on Acoustics* 37:070005.

Johnson, A. 2018. *White Paper on the Effects of Increased Turbidity and Suspended Sediment on ESA Listed Species from Projects Occurring in the Greater Atlantic Regions*. Greater Atlantic Region Policy Series 18-02. NOAA Fisheries. Available: https:/www.greateratlantic.fisheries.noaa.cov/policyseriesindex.phpGARPS/article/view/8/8.

Jones, I. T., M. Schumm, J. A. Stanley, R. T. Hanlon, and T. A. Mooney. 2023. Longfin squid reproductive behaviours and spawning withstand wind farm pile driving noise. *ICES Journal of Marine Science*10.1093/icesjms/fsad117.

Kaplan, M. B., and T. A. Mooney. 2016. Coral Reef Soundscapes May Not Be Detectable Far from the Reef. *Scientific Reports* 6:31862. doi:10.1038/srep31862.

Kazyak, D. C., S. L. White, B. A. Lubinski, R. Johnson, and M. Eackles. 2021. Stock Composition of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) Encountered in Marine and Estuarine Environments on the U.S. Atlantic Coast. *Conservation Genetics* 22:767–781.

Kellar, N. M., T. R. Speakman, C. R. Smith, S. M. Lane, B. C. Balmer, M. L. Trego, K. N. Catelani, M. N. Robbins, C. D. Allen, R. S. Wells, E. S. Zolman, T. K. Rowles, and L. H. Schwacke. 2017. Low Reproductive Success Rates of Common Bottlenose Dolphins *Tursiops truncatus* in the Northern Gulf of Mexico Following the Deepwater Horizon Disaster (2010–2015). *Endangered Species Research* 33:1432–158.

Kelly, J. T., and A. P. Klimley. 2012. Relating the Swimming Movements of Green Sturgeon to the Movement of Water Currents. *Environmental Biology of Fishes* 93:151–167.

Kenney, R. D., and K. J. Vigness-Raposa. 2010. *Marine Mammals and Sea Turtles of Narragansett Bay, Block Island Sound, Rhode Island Sound, and Nearby Waters: An Analysis of Existing Data for the Rhode Island Ocean Special Area Management Plan*. Technical report no. 10. Wakefield (RI): Coastal Resources Management Council.

Khan, C., A. Henry, P. Duley, J. Gatzke, L. Crowe, and T. Cole. 2018. *North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2016 Results Summary.* Northeast Fisheries Science Center Reference Document 18-01.

Kite-Powell, H. L., A. Knowlton, and M. Brown. 2007. *Modeling the Effect of Vessel Speed on Right Whale Ship Strike Risk*. Unpublished Report for NOAA/NMFS Project NA04NMF47202394. 8 pp. Available: https://tethys.pnnl.gov/sites/default/files/publications/Kite-Powell-et-al-2007.pdf.

Koschinski, S., and K. Lüdemann. 2020. *Noise Mitigation for the Construction of Increasingly Large Offshore Wind Turbines: Technical Options for Complying with Noise Limits*. Report commissioned by the Federal Agency for Nature Conservation, Isle of Vilm, Germany. March 2020. 40 pp.

Kraus, S. D., J. K. D. Taylor, B. Wikgren, R. D. Kenney, C. Mayo, L. Ganley, P. Hughes, C. W. Clark, and A. N. Rice. 2013. *Field Surveys of Whales and Sea Turtles for Offshore Wind Energy Planning in Massachusetts. 2011 – 2012.* Massachusetts Clean Energy Center.

Kraus, S. D., S. M. Leiter, B. Wikgren, R. D. Kenney, C. Mayo, P. Hughes, J. T. Tielens, B. J. Estabrook, and A. N. Rice. 2014. *Aerial and Acoustic Surveys for Large Whales and Sea Turtles for Offshore Wind Energy Planning in Massachusetts.* Year 2 Report. Massachusetts Clean Energy Center.

Kraus, S. D., S. Leiter, K. Stone, B. Wikgren, C. Mayo, P. Hughes, R. D. Kenney, C. W. Clark, A. N. Rice, B. Estabrook, and J. Tielens. 2016. *Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles. Final Report*. OCS Study BOEM 2016-054. Available: https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-

Studies/Renewable-Energy/Northeast-Large-Pelagic-Survey-Collaborative-Aerial-and-Acoustic-Surveys-for-Large-Whales-and-Sea-Turtles.pdf.

Laist, D. W., A. R. Knowlton, J. G. Mead, A. S. Collet, and M. Podesta. 2001. Collisions between Ships and Whales. *Marine Mammal Science* 17:35–75.

Leiter, S. M., K. M. Stone, J. L. Thompson, C. M. Accardo, B. C. Wikgren, M. A. Zani, T. V. N. Cole, R. D. Kenney, C. A. Mayo, and S. D. Kraus. 2017. North Atlantic Right Whale *Eubalaena glacialis*, Occurrence in Offshore Wind Energy Areas near Massachusetts and Rhode Island, USA. *Endangered Species Research* 35:45–49.

Løkkeborg, S., E. Ona, A. Vold, and A. Salthaug. 2012. Sounds from seismic air guns: gear- and species-specific effects on catch rates and fish distribution. *Canadian Journal of Fisheries and Aquatic Sciences* 69(8):1278-1291.

Love, M. S., A. Baldera, C. Young, and C. Robbins. 2013. *The Gulf of Mexico Ecosystem: A Coastal and Marine Atlas*. New Orleans, LA: Ocean Conservancy, Gulf Restoration Center.

Lutcavage, M. E., and P. L. Lutz. 1997. Diving Physiology Pages 277–296 in P. L. Lutz and J. A. Musick (eds.), *The Biology of Sea Turtles*. Boca Raton, FL: CRC Press.

Lutz, P. L., and J. A. Musick. 1997. The *Biology of Sea Turtles*. Boca Raton, FL: CRC Press.

Massachusetts Division of Marine Fisheries (MA DMF). 2023. *Recreational Saltwater Fishing Regulations*. Available at: https://www.mass.gov/service-details/recreational-saltwater-fishing-regulations. Accessed: October 2023.

Mazet, J. A. K., I. A. Gardner, D. A. Jessup, and L. J. Lowenstine. 2001. Effects of Petroleum on Mink Applied as a Model for Reproductive Success in Sea Otters. *Journal of Wildlife Diseases* 37:686–692.

McGregor, F., A. J. Richardson, A. J. Armstrong, A. O. Armstrong, and C. L. Dudgeon. 2019. Rapid Wound Healing in a Reef Manta Ray Masks the Extent of Vessel Strike. *PLOS ONE* 14:e0225681.

McKenna, M. F., C. Gabriele, and B. Kipple. 2017. Effects of Marine Vessel Management in the Underwater Acoustic Environment of Glacier Bay National Park, AK. *Ocean & Coastal Management* 139:102–112.

McKenna, M. F., S. M. Wiggins, and J. A. Hildebrand. 2013. Relationship Between Container Ship Underwater Noise Levels and Ship Design, Operational and Oceanographic Conditions. *Scientific Reports* 3:01760.

McPherson, C. R., J. E. Quijano, M. J. Weirathmueller, K. R. Hiltz, and K. Lucke. 2019. *Browse to North-West-Shelf Noise Modelling Study: Assessing Marine Fauna Sound Exposures*. Technical report by JASCO Applied Sciences for Jacobs.

Mid-Atlantic Fishery Management Council (MAFMC). 2017. *Unmanaged Forage Omnibus Amendment: Amendment 20 to the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan;*

Amendment 18 to the Mackerel, Squid, and Butterfish Fishery Management Plan; Amendment 19 to the Surf Clam and Ocean Quahog Fishery Management Plan; Amendment 6 to the Bluefish Fishery Management Plan; Amendment 5 to the Tilefish Fishery Management Plan; Amendment 5 to the Spiny Dogfish Fishery Management Plan Including an Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis. March 2017. 223 pp.

Mid-Atlantic Fishery Management Council (MAFMC). 2023. *Fishery Management Plans and Amendments*. Available: https://www.mafmc.org/fishery-management-plans. Accessed: October 2023.

Mitchelmore, C. L., C. A. Bishop, and T. K. Collier. 2017. Toxicological Estimation of Mortality of Oceanic Sea Turtles Oiled During the Deepwater Horizon Oil Spill. *Endangered Species Research* 33:39–50.

MMS. 2007a. *Gulf of Mexico OCS oil and gas lease sales: 2007-2012. Western Planning Area sales 204, 207, 210, 215, and 218; Central Planning Area sales 205, 206, 208, 213, 216, and 222. Final environmental impact statement.* New Orleans (LA): U.S. Department of the Interior, Minerals Management Service. 2 vols. 1095 p. Report No.: OCS EIS/EA MMS 2007-018.

MMS. 2007b. *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement*. 4 vols. Report No.: OCS EIS/EA MMS 2007-046.

Mohr, F. C., B. Lasely, and S. Bursian. 2008. Chronic Oral Exposure to Bunker C Fuel Oil Causes Adrenal Insufficiency in Ranch Mink. *Archive of Environmental Contamination and Toxicology* 54:337–347.

Montgomery, J. C., A. Jeffs, S. D. Simpson, M. Meekan, and C. Tindle. 2006. Sound as an Orientation Cue for the Pelagic Larvae of Reef Fishes and Decapod Crustaceans. *Advances in Marine Biology* 51:143–196.

Mooney, T. A., R. T. Hanlon, J. Christensen-Dalsgaard, P. T. Madsen, D. R. Ketten, and P. E. Nachtigall. 2010. Sound Detection by the Longfin Squid (*Loligo pealeii*) Studied with Auditory Evoked Potentials: Sensitivity to low-Frequency Particle Motion and Not Pressure. *Journal of Experimental Biology* 213:3748–3759. Doi:10.1242/jeb.048348.

Moore, J.-S., V. Bourret, M. Dionne, I. Bradbury, P. O'Reilly, M. Kent, G. Chaput, and L. Bernatchez. 2014. Conservation Genomics of Anadromous Atlantic Salmon Across Its North American Range: Outlier Loci Identify the Same Patterns of Population Structure As Neutral Loci. *Molecular Ecology* 23:5680–5697.

Moore, S. E., and J. T. Clarke. 2002. Potential Impact of Offshore Human Activities on Gray Whales (*Eschrichtius robustus*). *Journal of Cetacean Resource Management* 4:19–25.

Morley, E. L., G. Jones, and A. N. Radford. 2014. The Importance of Invertebrates when Considering the Impacts of Anthropogenic Noise. *Proceedings of the Royal Society of London Series B* 281:20132683.

National Aeronautics and Space Administration (NASA). 2023. *The Effects of Climate Change*. Available: https://climate.nasa.gov/effects/. Accessed: March 2023.

National Centers for Environmental Information (NCEI). 2023. *Zooplankton and Ichthyoplankton Abundance and Distribution in the North Atlantic Collected by the Ecosystem Monitoring (EcoMon) Project from 1977-02-13 to 2021-11-15*. NCEI Accession 0187513. Available: https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.nodc:0187513.

National Marine Fisheries Service (NMFS). 2006. *Consolidated Atlantic Highly Migratory Species Management Plan*. Available: https://www.fisheries.noaa.gov/management-plan/consolidated-atlantic-highly-migratory-species-management-plan.

National Marine Fisheries Service (NMFS). 2016. Critical Habitat for Endangered North Atlantic Right Whale. 81 *Federal Register* 4838.

National Marine Fisheries Service (NMFS). 2017. *Omnibus Essential Fish Habitat Amendment 2*. Volume: EFH and HAPC Designation Alternatives and Environmental Impacts. Available: https://www.habitat.noaa.gov/application/efhmapper/oa2_efh_hapc.pdf.

National Marine Fisheries Service (NMFS). 2020a. Letter of Concurrence re: Survey ROV Operations. 1 p.

National Marine Fisheries Service (NMFS). 2020b. *Section 7 Effect Analysis: Turbidity in the Greater Atlantic Region.* Available: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-effect-analysis-turbidity-greater-atlantic-region. Accessed: August 2020.

National Marine Fisheries Service (NMFS). 2021a. *Cold-Stunning and Sea Turtles*. Available: https://www.fisheries.noaa.gov/national/marine-life-distress/cold-stunning-and-sea-turtles-frequently-asked-questions. Accessed: March 2022.

National Marine Fisheries Service (NMFS). 2021b. *Section 7 Species Presence Table: Sea Turtles in the Greater Atlantic Region*. Available: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-presence-table-sea-turtles-greater. Accessed: March 2022.

National Marine Fisheries Service (NMFS). 2023a. *2016–2023 Humpback Whale Unusual Mortality Event Along the Atlantic Coast*. Available: https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2023-humpback-whale-unusual-mortality-event-along-atlantic-coast.

National Marine Fisheries Service (NMFS). 2023b. *2017–2022 Minke Whale Unusual Mortality Event along the Atlantic Coast*. Available: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2022-minke-whale-unusual-mortality-event-along-atlantic-coast.

National Marine Fisheries Service (NMFS). 2023c. *2017–2023 North Atlantic Right Whale Unusual Mortality Event*. Available: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2023-north-atlantic-right-whale-unusual-mortality-event.

National Marine Fisheries Service (NMFS). 2023d. *2022-2023 Pinniped Unusual Mortality Event along the Maine Coast*. Available: https://www.fisheries.noaa.gov/marine-life-distress/2022-2023-pinniped-unusual-mortality-event-along-maine-coast.

National Marine Fisheries Service (NMFS). 2023e. *Continued Operation of Salem and Hope Creek Nuclear Generation Stations*. GAR-2020-02842. Biological Opinion. 263 pp.

National Marine Fisheries Service (NMFS). 2023f. *Greater Atlantic Regional Fisheries Office (GARFO)*. Personal communication. September 2023.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1993. *Recovery Plan for the Hawksbill Turtle in the U.S. Caribbean, Atlantic, and Gulf of Mexico (*Eretmochelys imbricata*).*

National Marine Fisheries Service (NMFS) Sea Turtle Stranding and Salvage Network (STSSN). 2023. *Sea Turtle Stranding and Salvage Network*. Available: https://www.fisheries.noaa.gov/national/marine-life-distress/sea-turtle-stranding-and-salvage-network.

National Oceanic and Atmospheric Administration (NOAA) Office of National Marine Sanctuaries. 2017. *Small but Mighty: Understanding Sand Lance in Stellwagen Bank National Marine Sanctuary*. Available: https://sanctuaries.noaa.gov/news/jan17/sand-lance-stellwagen-bank.html.

National Science Foundation (NSF) and U.S. Geological Survey (USGS). 2011. *Final Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey.* 514 pp. Available: https://www.nsf.gov/geo/oce/envcomp/usgs-nsf-marine-seismic-research/nsf-usgs-final-eis-oeis_3june2011.pdf.

Nedelec, S., S. Mills, D. Lecchini, B. Nedelec, S. Simpson, and A. Radford. 2016. Repeated Exposure to Noise Increases Tolerance in a Coral Reef Fish. *Environmental Pollution* 216:428–436.

Nedelec, S. L., A. N. Radford, L. Pearl, B. Nedelec, M. I. McCormick, M. G. Meekan, and S. D. Simpson. 2017. Motorboat Noise Impacts Parental Behaviour and Offspring Survival in a Reef Fish. *The Royal Society Proceedings B* 284:20170142.

Nelms, S. E., E. M. Duncan, A. C. Broderick, T. S. Galloway, M. H. Godfrey, M. Hamann, P. K. Lindeque, and B. J. Godley. 2016. Plastic and Marine Turtles: A Review and Call for Research. *ICES Journal of Marine Science* 73:165–181.

New England Fishery Management Council (NEFMC). *2017. Omnibus Essential Fish Habitat Amendment 2 Final Environmental Impact Statement Appendix B: EFH Supplementary Tables, Prey Species Information, and Spawning Information*. 127 pp.

New England Fishery Management Council (NEFMC). 2023. *Management Plans*. Available: https://www.nefmc.org/management-plans. Accessed: October 2023.

New York State Energy Research and Development Authority (NYSERDA). 2017. *New York State Offshore Wind Master Plan Fish and Fisheries Study Final Report*. 202 pp.

Nichols, T. A., T. W. Anderson, and A. Širović. 2015. Intermittent Noise Induces Physiological Stress in a Coastal Marine Fish. *PLOS One* 10:e139157.

Normandeau Associates Inc. (Normandeau) and APEM Ltd. (APEM). 2020. *Digital Aerial Baseline Survey of Marine Wildlife in Support of Offshore Wind Energy. Third Annual Report Summer 2016 – Spring 2019*. Prepared for New York State Energy Research and Development Authority.

Northeast Fisheries Science Center (NEFSC) and Southeast Fisheries Science Center (SEFSC). 2015. *2015 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS II.*

Northeast Fisheries Science Center (NEFSC) and Southeast Fisheries Science Center (SEFSC). 2016. *2016 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS II.*

Northeast Fisheries Science Center (NEFSC) and Southeast Fisheries Science Center (SEFSC). 2018. *2017 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS II*.

Northeast Fisheries Science Center (NEFSC) and Southeast Fisheries Science Center (SEFSC). 2019. *2018 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS II.*

Northeast Fisheries Science Center (NEFSC) and Southeast Fisheries Science Center (SEFSC). 2020. *2019 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US Waters of the Western North Atlantic Ocean - AMAPPS II*. Available: https://repository.library.noaa.gov/view/noaa/26467.

Northeast Fisheries Science Center (NEFSC) and Southeast Fisheries Science Center (SEFSC). 2021. *2020 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US waters of the Western North Atlantic Ocean – AMAPPS III.*

Northeast Fisheries Science Center (NEFSC) and Southeast Fisheries Science Center (SEFSC). 2022. *2021 Annual Report of a Comprehensive Assessment of Marine Mammal, Marine Turtle, and Seabird Abundance and Spatial Distribution in US Waters of the Western North Atlantic Ocean - AMAPPS III*.

Nowacek, D. P., L. H. Thorne, D. W. Johnston, and P. L. Tyack. 2007. Responses of Cetaceans to Anthropogenic Noise. *Mammal Review* 37:81–115.

OBIS SEAMAP. 2023. Sea turtle sighting data. SERDP_NODES_33954. Available: http://seamap.env.duke.edu/species.

O'Brien, O., K. McKenna, B. Hodge, D. Pendleton, M. Baumgartner, and J. Redfern. 2020. *Megafauna Aerial Surveys in the Wind Energy Areas of Massachusetts and Rhode Island with Emphasis on Large Whales: Summary Report Campaign 5, 2018-2019*. OCS Study BOEM 2021-033. 83 pp.

O'Brien, O., K. McKenna, M. Baumgartner, and J. Redfern. 2021. *Megafauna Aerial Surveys in the Wind Energy Areas of Massachusetts and Rhode Island with Emphasis on Large Whales: Interim Report Campaign 6A, 2020*. OCS Study BOEM 2021-054. 32 pp.

O'Brien, O., K. McKenna, D. Pendleton, and J. Redfern. 2022. *Megafauna Aerial Surveys in the Wind Energy Areas of Massachusetts and Rhode Island with Emphasis on Large Whales: Final Report Campaign 6B, 2020-2021*. Massachusetts Clean Energy Center. 40 pp.

O'Brien, O., K. McKenna, S. Hsu, D. Pendleton, L. Ganley, and J. Redfern. 2023. *Megafauna Aerial Surveys in the Wind Energy Areas of Southern New England with Emphasis on Large Whales: Final Report Campaign 7, 2022*. OCS Study BOEM 2023-061. 61 pp.

Pace, R. M., and G. K. Silber. 2005. *Simple Analysis of Ship and Large Whale Collisions: Does Speed Kill?* Presentation at the Sixteenth Biennial Conference on the Biology of Marine Mammals, San Diego, CA, December.

Palka, D. L., S. Chavez-Rosales, E. Josephson, D. Cholewiak, H. L. Haas, L. Garrison, M. Jones, D. Sigourney, G. Waring, M. Jech, E. Broughton, M. Soldevilla, G. Davis, A. DeAngelis, C. R. Sasso, M. V. Winton, R. J. Smolowitz, G. Fay, E. LaBrecque, J. B. Leiness, Detloff, M. Warden, K. Murray, and C. Orphanides. 2017. *Atlantic Marine Assessment Program for Protected Species: 2010–2014*. OCS Study BOEM 2017-071.

Pate, J. H., and A. D. Marshall. 2020. Urban Manta Rays: Potential Manta Ray Nursery Habitat Along a Highly Developed Florida Coastline. *Endangered Species Research* 43:51–64.

Perlmutter, A. 1947. The Blackback Flounder and Its Fishery in New England and New York. *Bulletin of The Bingham Oceanographic Collection* 11:1–92.

Peterson, T. S. 2016. *Long-term bat monitoring on islands, offshore structures, and coastal sites in the Gulf of Maine, Mid-Atlantic, and Great Lakes—final report.* Washington (DC): U.S. Department of Energy. 171 p.

Prange, H. D. 1976. Energetics of Swimming of a Sea Turtle. *Journal of Experimental Biology* 64:1–12.

Quintana, E., S. Kraus, and M. Baumgartner. 2019. *Megafauna Aerial Surveys in the Wind Energy Areas of Massachusetts and Rhode Island with Emphasis on Large Whales: Summary Report Campaign 4, 2017-2018.* New England Aquarium, Anderson Cabot Center for Ocean Life, Boston, Massachusetts, and Woods Hole Oceanographic Institution, Woods Hole, Maine.

Ramey, P. 2008. Life history of a dominant polychaete, *Polygordius jouinae*, in inner continental shelf sands of the Mid-Atlantic Bight, USA. *Marine Biology* 154:443–452.

Reid, R. N., L. M. Cargnelli, S. J. Griesbach, D. B. Packer, D. L. Johnson, C. A. Zetlin, W. W. Morse, and P. L. Berrien. 1999. Essential Fish Habitat Source Document: Atlantic Herring, *Clupea harengus*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-126. 56 pp.

Rikardsen, A. H., D. Righton, J. F. Strom, E. B. Thorstad, P. Gargan, T. Sheehan, F. Okland, C. M. Chittenden, R. D. Hedger, T. F. Naesje, M. Renkawitz, J. Sturlaugsson, P. Caballero, H. Baktoft, J. G. Davidsen, E. Halttunen, S. Wright, B. Finstad, and K. Aerestrup. 2021. Redefining the Oceanic Distribution of Atlantic Salmon. *Scientific Reports* 11:12266.

Roberts J. J., L. Mannocci, and P. N. Halpin. 2016. *Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2015–2016 (Base Year).* Document version 1.0. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Roberts J. J., L. Mannocci, and P. N. Halpin. 2017. *Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2016–2017 (Opt. Year 1)*. Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Roberts J. J., L. Mannocci, R. S. Schick, and P. N. Halpin. 2018. *Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2017–2018 (Opt. Year 2)*. Document version 1.2. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Roberts J. J., R. S. Schick, and P. N. Halpin. 2020. *Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2018–2020 (Option Year 3)*. Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Roberts, J., T. Yack, and P. Halpin. 2022. *Habitat-based Marine Mammal Density Models for the U.S. Atlantic.* Updated June 20, 2022. Available: https://seamap.env.duke.edu/models/Duke/EC/.

Roberts, J. J., T. M. Yack, and P. N. Halpin. 2023. *Marine Mammal Density Models for the U.S. Navy Atlantic Fleet Training and Testing (AFTT) Study Area for the Phase IV Navy Marine Species Density Database (NMSDD)*. Document version 1.3. Report prepared for Naval Facilities Engineering Systems Command Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC.

Rogers, S. G., and M. J. Van Den Avyle. 1989. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic) Atlantic Menhaden. U.S. Department of the Interior Fish and Wildlife Service. *Biological Report* 82:11.108.

Rolland, R. M., S. E. Parks, K. E. Hunt, M. Castellote, P. J. Corkeron, D. P. Nowacek, S. K. Wasser, and S. D. Krauss. 2012. Evidence that Ship Noise Increases Stress in Right Whales. *Proceedings of the Royal Society B* 279:2363–2368.

Saila, S. B. 1961. A study of winter flounder movements. *Limnology and Oceanography* 6:292–298.

Samuel, Y., S. J. Morreale, C. W. Clark, C. H. Greene, and M. E. Richmond. 2005. Underwater, Low-Frequency Noise in a Coastal Sea Turtle Habitat. *Journal of the Acoustical Society of America* 117:1465–1472.

Schaffner, L. C., and D. F. Boesch. 1982. Spatial and temporal resource use by dominant benthic amphipoda (*Ampeliscidae* and *Corophiidae*) on the Middle Atlantic Bight Outer Continental Shelf (1982). *Marine Ecology Progress Series* 9:231–243. 10.3354/meps009231

Schuyler, Q. A., C. Wilcox, K. Townsend, B. D. Hardesty, and N. J. Marshall. 2014. Mistaken Identity? Visual Similarities of Marine Debris to Natural Prey Items of Sea Turtles. *BMC Ecology* 14. DOI: 10.1186/1472-6785-14-14.

Shackell, N. L., J. A. D. Fisher, C. E. den Heyer, D. R. Hennen, A. C. Seitz, A. Le Bris, D. Rober, M. E. Kersula, S. X. Cadrin, R. S. McBride, C. H. McGuire, T. Kess, K. T. Ransier, C. Liu, A. Czich, and K. T. Fank. 2022. Spatial ecology of Atlantic halibut across the Northwest Atlantic: A recovering species in an era of climate change. *Reviews in Fisheries Science & Aquaculture* 30:281–305.

Shigenaka, G., S. Milton, P. Lutz, R. Hoff, R. Yender, and A. Mearns. 2010. *Oil and Sea Turtles: Biology, Planning, and Response*. Reprinted in 2010. NOAA Office of Restoration and Response Publication. 116 pp.

Shigenaka, G., B. A. Stacy, B. P. Wallace. 2021. *Oil and Sea Turtles. Biology, Planning, and Rescue*. 150 pp.

Simpson, S. D., M. G. Meekan, J. C. Montgomery, R. D. McCauley, and A. G. Jeffs. 2005. Homeward Sound. *Science* 308:221. Doi:10.1126/science.1107406.

Simpson, S. D., A. N. Radford, S. L. Nedelec, M. C. O. Ferrari, M. I. McCormick, and M. G. Meekan. 2016. Anthropogenic Noise Increases Fish Mortality by Predation. *Nature Communications* 7:10544.

Sjollema A.L., J. E. Gates, R. H. Hilderbrand, and J. Sherwell. 2014. Offshore activity of bats along the Mid-Atlantic coast. *Northeastern Naturalist* 21(2):154–163.

Skalski, J. R., W. H. Pearson, and C. I. Malme. 1992. Effects of sounds from a geophysical survey device on catch-per-unit-effort in a hook-and-line fishery for rockfish (*Sebastes* spp.). *Canadian Journal of Fisheries and Aquatic Sciences* 49(7):13571365.

Slacum, H. W. Jr., W. H. Burton, E. T. Methratta, E. D. Weber, R. J. Llansó, and J. Dew-Baxter. 2010. Assemblage structure in shoal and flat-bottom habitats on the Inner Continental Shelf of the Middle Atlantic Bight, USA. *Marine and Coastal Fisheries* 2:277–298. DOI: 10.1577/C09-012.1

Slater, W. L., J. J. Pierson, M. B. Decker, E. D. Houde, C. Lozano, and J. Seuberling. 2020. Fewer Copepods, Fewer Anchovies, and More Jellyfish: How Does Hypoxia Impact the Chesapeake Bay Zooplankton Community? *Diversity* 12:d12010035.

Smith, C. R., T. K. Rowles, L. B. Hart, F. I. Townsend, R. S. Wells, E. S. Zolman, B. C. Balmer, B. Quigley, M. Ivnacic, W. McKercher, M. C. Tumlin, K. D. Mullin, J. D. Adams, Q. Wu, W. McFee, T. K. Collier, and L. H. Schwacke. 2017. Slow Recovery of Barataria Bay Dolphin Health Following the Deepwater Horizon

Oil Spill (2013–2014), with Evidence of Persistent Lung Disease and Impaired Stress Response. *Endangered Species Research* 33:127–142.

Southall, B. L., A. E. Bowles, W. T. Ellison, J. J. Finneran, R. L. Gentry, C. R. Greene Jr., D. Kastak, D. R. Ketten, J. H. Miller, P. E. Nachtigall, W. J. Richardson, J. A. Thomas, and P. L. Tyack. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals* 33:411–521.

Spidle, A. P., W. B. Schill, B. A. Lubinski, and T. L. King. 2001. Fine-Scale Population Structure in Atlantic Salmon from Maine's Penobscot River Drainage. *Conservation Genetics* 2:11–24.

Staaterman, E., C. B. Paris, and A. S. Kough. 2014. First Evidence of Fish Larvae Producing Sounds. *Biology Letters* 10:20140643. Doi:10.1098/rsbl.2014.0643.

Staaterman, E., A. J. Gallagher, P. E. Holder, C. H. Reid, A. H. Altieri, M. B. Ogburn, J. L. Rummer, and S. J. Cooke. 2020. Exposure to Boat Noise in the Field Yields Minimal Stress Response in Wild Reef Fish. *Aquatic Biology* 29:93–103.

Stanley, J. A., C. A. Radford, and A. G. Jeffs. 2012. Location, Location, Location: Finding a Suitable Home Among the Noise. *Proceedings of the Royal Society B: Biological Sciences* 279:3622–3631. Doi:10.1098/rspb.2012.0697.

Staudinger, M. D., H. Goyert, J. J. Suca, K. Coleman, L. Welch, J. K. Llopiz, D. Wiley, I. Altman, A. Applegate, P. Auster, H. Baumann, J. Beaty, D. Boelke, L. Kaufman, P. Loring, J. Moxley, S. Paton, K. Powers, D. Richardson, J. Robbins, J. Runge, B. Smith, C. Spiegel, and H. Steinmetz. 2020. The role of sand lances (*Ammodytes* sp.) in the Northwest Atlantic ecosystem: A synthesis of current knowledge with implications for conservation and management. *Fish and Fisheries* 21:522–556.

Steinback, S. R., and A. A. Brinson. 2013. *The Economics of the Recreational For-hire Fishing Industry in the Northeast United States*. U.S. Department of Commerce, Northeast Fisheries Science Center Reference Document 13-03.

Stone, K. M., S. M. Leiter, R. D. Kenney, B. C. Wikgren, J. L. Thompson, J. K. D. Taylor, and S. M. Kraus. 2017. Distribution and Abundance of Cetaceans in a Wind Energy Development Area Offshore of Massachusetts and Rhode Island. *Journal of Coast Conservation* 21:527–543.

Sullivan, L., T. Brosnan, T. K. Rowles, L. Schwacke, C. Simeone, and T. K. Collier. 2019. *Guidelines for Assessing Exposure and Impacts of Oil Spills on Marine Mammals*. NOAA Tech. Memo. NMFS-OPR-62. 82 pp.

Takeshita, R., L. Sullivan, C. Smith, T. Collier, A. Hall, T. Brosnan, T. Rowles, and L. Schwacke. 2017. The Deepwater Horizon Oil Spill Marine Mammal Injury Assessment. *Endangered Species Research* 33:96–106.

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

Tetra Tech Inc. (Tetra Tech). 2023. *Site Assessment Plan Amendment Beacon Wind Massachusetts Wind Energy Lease Areas OCS-A 0520*. Available: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/BW-Foundation-Testing-SAP-Amendment.pdf.

Tomás, J., R. Guitart, R. Mateo, and J. A. Raga. 2002. Marine Debris Ingestion in Loggerhead Turtles, *Caretta caretta*, from the Western Mediterranean. *Marine Pollution Bulletin* 44:211–216.

U.S. Atlantic Salmon Assessment Committee (USASAC). 2020. *Annual Report of the U.S. Atlantic Salmon Assessment Committee*. Report No. 33 – 2020 Activities. 185 pp.

U.S. Coast Guard (USCG). 2011*. Table 386: oil spills in U.S. water-number and volume. Pollution incidents in and around U.S. waters, a spill/release compendium: 1969–2004 and 2004–2009*. U.S. Coast Guard Marine Information for Safety and Law Enforcement (MISLE) System. Available at: https://www2.census.gov/library/publications/2011/compendia/statab/131ed/tables/12s0386.xls. Accessed: August 28, 2023.

U.S. Environmental Protection Agency (USEPA). 1986. *Quality Criteria for Water*. EPA 440/5-86-001.

U.S. Environmental Protection Agency (USEPA). 2022. *Climate Change Indicators: Oceans.* Available: https://www.epa.gov/climate-indicators/oceans. Accessed: March 2023.

Vabø, R., K. Olsen, and I. Huse. 2002. The Effect of Vessel Avoidance of Wintering Norwegian Spring Spawning Herring. *Fisheries Research* 58:59–77.

Vanderlaan, A. S. M., and C. T. Taggart. 2007. Vessel Collisions with Whales: The Probability of Lethal Injury Based on Vessel Speed. *Marine Mammal Science* 23:144–156.

Van Parjis, S. M., C. Curtice, and M. C. Ferguson. 2015. Biologically Important Areas for Cetaceans within U.S. Waters. *Aquatic Mammals* 41:1–128.

Vargo, S., P. Lutz, D. Odell, E. Van Vleet, and G. Bossart. 1986. *Effects of Oil on Marine Turtles*. Final Report prepared for the Minerals Management Service (MMS). 12 pp. Available: http://www.seaturtle.org/PDF/VargoS_1986a_MMSTechReport.pdf. Accessed: September 2020.

Wale, M. A., S. D. Simpson, and A. N. Radford. 2013. Size-Dependent Physiological Responses of Shore Crabs to Single and Repeated Playback of Ship Noise. *Biology Letters* 9:20121194. Doi:10.1098/rsbl.2012.1194.

Walsh, H. J., D. E. Richardson, K. E. Marancik, and J. A. Hare. 2015. Long-Term Changes in the Distributions of Larval and Adult Fish in the Northeast U.S. Shelf Ecosystem. *PLOS ONE* 10:e0137382.

Warner, G., and A. McCrodan. 2011. *Chapter 3 Underwater Sound Measurements*. Pages 2.1–3.83 in K. Hartin, L. Bisson, S. Case, D. Ireland, and D. Hannay (eds.), Marine Mammal Monitoring and Mitigation During Site Clearance and Geotechnical Surveys by Statoil E&P Inc. In The Chukchi Sea, August-October 2011: 90-Day Report. Anchorage, AK.

Watwood, S. L., and D. M. Buonantony. 2012. *Dive Distribution and Group Size Parameters for Marine Species Occurring in Navy Training and Testing Aras in the North Atlantic and North Pacific Oceans.* Newport, Rhode Island. NUWC-NPT Technical Document 12,085. March 2012. Available: https://apps.dtic.mil/sti/pdfs/ADA560975.pdf. Accessed: June 2022.

Werner, S., A. Budziak, J. van Franeker, F. Galgani, G. Hanke, T. Maes, M. Matiddi, P. Nilsson, L. Oosterbaan, E. Priestland, R. Thompson, J. Veiga, and T. Vlachogianni. 2016. *Harm Caused by Marine Litter*. MSFD GES TG Marine Litter—Thematic Report; JRC Technical report; EUR 28317 EN. DOI: 10.2788/690366. Available: https://publications.jrc.ec.europa.eu/repository/bitstream/JRC104308/lbna28317enn.pdf. Accessed: September 2020.

Wiernicki, C. J., D. Liang, H. Bailey, and D. H. Secor. 2020. The Effect of Swim Bladder Presence and Morphology on Sound Frequency Detection for Fishes. *Reviews in Fisheries Science & Aquaculture* 28:459–477.

Wilber, D. H., and D. G. Clarke. 2007. Defining and Assessing Benthic Recovery Following Dredging and Dredged Material Disposal. Pages 603–618 in R.E. Randall (ed.), *Proceedings of the XVIII World Dredging Congress*. Lake Buena Vista, FL, USA. Newman Printing Co., Bryan, TX, USA.

Wilkens, J. L., A. W. Katzenmeyer, N. M. Hahn, J. J. Hoover, and B. C. Suedel. 2015. Laboratory Test of Suspended Sediment Effects on Short-Term Survival and Swimming Performance of Juvenile Atlantic Sturgeon (*Acipenser oxyrinchus oxyrunchus*, Mitchill, 1815). *Journal of Applied Ichthyology* 31:984–990.

Wysocki, L. E., J. P. Dittami, and F. Ladich. 2006. Ship Noise and Cortisol Secretion in European Freshwater Fishes. *Biological Conservation* 128:501–508.

Zykov, M. M., L. Bailey, T. J. Deveau, and R. G. Racca. 2013. *South Stream Pipeline – Russian Sector – Underwater Sound Analysis*. Technical report by JASCO Applied Sciences for South Stream Transport B.V.

APPENDIX E: Public Comments and BOEM's Responses

E.1 Introduction

The Bureau of Ocean Energy Management (BOEM) solicited comments from the public on the Environmental Assessment (EA) for Additional Site Assessment Activities on Beacon Wind, LLC's Renewable Energy Lease OCS-A 0520 during:

- A 30-day public scoping period from November 7 to December 7, 2023.
- A 30-day public comment period on the Draft EA from February 2 to March 4, 2024.

This appendix outlines the methodology used to analyze public comments, summarizes key themes or issues conveyed in comments, and provides BOEM's responses.

E.1.1 Notice of Intent to Prepare an EA

On November 7, 2023, BOEM released a Notice of Intent (NOI; https://www.federalregister.gov/documents/2023/11/07/2023-24610/notice-of-intent-to-prepare-an-environmental-assessment-for-additional-site-assessment-activities-on) to prepare this EA for additional site assessment activities in Lease Area OCS-A 0520 offshore Massachusetts, which commenced the public scoping process for identifying issues for consideration in the EA. The formal scoping period was from November 7 through December 7, 2023. During this timeframe, federal agencies, state and local governments, and the general public had the opportunity to help BOEM identify potential significant resources and issues, impact-producing factors (IPFs), reasonable alternatives, and potential mitigation measures to analyze in the EA, as well as to provide additional information. During the 30-day comment period, BOEM received 9 unique comment submissions from representatives of federal, state, or regional government entities; business associations; advocacy groups; and the general public. The comments can be viewed at www.regulations.gov by searching for docket ID BOEM-2023-062.

E.1.2 Notice of Availability of a Draft EA

On February 2, 2024, BOEM published a Notice of Availability (https://www.federalregister.gov/documents/2024/02/02/2024-02065/notice-of-availability-of-a-draft-environmental-assessment-for-additional-site-assessment-activities) of the Draft EA for additional Site Assessment Plan activities offshore Massachusetts in the Federal Register. The Draft EA was available for public comment through March 4, 2024. During the comment period BOEM held two virtual public meetings for the Draft EA on February 23 and February 28, 2024. During the 30-day comment period, BOEM received 17 unique comment submissions from representatives of federal, state, or regional government entities, business associations, advocacy groups, and individuals, including 5 comments made verbally during the virtual public meetings. The EA comments can be viewed at www.regulations.gov under docket ID BOEM-2024-0006.

E.1.3 Comment Review and Response Protocol

All comment submissions were reviewed and systematically categorized in the same manner. One or more comment excerpts from each submission were categorized to a single topic and summarized for review and response.

E.2 Summary of Comments

This section provides an overview and summary of the comments received during scoping and the EA comment period by topic and is not intended to be a reproduction of the exact wording of individual comments. The summaries illustrate the varied issues, concerns, and requested changes presented in the public comments. For some resources, the summary information is more detailed, as these resources received more detailed comments. BOEM responses to comments refer readers to where issues are discussed in the Final Environmental Assessment (EA), acknowledging revisions made in response to comments or provide rationale for not making revisions, and provide other clarifications and information.

E.2.1 Proposed Action

Comment Summary

Commenters urged BOEM to require relevant geological information to be available early in the process, stating that it has the potential to change the Project design.

Multiple commenters requested that the resiliency of suction buckets to extreme weather conditions be analyzed as storm frequency will increase due to climate change, and another stated that the proposed sites for the Foundation Tests should be representative of the entire Project area and contain multiple soil types.

Commenters encouraged the use of quieter foundations during Project installation and encouraged these options to be selected as the Preferred Alternative.

One commenter, the Massachusetts Office of Coastal Zone Management, stated all portions of the suction bucket and associated equipment must be removed upon completion of testing.

One commenter expressed concern that the size of the suction bucket testing would not be indicative of the size of suction buckets that would be installed in the future.

One commenter inquired about glauconite soils and how that will affect the placement of turbines.

BOEM Response to Comments

Comments in support of, and opposition to, the site assessment activities within the Beacon Wind Lease Area are noted.

As discussed in **Section 2** of the EA, this analysis does not consider whether a site is suitable for commercial development, as will be determined during BOEM's review of the Lessee's Construction and Operations Plan (COP). An environmental analysis of the Project-specific design parameters would be conducted at that time.

As discussed in **Section 3.2** of the EA, at the completion of each test, the pump would slowly return water to the interior of the bucket to create positive pressure inside the bucket, allowing it to be removed from the seafloor. Additionally, following the completion of testing, Beacon Wind will ensure that the seafloor has been cleared of all obstructions created by activities on the lease.

As discussed in **Section 3.2.1** of the EA, the suction bucket equipment used in the tests will have a diameter of 30 to 39 feet (9 to 12 meters), a height of 36 to 39 feet (11 to 12 meters), a total weight of approximately 200 tons, and will be similar to that considered within the COP for the suction bucket jacket foundation.

Determination of foundation type utilized is dependent on the geological conditions of the Lease Area. The Proposed Action and purpose of suction bucket testing is to gather data, assess foundation feasibility, and refine foundation design given Lease Area geophysical and geotechnical conditions. Glauconitic sands impose constraints on pile driving for monopile foundations, causing pile refusal. Suction bucket foundations require a shallower depth penetration than monopiles and use different installation methods that are less influenced by glauconite sands. Thus, developers could install suction bucket jackets in areas that have glauconitic sands at depths that may interfere with monopile installation. Turbine layout and development of alternatives are analyzed in the COP and will be analyzed in the associated Environmental Impact Statement (EIS).

Please refer to **Section 1.1**, which has been revised to add the detail for "geologic and geotechnical" in the site conditions description: "The Proposed Action will be conducted to further assess the geological and geotechnical site conditions and gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area for the proposed Beacon Wind Project." Additional information about glauconite soils can be found in the white paper *Supporting National Environmental Policy Act Documentation for Offshore Wind Energy Development Related to Glauconite Sand* (Bruggeman et al. 2023) that is incorporated by reference in this EA.

E.2.2 Alternatives

Comment Summary

One commenter discussed various concepts, strategies, tools, and safeguards for BOEM to consider including when developing the range of alternatives for the Proposed Action. These consisted of vessel traffic plans, additional monitoring technologies such as infrared camera detection devices, limitations on vessel speeds to less than 10 knots, and requiring vessels to be equipped with Class A automatic Identification System devices in order to minimize effects on marine wildlife, specifically North Atlantic right whales (NARWs).

A commenter encouraged BOEM to include alternatives specific to each phase of the Project to ensure environmental effects are avoided or mitigated.

BOEM Response to Comments

The EA includes all relevant Project Design Criteria (PDC) and Best Management Practices (BMPs) from the 2021 programmatic consultation for site characterization activities associated with offshore wind leases on the Atlantic Outer Continental Shelf as mitigation measures rather than alternatives.[4] These PDC and BMPs include many of the measures suggested by commenters. BOEM will ensure that impacts of the Proposed Action are avoided or minimized to the greatest extent practicable and that the Proposed Action includes robust, enforceable mitigation measures for anticipated impacts.

E.2.3 National Environmental Policy Act / Public Involvement Process

Comment Summary

One commenter felt that an EA is not required for the Proposed Action, stating that the 2014 EA was comprehensive enough to cover the planned actions and anticipated impacts and encouraging BOEM to approve revisions to the Site Assessment Plan (SAP) without preparing an EA. The commenter cited concern for delays that could be a disincentive or preclude the use of the foundation technology, urging BOEM to be mindful of timing issues when preparing and publishing the EA. The commenter suggested that if BOEM was to move forward to an EA, to do so under certain conditions including immediately preparing a Final EA at the close of the scoping period, revising the 2014 EA based on comments received, and/or applying applicable Standard Operating Conditions from the 2014 EA.

Commenters also requested for BOEM to ensure the SAP clarifies which data relative to the Proposed Action would be treated as public versus confidential business information, data used in preparing the EA is based on actual observations and representative of key processes, and the Project complies with existing laws. One commenter asked that BOEM prepare an EIS if impacts from the Proposed Action are found to be significant.

Commenters requested that data from the suction bucket Foundation Tests be made available to the public and accessible on a publicly available website as quickly as possible, along with any other site assessment information and reports and data related to the Project and its monitoring program.

Multiple commenters expressed concern regarding BOEM's current approach to public engagement. Commenters stated that BOEM has historically ignored requests for transparency and authentic inclusion, preventing meaningful engagement. Commenters requested that BOEM work to improve communication and forge working relationships with stakeholder groups and the public.

Multiple commenters expressed dislike for the way BOEM organizes the virtual public meetings because the public comment period comes before the question and answer period. These commenters request the question and answer period come first so commenters can shape their comments based on BOEM's answers.

One commenter requested the Draft EA comment period be extended for an additional 30 days.

One commenter requested BOEM prepare an EIS if impacts after analysis of the Proposed Action are found to be significant.

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[4] Available at: https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%201222021.pdf.

BOEM Response to Comments

BOEM notes the commenter's request to immediately prepare a Final EA.

BOEM has published the SAP Amendment on the Beacon Wind webpage available at: https://www.boem.gov/renewable-energy/state-activities/beacon-wind.

BOEM is using regulatory tools and working with partners and stakeholders to avoid, minimize, and mitigate impacts and equitably distribute benefits. BOEM is also working to enhance engagement with environmental justice communities.

BOEM notes commenters' request to consider reorganizing the format of future virtual public meetings. By having the public comment period come before the question and answer session of the public meetings, BOEM subject matter experts are given necessary time to be able to meaningfully respond to and answer questions that have been posed, citing specific resources or sections of the EA in their responses.

BOEM notes the commenter's request to extend the comment period. The public was informed of this Project's 30-day comment period as required by the National Environmental Policy Act (NEPA) via the *Federal Register*, as well as BOEM's website (https://www.boem.gov/renewable-energy/state-activities/beacon-wind), where it was stated that the public had until the beginning of March 2024 to submit comments.

This EA was prepared to determine whether the proposed suction bucket testing would lead to reasonably foreseeable significant impacts on the environment. BOEM has determined that an EA is the appropriate level of NEPA review for the Proposed Action because EAs are prepared for actions that are not likely to have significant effects on the human environment (40 CFR § 1501.5(a)), as supported by the analysis in this EA. Additionally, this EA supplements analysis presented in BOEM's 2014 revised EA and focuses on new site assessment activities and their potential impacts that have not been previously evaluated.

E.2.4 Connected Actions, Planned Actions Scenario, and Cumulative Impacts

Comment Summary

One commenter encouraged BOEM to consider both immediate and cumulative impacts on ocean wildlife when reviewing the Proposed Action and include an analysis of the effects of the Proposed Action on species listed under the Endangered Species Act (ESA) and Marine Mammal Protection Action.

One commenter, the National Park Service (NPS), stated that there are many resources in the National Park System that could be affected by BOEM's subsequent actions related to Beacon Wind LLC's renewable energy lease, including offshore development activities. The NPS also stated concern for other resources, including National Historic Landmarks, National Natural Landmarks, and Water Conservation Fund properties. They stated the concern that connected onshore activities may include direct impacts should the construction of export cable landings or onshore transmission connections be proposed for siting within or adjacent to NPS units and/or program lands.

One commenter stated that guidance should be consistent across projects along the East Coast regarding grid layout, mitigation, and data collection.

One commenter, the National Marine Fisheries Service (NMFS), requested for the data from the suction bucket testing to be incorporated in the Beacon Wind EIS as quickly as possible. Incorporating substantial new information later in the process could cause timeline challenges and affect NMFS' ability to provide meaningful reviews of the EIS at early stages.

One commenter expressed support that the results of the suction bucket testing and stated BOEM should encourage other offshore wind lease areas to use suction bucket technology due to its quiet installation.

BOEM Response to Comments

Cumulative impacts are referred to as planned actions in this EA. Planned actions are described in **Appendix C**. This EA addresses site assessment activities in the specifically identified Beacon Wind Lease Area. Potential impacts of the future Beacon offshore wind development will be assessed in the EIS as the Lessee submitted a COP to BOEM on June 5, 2023. Cumulative impacts for other existing and future offshore wind development projects will be assessed in the EIS. If available, data/results from the suction bucket Foundation Test will be assessed/evaluated in the EIS.

E.2.5 Mitigation and Monitoring

Comment Summary

Commenters provided various mitigation and monitoring measures to minimize impacts to marine mammals, particularly NARW, for BOEM to consider or include in the EA. Suggested measures included use of protected species observers, implementation of clearance and shutdown zones, seasonal restrictions for noise-producing activities, vessel speed restrictions, implementation of vessel separation distances, and training and reporting requirements. Commenters also recommended vessel speed restrictions in areas where sea turtles may be foraging. Commenters also urged BOEM to incentivize the use of environmentally responsible design alternatives, to ensure the developer's actions aim to avoid, mitigate, and monitor impacts, and to increase the overall rigor of the mitigation measures proposed for the Proposed Action.

One commenter inquired what BOEM has in place for monitoring of suction bucket testing.

BOEM Response to Comments

The EA will include all relevant PDC and BMPs from the 2021 programmatic consultation for site characterization activities associated with offshore wind leases on the Atlantic Outer Continental Shelf.[5] These PDC and BMPs include many of the measures suggested by commenters. BOEM will ensure that impacts of the Proposed Action are avoided or minimized to the greatest extent practicable and that the Proposed Action includes robust monitoring and enforceable mitigation measures for anticipated impacts.

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[5] Available at: https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%2011222021.pdf

E.2.6 Benthic Resources

Comment Summary

One commenter requested that benthic resources be studied further. Comments encouraged studies on sediment characterization, resuspension of sediments, plume dispersal, and deposition to be conducted.

One commenter stated that the Proposed Action may have different habitat impacts compared to other foundation technologies and urged BOEM to ensure this difference was fully accounted for and analyzed in the EA.

Multiple commenters, including the Massachusetts Office of Coastal Zone Management and the Environmental Protection Agency (USEPA), stated that data collection and analysis concerning possible turbidity effects from sediment disturbance and resuspension are recommended during all installation tests and should be collected to allow for accurate assessment of size, extent, and duration of sediment plumes in and around the installation sites. The USEPA stated that data obtained from monitoring will help inform the potential for impacts on fish spawning and foraging habitat impacts from construction.

The commenter also requested that associated spatially referenced measurements of sea conditions, currents, seafloor, geology, etc., should be made concurrently with turbidity measurements to allow turbidity results to be generalized to the greatest extent possible. The commenter also requested in the event that suction bucket testing brings to the surface any previously buried boulders greater than 0.5 m or any boulders greater than 0.5 m that are relocated to facilitate suction bucket testing, that the new location of the boulder should be recorded and reported to BOEM and to mariners that use the area. They requested BOEM specify boulder-relocation reporting requirements similar to those required for other offshore wind construction activities. One commenter stated that a more thorough analysis of the benthic substrate and site characterization tests should be conducted throughout the Lease Area.

BOEM Response to Comments

The EA evaluates all potential impacts of the Proposed Action, including but not limited to resuspension of sediments, sediment plume dispersal, and sediment deposition. Additionally, habitat impacts related specifically to suction bucket foundations are analyzed using best available information. The EA outlines all monitoring that will be conducted as part of the Proposed Action, and, at this time, BOEM is not requiring any additional monitoring, such as turbidity measurements. Surveys characterizing the substrate and benthic communities throughout the Lease Area and export cable routes have been conducted, and their results are presented in the Beacon Wind COP. At this time, no boulders are anticipated to be relocated.

E.2.7 Finfish, Invertebrates, and Essential Fish Habitat

Comment Summary

Commenters urged BOEM to assess impacts on ichthyoplankton and ensure discussions of sediment and habitat disturbance, direct and indirect effects, the extent of the area effected, and effects of pumping water on eggs, larvae, and prey organisms, as well as how activities will avoid and minimize adverse impacts on Essential Fish Habitat (EFH), were included in the Proposed Action’s EA, Biological Assessment (BA), and EFH Assessment.

Another commenter requested that the EA include a detailed assessment of the effects the Project will have on EFH, as well as a range of alternatives to minimize effects and conserve these habitats. The commenter requested that particular attention be given to areas designated as Habitat Areas of Particular Concern (HAPC) due to their ecological importance and sensitivity. The commenter noted that the New England Fishery Management Council voted to establish a new HAPC that overlaps with offshore wind energy lease sites in southern New England and requested that BOEM ensure this area is considered in its EFH consultation.

The commenter also encouraged BOEM to consult with the New England Fishery Management Council to provide recommendations concerning activities that may affect EFH, as well as with state and regional managers of the Atlantic States Marine Fisheries Commission to minimize effects on inshore fisheries and habitats.

One commenter stated that additional monitoring and data collection of ichthyoplankton entrainment is needed to better understand the risks associated with the suction bucket pump system.

One commenter stated that the total loss of larvae and other age classes of fish due to entrainment per day and per month as was done for the Draft EA should be analyzed for the entire Beacon Wind Lease Area if the suction bucket system is used throughout, due to the water pump flow. The commenter also stated that this must be analyzed as if the entire Lease Area were using suction buckets, along with suction bucket systems occupying 80%, 60%, 40%, and 20% of the Lease Area along with whatever cooling water intake systems are utilized as DC converter stations.

One commenter requested that sediment plume dispersal, sediment deposition, and habitat disturbance should be analyzed as a discussion of the Lease Area and EFH along with HAPCs, including those recently added by the New England Fishery Management Council.

One commenter stated the Atlantic cod HAPC overlaps the entire Beacon Wind Lease Area and is not acknowledged in the Draft EA and recommends an analysis to include a detailed discussion of the Project’s proximity with documented Atlantic cod spawning activity and evaluation of impacts on Atlantic cod spawning and sensitive life history stages EFH (i.e., egg and larvae) that would occur as a result of the proposed suction bucket testing be included in the Final EA.

One commenter, NMFS, requested the Final EA incorporate the Final EFH Assessment and the conclusion of the EFH consultation.

BOEM Response to Comments

The EA evaluates all potential impacts on finfish, invertebrates, and EFH, including but not limited to potential disturbance of sediments and habitat, with associated sediment resuspension and deposition, and entrainment. These evaluations include the spatial extent of impacts where appropriate. The EA also includes measures to avoid or minimize impacts. Detailed evaluations for ESA-listed fish species and EFH have been provided in the BA and EFH Assessment for the Proposed Action, respectively, which are included in **Appendix G**.

The loss of ichthyoplankton due to entrainment was estimated based on available ichthyoplankton data from scientific surveys conducted in the area. Using this information, losses due to entrainment associated with Foundation Testing were calculated from ichthyoplankton densities and the proposed water volumes that will be pumped by suction bucket installations. An evaluation of suction bucket installation throughout the Lease Area is outside the scope of the EA. Such an evaluation will be undertaken for the Beacon Wind EIS.

The EA identifies species with EFH in the area affected by the Proposed Action and evaluates all potential impacts on these habitats. A discussion has been added addressing the overlap between the Beacon Wind Lease Area and HAPC for Atlantic cod. Specific habitat requirements for spawning adult and juvenile Atlantic cod include gravel or rocky hardbottom habitats with or without eelgrass; these habitats are not found within the Lease Area.

BOEM has consulted with the NMFS under the Magnuson-Stevens Fishery Conservation and Management Act regarding potential impacts on EFH. The conclusion of the EFH consultation and Final EFH Assessment can be found in **Appendix G**. Other interested agencies also had the opportunity to comment on the Draft EA, and their comments are addressed in the Final EA.

E.2.8 Marine Mammals

Comment Summary

Commenters expressed concern over potential negative effects the Proposed Action could have on marine mammals, including the NARW. Commenters stated that wind turbines could disrupt dense concentrations of zooplankton whales depend upon and that whales could be accidentally hit by vessels or entangled in offshore wind turbine cables and killed. One commenter felt that there were significant knowledge gaps in the feeding patterns and prey selection of NARWs in the Nantucket Shoals region, stating that more information is needed before offshore wind construction can begin.

Commenters were also concerned about the potential direct and indirect noise impacts on whales and sea turtles, including habitat displacement. One commenter requested that a visual clearance zone and exclusion zone be established around each vessel conducting activities with noise levels that could harm whales.

Multiple commenters expressed concern over the potential for the Proposed Action to result in NARW mortalities from vessel strikes. Many commenters urged BOEM to require restrictions on vessel speeds, specifically between certain times of the year, for vessels of greater size, and within NARW Dynamic Management Areas. Commenters also felt that vessels should be required to carry and use protected species observers and maintain specified separation distances from large whales.

One commenter requested that BOEM conduct consultation and permitting under the ESA and Marine Mammal Protection Act, completing a biological opinion and obtaining Incidental Harassment Authorizations.

One commenter, the NMFS, requested the Final EA incorporate the Final BA, including the description of listed species in the action area, the assessment of effects, and the conclusion of the ESA consultation. One commenter, the USEPA, encouraged BOEM to establish appropriate time of year restrictions on the proposed suction bucket testing to avoid work during periods of time when NARWs are more likely to be present in the Lease Area.

BOEM Response to Comments

The EA evaluates all potential impacts of the Proposed Action of only one vessel trip during a 2-week period and includes but is not limited to noise and vessel strikes on marine mammals. Impacts on NARW are further evaluated in the BA for the Proposed Action, which is included in **Appendix G**. As described in **Section E.2.5**, the EA includes mitigation measures to ensure that impacts of the Proposed Action are avoided or minimized to the greatest extent practicable. The mitigation measures do not include time of year restrictions; the mitigation measures included in the Proposed Action and required by BOEM minimize the impacts of the Foundation Testing activities on marine mammals. The Proposed Action has undergone all applicable consultations, including consultations under the National Environmental Protection Act, the ESA, and the Marine Mammal Protection Act. BOEM notes that the Proposed Action does not include construction of any offshore wind structures, as is suggested by some comments received on the NOI.

E.2.9 Bats

Comment Summary

One commenter stated that technology for detection and tracking of sea foraging or migrating birds and bats has greatly improved since 2016 and continues to improve and recommended further study.

BOEM Response to Comments

The U.S. Fish and Wildlife Service (USFWS) concurs with BOEM's no effect determination for impacts of the suction bucket testing on birds and bats located within the Proposed Action area that are covered under the ESA Section 7.

E.2.10 Navigation and Vessel Traffic

Comment Summary

One commenter requested requirements for all vessels to follow vessel plans and rules and specifying that developers are liable for the behavior of all employees, vessels, and machineries.

BOEM Response to Comments

BOEM maintains continuous lines of communication with the U.S. Coast Guard (USCG) and is following their recent Port Access Route Study processes as USCG works to designate shipping safety fairways along the Atlantic.

E.2.11 Noise

Comment Summary

One commenter asked BOEM to ensure that the Biological Assessment, EFH Assessment, and EA fully addressed potential noise impacts, specifically from vessel survey equipment. Another commenter requested the EA require the best available technology to be used to minimize sound levels, coupled with a monitoring and reporting program to ensure compliance. One commenter felt that more information is needed on how much noise suction pump technologies generate relative to background noise.

BOEM Response to Comments

The EA will evaluate noise impacts of the Proposed Action based on the best available science. As noted above, the EA will include appropriate mitigation measures to ensure that impacts of the Proposed Action are avoided or minimized to the greatest extent practicable.

E.2.12 Commercial and Recreational Fishing

Comment Summary

One commenter requested that BOEM refer to their previous comments submitted on the Beacon Wind Construction and Operations Plan EIS for further information on fisheries and fishing communities that may be affected by the Proposed Action.

BOEM Response to Comments

The Draft EA will provide a description of commercial and recreational fisheries resources in the Lease Area based on NMFS socioeconomic impact summary reports from 2008 to 2021. The description of resources will be broken down by species and by fishing port to characterize fisheries and fishing communities that may be affected by the Proposed Action.

E.2.13 Scenic and Visual Resources

Comment Summary

One commenter, the NPS, expressed concern for resources under their jurisdiction because of visual impacts of commercial wind energy developments in the Beacon Wind Lease Area.

BOEM Response to Comments

The suction bucket testing only includes temporary and short-term vessel activity and does not include placement of permanent infrastructure. As described in Section 3.3.9 of the EA, impacts on visual resources would be short term and negligible. This EA does not consider construction and operation of any wind power facilities.

E.2.14 General Support or Opposition

Comment Summary

BOEM received comments both in support of and opposition to the development of the Proposed Action. Many commenters expressed their support for the use of quiet foundation types and were hopeful that the Proposed Action could provide valuable information to advance deployment of quiet foundation technologies for offshore wind and mitigate noise impacts from offshore wind construction. Commenters urged BOEM to ensure these positive outcomes were adequately discussed in the EA. Commenters felt that more information, as an outcome of the Proposed Action, could enable developers to make more reasonable and rational decisions. Commenters also expressed support for conducting an environmental review of the Proposed Action during the Site Assessment phase of development.

A few commenters expressed their opposition for the Proposed Action, stating that offshore wind farms pose a significant threat to endangered wildlife, specifically NARWs, during both initial construction and operation. One commenter expressed concern that the Proposed Action was in violation of the ESA because of the potential threat it posed to the NARWs.

BOEM also received comments that addressed multiple topics more generally. These comments urged BOEM to use the best available science and ensure the EA is updated with current knowledge, science, technology, and practice and takes into account similar projects and their successes. One comment recommended the use of turbines that emit lower noise levels, and another recommended the use of ecological and nature-based design elements to minimize negligible impacts and create marine habitat opportunities.

BOEM Response to Comments

BOEM acknowledges both the public's support and opposition for the Proposed Action and offshore wind development generally. BOEM assessed impacts on threatened and endangered species and concluded ESA consultation with both NMFS and USFWS. Please reference **Section 6** and **Appendix G**. Testing this new technology for suction bucket foundations could reduce pile driving impacts utilized for other foundation types if this foundation is implemented for future projects.

APPENDIX F: Standard Operating Conditions

This section lists the Standard Operating Conditions (SOCs) and mitigation that are part of the Proposed Action. The SOCs were developed by the Bureau of Ocean Energy Management (BOEM) in coordination with cooperating agencies to avoid, minimize, or mitigate potential impacts.

1 General Requirements

1.1 Prior to the start of operations, the Lessee must hold a briefing to establish responsibilities of each involved party, define the chains of command, discuss communication procedures, provide an overview of monitoring procedures, and review operational procedures. This briefing must include all relevant personnel, crew members, and protected species observers. New personnel must be briefed as they join the work in progress.

1.2 The Lessee must ensure that all vessel operators and crew members, including protected species observers, are familiar with, and understand, the requirements specified in Addendum C [https://www.boem.gov/sites/default/files/documents/regions/pacific-ocs-region/renewable-energy/Lease%20OCS-A%200520.pdf] of the lease.

1.3 Endangered Species Act (ESA) Consultation for Biological Surveys. The Lessee must consult with BOEM, the National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS) prior to designing and conducting a literature review intended to support offshore renewable energy plans that could interact with ESA-listed species.

2 Protected Species

2.1 Project Design Criteria and Best Management Practices for Protected Species. The Lessee must comply with all the Project Design Criteria (PDC) and Best Management Practices (BMPs) in BOEM's *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection*[6] that implement the integrated requirements for threatened and endangered species in the June 29, 2021, programmatic consultation under the ESA, revised November 22, 2021. The relevant PDC and BMPs, and the mitigation measures Beacon must implement to comply with them, are identified below.

2.1.1 The Lessee must ensure the Foundation Testing vessel utilizes dynamic positioning thrusters during suction bucket installation and removal, which will avoid anchoring impacts on benthic resources in accordance with BMP 1.1 under PDC 1.

2.1.2 The Lessee must ensure that Foundation Testing is conducted at sites without sensitive benthic habitats (e.g., hard bottom, seagrass), which will avoid impacts on these benthic resources in accordance with BMP 1.1 under PDC 1.

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[6] Available at https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%201222021.pdf.

2.1.3 The Lessee must conduct marine debris awareness training, as described in BMP 3.1 under PDC 3, and submit a training compliance report, as described in BMP 3.2 under PDC 3.

2.1.4 The Lessee must recover marine trash and debris resulting from the proposed Project that could cause undue harm or damage to natural resources, in accordance with BMP 3.4 under PDC 3.

2.1.5 The Lessee must comply with measures to minimize vessel interactions with protected species, as described under PDC 5 and 7, including BMPs 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 7.2, 7.4, and 7.5.

2.1.5.1 The Lessee must ensure the Foundation Testing vessel captain and crew maintain a vigilant watch for all protected species and reduce speed, stop the vessel, or alter course, as appropriate, to avoid striking any listed species.

2.1.5.2 The Lessee must ensure any time the Foundation Testing vessel is underway, the vessel maintains a 1,640-foot (500-meter) separation distance from ESA-listed species, including unidentified large whales, and a trained lookout monitors a Vessel Strike Avoidance Zone of at least 1,640 feet (500 meters).

2.1.5.3 The Lessee must ensure that if the trained lookout is a vessel crew member, this is their designated role and primary responsibility, and they receive training on protected species identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements.

2.1.5.4 The Lessee must ensure all vessel crew members are briefed in the identification of protected species that may occur in the action area and in regulations and best practices for avoiding vessel collisions. Reference materials for identification of ESA-listed species must be available on board the vessel, and the Lessee must clearly communicate, and post in highly visible locations, the expectation and process for reporting of protected species sightings.

2.1.5.5 The Lessee must ensure that if an ESA-listed whale or unidentified large whale is observed within 1,640 feet (500 meters) of the forward path of the vessel, the operator steers a course away from the whale at 10 knots (18.5 kilometers per hour) or less until the 1,640-foot (500-meter) minimum separation distance has been established. The vessel operator may also shift to idle if feasible.

2.1.5.6 The Lessee must ensure that if a large whale is sighted within 656 feet (200 meters) of the forward path of a vessel, the vessel operator reduces speed and shifts the engine to neutral. Engines must not be engaged until the whale has moved outside of the vessel's path and beyond 1,640 feet (500 meters). If stationary, the vessel must not engage engines until the large whale has moved beyond 1,640 feet (500 meters).

2.1.5.7 The Lessee must ensure that if a sea turtle or manta ray is sighted at any distance within the operating vessel's forward path, the vessel operator slows down to 4 knots (7.4 kilometers per hour) and steers away (unless unsafe to do so). The vessel may resume normal vessel operations once the vessel has passed the individual.

2.1.5.8 The Lessee must ensure that during times of year when sea turtles are known to occur in the action area, the vessel avoids transiting through areas of visible jellyfish aggregations or floating vegetation (e.g., sargassum lines or mats). In the event that operational safety prevents avoidance of such areas, the vessel must slow to 4 knots (7.4 kilometers per hour) while transiting through such areas.

2.1.5.9 The Lessee must ensure a trained lookout is posted during all times to avoid interactions with ESA-listed species when a vessel is underway (transiting or surveying) by monitoring in all directions; during any nighttime transits, the lookout will be equipped with night vision and/or infrared equipment to aid in detection of ESA-listed species.

2.1.5.10 The Lessee must ensure all crew members responsible for navigation duties receive site-specific training on ESA-listed species sighting/reporting and vessel strike avoidance measures.

2.1.5.11 The Lessee must ensure the Foundation Testing vessel does not divert course to approach any ESA-listed species or other marine mammal species.

2.1.5.12 The Lessee must ensure the Foundation Testing vessel reduces speed to 10 knots (18.5 kilometers per hour) or less while operating in any Slow Zone, except in areas within a portion of a visually designated Dynamic Management Area or Slow Zone where it is not reasonable to expect the presence of North Atlantic right whales (NARWs; e.g., Long Island Sound, shallow harbors).

2.1.5.13 The Lessee must ensure the vessel operator checks for information regarding mandatory or voluntary ship strike avoidance (Seasonal Management Areas and Dynamic Management Areas [or Slow Zones that are also designated as Dynamic Management Areas]) and daily information regarding NARW sighting locations. These media may include but are not limited to: NOAA weather radio, U.S. Coast Guard NAVTEX and channel 16 broadcasts, Notices to Mariners, the Whale Alert app, or WhaleMap website.

2.1.6 The Lessee must comply with the reporting requirements described under PDC 8.

2.2 Vessel Speed Restrictions. In compliance with Lease OCS-A 0520, the Lessee must ensure the Foundation Testing vessel would operate at 10 knots or less in all U.S. waters between November 1 and July 31.

2.3 Avoid Interactions with Protected Species. The Lessee must ensure protected species observers or trained Project personnel monitor for listed species in the Foundation Testing area prior to and during deployment and retrieval of the suction bucket and reference frame, and work must be stopped if ESA-listed species are observed within 1,640 feet (500 meters) of the Foundation Testing vessel.

3 Essential Fish Habitat Conservation Recommendations

3.1 Pursuant to Section 304(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act, BOEM provided detailed responses to NMFS's EFH conservation recommendations. The conditions developed are identified below and can be found in Appendix G.

3.1.1 Turbidity Monitoring Plan. The Lessee must provide the results of in situ turbidity monitoring to BOEM, BSEE, and NMFS HESD upon completion of the Foundation Testing.

3.1.2 Suction Bucket Flow Rate Monitoring Plan. The Lessee must provide the results of flow rate monitoring to BOEM, BSEE, and NMFS HESD upon completion of Foundation Testing.

3.1.3 The Lessee must avoid placing the reference frame in areas of known sensitive benthic habitat. The term "sensitive benthic habitats" will be used to encompass: complex habitats and benthic features (defined as coarse unconsolidated mineral substrates [i.e., substrates containing 5% or greater gravels], rock substrates [e.g., bedrock], and shell substrates [e.g., mussel reef] consistent with CMECS definitions as well as vegetated habitats [e.g., SAV], bathymetric features (such as lumps, banks, and scarps) and other areas of high habitat heterogeneity (diversity of structural elements including bathymetric features) and complexity)).

4 Archaeological Requirements

4.1 Archaeological Survey Required. The Lessee must provide the results of an archaeological survey with its plans.

4.2 Qualified Marine Archaeologist. The Lessee must ensure that the analysis of archaeological survey data collected in support of plan (e.g., Site Assessment Plan [SAP] and/or Construction and Operations Plan [COP]) submittal and the preparation of archaeological reports in support of plan submittal are conducted by a Qualified Marine Archaeologist.

4.3 Monitoring and Avoidance. The Lessee must inform the Qualified Marine Archaeologist that he or she may elect to be present during the bottom-disturbing activities performed in support of plan (i.e., SAP and/or COP) submittal to ensure avoidance of potential archaeological resources, as determined by the Qualified Marine Archaeologist assessment detailed in the Marine Archaeological Resources Assessment (MARA; including bathymetric, seismic, and magnetic anomalies; side-scan sonar contacts; and other seafloor or subsurface features that exhibit potential to represent or contain potential archaeological sites or other historic properties). In the event that the Qualified Marine Archaeologist indicates that he or she wishes to be present, the Lessee must reasonably facilitate the Qualified Marine Archaeologist's presence, as requested by the Qualified Marine Archaeologist, and provide the Qualified Marine Archaeologist the opportunity to inspect data quality.

4.4 BOEM will include the following avoidance measures for adverse effects within the marine area of potential effects (APE):

4.4.1 The Lessee will avoid all known and potential shipwrecks previously identified during marine archaeological surveys by a distance of no less than 55 yards (50 meters) from the known extent of the resource for placement of Project structures and when conducting seafloor-disturbing activities.

4.4.2 The Lessee will avoid all magnetic anomalies or acoustic contacts identified during marine archaeological surveys by a distance of no less than 55 yards (50 meters) from the known extent of the resource for placement of Project structures and when conducting seafloor-disturbing activities.

4.4.3 The Lessee will avoid all ancient submerged landform features (ASLFs). No additional avoidance buffer is required for these ASLFs given avoidance of the ASLFs is based on the defined spatial extent of each ASLF, which has been determined based on the maximum observed presence of the seismic reflector and unique buffer area designed to account for minimal positioning errors or lack of resolution.

4.5 No Impact without Approval. In no case may the Lessee knowingly impact a potential archaeological resource without the Lessor's prior approval.

4.6 Post-Activity Reporting. A series of as-placed plats must show the location of the placement of the testing infrastructure in relation to all known or potential shipwrecks, magnetic anomalies and sonar targets that require avoidance, and all ASLFs and their avoidance buffers. These plats must include both horizontal and vertical penetration into the seafloor and its distance from the above-named cultural resources.

4.7 Post-Review Discovery Clauses. If the Lessee, while conducting bottom-disturbing activities in support of plan submittal and after review of the location by a Qualified Marine Archaeologist under Section 4.2.4 of the lease, discovers an unanticipated potential archaeological resource, such as the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of historic objects, piles of ballast rock) or evidence of a pre-contact archaeological site (e.g., stone tools, pottery, or other pre-contact artifacts) within the Project area, the Lessee must:

4.7.1 Immediately halt seafloor/bottom-disturbing activities within the area of discovery;

4.7.2 Notify the Lessor within 24 hours of discovery;

4.7.3 Notify the Lessor in writing via report to the Lessor within 72 hours of its discovery;

4.7.4 Keep the location of the discovery confidential and take no action that may adversely impact the archaeological resource until the Lessor has made an evaluation and instructs the applicant on how to proceed; and

4.7.5 If (1) the site has been impacted by the Lessee's Project activities or (2) impacts on the site or on the APE cannot be avoided, conduct additional investigations, as directed by the Lessor, to determine if the resource is eligible for listing in the National Register of Historic Places (NRHP; 30 Code of Federal Regulations [CFR] 585.802(b)). If investigations indicate that the resource is potentially eligible for listing in the NRHP, the Lessor will inform the Lessee how to protect the resource or how to mitigate adverse effects on the site. If the Lessor incurs costs in protecting the resource, then, under Section 110(g) of the National Historic Preservation Act, the Lessor may charge the Lessee reasonable costs for carrying out preservation responsibilities under the OCS Lands Act (30 CFR 585.802(c-d)).

Progressive Transport/"Hopping." If at any point in the proposed testing operations, progressive transport/"hopping" activities are required to transport the jacket assembly or to support material barge loading (i.e., placing on the seafloor any part of the suction bucket structure assembly or jacket in between tests), a prior written request must be submitted, and approval must be obtained from the Office of Renewable Energy Programs. The request to use progressive transport must include a detailed procedural narrative and separate location plat for each "set-down" site, showing the location of all cables, anchor patterns for the derrick barge, and pipelines and any known archaeological or potentially sensitive biological features previously identified in that location. The diagram/map of the route to be taken from the initial or previous testing location along the transport path to each site must also be submitted with the request. If the proposed areas intended to be used as "set-down" sites have not been surveyed, the Lessee may be required to conduct the necessary surveys/reporting prior to mobilizing on site and conducting any seafloor-disturbing activities associated with the proposed testing operations.

5 Avian and Bat Survey and Reporting Requirements

5.1 Lighting. Nothing in this condition supersedes or is intended to conflict with lighting, marking, and signaling requirements of the Federal Aviation Administration (FAA), U.S. Coast Guard (USCG), or BOEM. Any lights used by the Lessee during site assessment activities must meet BOEM's Guidelines for Lighting and Marking of Structures Supporting Renewable Energy Development [https://www.boem.gov/2021-lighting-and-marking-guidelines]. For any additional lighting, the Lessee must use such lighting only when necessary, and the lighting must be hooded downward and directed, when possible, to reduce upward illumination and illumination of adjacent waters.

5.2 Incidental Mortality Reporting. The Lessee must provide an annual report to BOEM, the Bureau of Safety and Environmental Enforcement (BSEE), and USFWS documenting any dead (or injured) birds or bats found on vessels and structures during testing. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the U.S. Geological Survey Bird Band Laboratory, available at https://www.pwrc.usgs.gov/BBL/bblretrv/.

APPENDIX G: Consultations

This section includes the consultations required under the Endangered Species Act, the Magnuson-Stevens Fishery Conservation Management Act, and the Coastal Zone Management Act.

G.1 Endangered Species Act

G.1.1 United States Fish and Wildlife Service

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

Dr. Audrey Mayer
Supervisor
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087

Re: Project Code 2024-0013543

Dr. Mayer,

BOEM has received and is reviewing a Site Assessment Plan (SAP) amendment for Equinor's (Beacon Wind LLC) Beacon Wind Project as described below. This letter is to request initiate informal consultation under the Endangered Species Act (ESA) for activities that were not fully described in the October 2012 consultation with USFWS for lease issuance, site characterization and site assessment activities on the OCS off Rhode Island and Massachusetts. Foundation testing (see attached) was not previously considered as part of site assessment activities in Lease Area OCS-A 0520 (Lease Area).

If BOEM approves the SAP amendment, Beacon Wind would be authorized to carry out the foundation testing, as described in the attachment. The purpose of the foundation testing is to collect site-specific data during installation and removal of a single suction bucket foundation at up to 26 locations within the Lease Area. The foundation tests are necessary to assess site conditions and gather information to support engineering design of foundations for wind turbine generators and offshore substations in support of the construction and operations plan for the Beacon Wind project.

BOEM used USFWS IPaC system to obtain a species list and determination keys. The IPaC results indicated that roseate tern is potentially present in the project area. Based on BOEM's responses to the Service's Northeast DKey, the proposed activity will have no effect on roseate terns. Although IPaC did not identify other species in the project area, Red Knot and Piping Plover may pass over the project area during migration. Given that these species do not feed in the lease area, the proposed activity will have on effect on Red Knot and Piping Plover.

Thank you for your continued coordination on the proposed Project. Please contact David Bigger (david.bigger@boem.gov) with any questions or additional information that may be required. We request your concurrence with this determination.

Sincerely,

12-13-2023

David Diamond

ATTACHMENT – BEACON WIND FOUNDATION TESTING BIOLOGICAL ASSESSMENT

Proposed Project

The Bureau of Ocean Energy Management (BOEM) is reviewing the SAP amendment submitted by Beacon Wind to conduct foundation testing in the Lease Area as part of Beacon Wind's site assessment activities. If BOEM approves the SAP amendment, Beacon Wind would be authorized to carry out the foundation testing, as described below. The purpose of the foundation testing is to collect site-specific data during installation and removal of a single suction bucket foundation at up to 26 locations within the Lease Area. The foundation tests are necessary to assess site conditions and gather information to support engineering design of foundations for wind turbine generators and offshore substations in support of the construction and operations plan for the Beacon Wind project.

The proposed foundation testing includes the installation and removal of a single steel suction bucket foundation at up to 26 sites within the Lease Area (**Figure 1, Table 1**). Multiple suction bucket tests are anticipated at some of the 26 sites, resulting in a total of 35 tests. Each test site would be 984 by 984 feet (300 by 300 meters). For each test, the suction bucket foundation would be installed and removed once over a period of approximately six to nine hours (three to five hours for installation and three to four hours for removal). In total, foundation testing at all 26 locations isplanned to be conducted over a period of 10 to 15 days, plus additional days for inclement weather or other potential delays. Foundation testing could begin as early as February 2024, pending agency approval, and would be completed no later than August 2024.

For each test, a steel reference frame would be lowered to the seabed prior to installation of the suction bucket foundation, where it would remain stationary for the duration of the test. The reference frame would be used to assist with the placement of the foundation onto the targeted location, ensuring accurate positioning of the suction bucket. The footprint of the frame would be approximately 11 square feet (one square meter). Studs at the edge of the reference frame may penetrate approximately 2 inches (5 centimeters) into the seabed.

Once the reference frame is in place, the suction bucket would be lowered into place at a rate of approximately 13 inches (30 centimeters) per second (0.7 miles [1.1 kilometers] per hour) or less. The suction bucket would be 36 to 39 feet (11 to 12 meters) in height with a diameter of 30 to 39 feet (9 to 12 meters) and a thickness of 2 to 2.8 inches (5 to 7 centimeters). The foundation would weigh approximately 200 tons (181 metric tons) and would be designed to penetrate 33 to 39 feet (10 to 12 meters) into the seabed. Up to two remotely-operated vehicles (ROVs) may be used to assist in positioning the suction bucket. After the suction bucket has settled into the sediment, a low-flow suction pump mounted to the top of the bucket, approximately 19 feet (6 meters) above the seabed, would remove water from within the bucket, creating an area of reduced pressure that would assist in installing the suction bucket to the target penetration depth. The pump is expected to operate at a typical flow rate of approximately 1,320 gallons per minute (5 cubic meters per minute) with a pump velocity of 5.2 feet per second (1.6 meters per second) and a maximum intake diameter of 7 inches (18 centimeters) while pumping water from the water column into the suction bucket. In total up to 1,775 cubic yards (1,357 cubic meters) of water may be removed from inside the suction bucket and released into the water column immediately outside the bucket. The hydraulic zone of influence of the pump, defined as area in the water column that would experience an increased flow velocity of greater than 10 percent towards the intake, is expected to be up to 20 square feet.[1] The suction pump would generate noise during operation, but observations conducted at other OSW facilities suggest that noise from suction pumps would attenuate to background noise levels at a relatively short distance from the pump (e.g., within 1,640 feet [500 meters]; Koschinski and Lüdemann 2020). As the suction bucket penetrates the seabed, the ROV(s) may be used to observe and gather data on the penetration process.

During installation of the suction bucket, imaging equipment mounted inside the top of the suction bucket would be used to monitor the soil plug and to gather data to be used in refinement of foundation engineering for the Beacon Wind project. Imaging equipment may include sonar and/or an echosounder. The sonar would be operated at frequencies of 600 to 900 kilohertz, and the echosounder would be operated at 400 to 600 kilohertz.

[1] Stream function theory was used to model the zone of influence based on the pump flow rate and ambient ocean current data collected from the Lease Area by Beacon Wind during site assessment activities. Modeling results indicated that the zone of influence would have a radial distance of 2.5 feet (0.8 meter) and a depth of 1 foot (0.3 meter) in the fall, resulting in a total area of 20 square feet (1.9 square meters). In the other seasons, the radial distance of the zone of influence would be reduced to 2 feet (0.6 meter), resulting in a total area of 13 square feet (1.2 square meters).

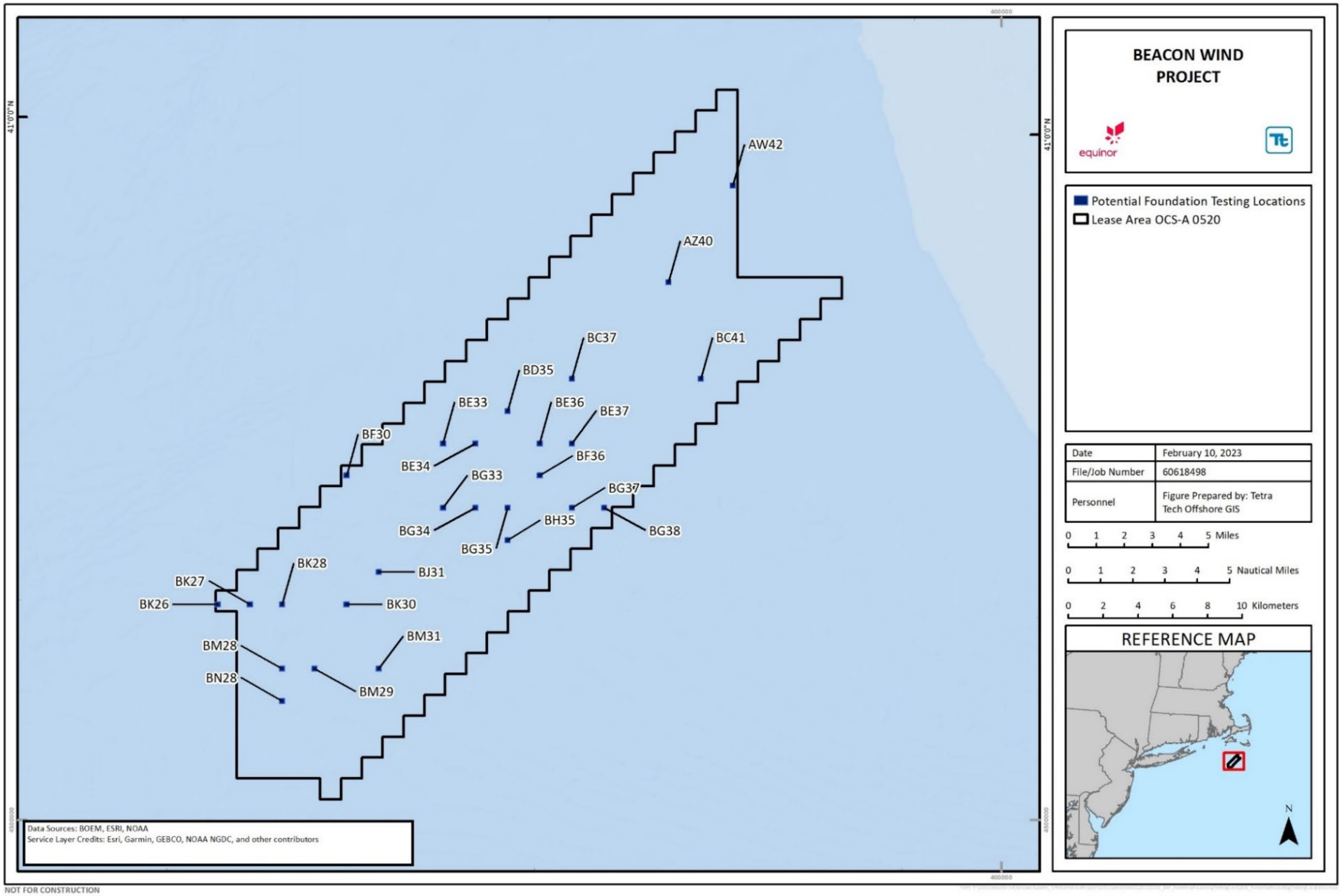

Figure 1 – Potential testing sites for foundation testing

Table 1 – Coordinates for potential test sites for foundation testing

Wind Turbine Location Name	Latitude (Center of Foundation Testing area)	Longitude (Center of Foundation Testing area)
AW42	40.97132	-70.3722
AZ40	40.92075	-70.4151
BC41	40.87099	-70.3921
BC37	40.86989	-70.4800
BD35	40.85264	-70.5235
BE33	40.83538	-70.5671
BE34	40.83567	-70.5451
BE36	40.83625	-70.5012
BE37	40.83654	-70.4792
BF30	40.81778	-70.6325
BF36	40.81957	-70.5008
BG33	40.80202	-70.5663
BG34	40.80232	-70.5443
BG35	40.80261	-70.5224
BG37	40.80318	-70.4785
BG38	40.80346	-70.4565
BH35	40.78593	-70.5220
BJ31	40.76806	-70.6094
BK30	40.75108	-70.6309
BK28	40.75045	-70.6748
BK27	40.75013	-70.6967
BM28	40.71709	-70.6739
BM29	40.71741	-70.6520
BM31	40.71803	-70.6082
BN28	40.70042	-70.6735
BK26	40.74980	-70.7186

After installation has been completed and the necessary information has been gathered, the suction pump would reverse flow, moving water into the suction bucket and increasing the pressure within the bucket, which would assist in removal from the seabed. During removal, the ROV(s) may be used to observe and gather data on the process of recovering the foundation from the seabed. Once the bucket is released from the seabed, it would be lifted vertically with a crane and placed back aboard the testing vessel. Then the reference frame would be lifted vertically with a separate winch and brought aboard the vessel. If weather conditions make lifting the bucket onboard hazardous, the bucket may be left suspended under the vessel as the vessel transits at 1 to 2 knots (2 to 4 kilometers per hour) to the next testing location. The reference frame can be brought aboard regardless of weather conditions due to its smaller size and would not be transported suspended under the vessel at any time.

At the completion of testing, no materials or debris would remain on the seabed. Photo documentation of all installed and removed equipment would be used to ensure that no equipment is left in place. Additionally, a post-test photographic survey using ROVs would be conducted to confirm that the seabed has been cleared of any obstructions created by the foundation testing activities.

A single vessel equipped with dynamic positioning (DP) thrusters and multiple cranes would be utilized for foundation testing. The vessel would be approximately 515 feet (157 meters) in length with a maximum draft of approximately 28 feet (8.5 meters). The vessel would be equipped with multiple two work-class ROVs. The ROVs would be operated from the vessel to support foundation testing, as described above, and would operate within the water column using hydraulic propellers or thrusters so as not to make contact with the seabed.

The vessel will travel from Europe, with the suction bucket, to ports in Canada and/or U.S. where the crew will mobilize. Ports currently under consideration include Halifax, Nova Scotia; New Bedford, Massachusetts; Providence, Rhode Island; and Davisville, Rhode Island. From the mobilization port(s), the vessel will make a single trip to the Lease Area to conduct the foundation testing; once testing is complete, the vessel will depart the Lease Area for ports in eastern Canada or the eastern U.S. to demobilize the crew.

Beacon Wind proposes to implement the following measures to avoid or minimize potential impacts of foundation testing activities:

- The vessel would utilize its DP thrusters during suction bucket installation and removal, which will avoid anchoring impacts to benthic resources;
- Foundation testing would be conducted at sites without sensitive benthic habitats (e.g., hard bottom, seagrass), which will avoid impacts to these benthic resources;
- Beacon Wind would conduct marine debris awareness training, as described in Project Design Criteria (PDC) 3 of the *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* (BOEM 2021);
- The foundation testing vessel, regardless of length, would observe a 10-knot speed restriction in the Block Island Sound Seasonal Management Area from November 1 through April 30 and any Dynamic Management Areas when in effect;
- In compliance with the Beacon Wind lease (Lease OCS-A 0520), the foundation testing vessel would operate at 10 knots or less in all waters between November 1 and July 31; and
- Beacon Wind would comply with measures to minimize vessel interactions with protected species, as described in PDC 5 of the *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* (BOEM 2021), including the use of trained lookouts, maintenance of a 1,640-foot (500-meter) minimum separation distance from any sighted ESA-listed species, and implementation of vessel strike avoidance procedures. These measures are described in more detail in the assessment of vessel traffic effects below.

Additionally, BOEM would require Protected Species Observers (PSOs) or trained project personnel to monitor for listed species in the area prior to and during deployment and retrieval of the suction bucket and reference frame and work would be stopped if ESA-listed species are observed within 1,640 feet (500 meters) of the vessel.

Description of the Action Area

The action area is defined as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 CFR §402.02). For this project, the action area includes the Lease Area (**Figure 1**) and the transit corridor between the vessel’s port of origin in Europe, the mobilization/demobilization port(s), and the Lease Area. This area is expected to encompass all of the effects of the proposed project.

Habitat within the action area was described in BOEM's (2014) *Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts*, which is incorporated here by reference. The Lease Area is 128,811 acres (521 square kilometers) in size and located in the center of the Massachusetts Wind Energy Area (WEA), approximately 20 miles (32 kilometers) south of Nantucket, Massachusetts and 60 miles (97 kilometers) east of Montauk, New York. Water depths in the Lease Area range from 118 to 223 feet (36 to 62 meters) (Beacon Wind 2023a). Videographic data demonstrate that the seabed within the action area is characterized by soft-bottom habitat composed primarily of fine sediment (i.e., very fine sand and silt) (Beacon Wind 2023a, 2023b). No hard-bottom substrates or sensitive habitats/communities were identified at any testing sites (Beacon Wind 2023a).

BOEM submitted a Biological Assessment to USFWS on December 21, 2023, with BOEM's determination that the impacts of the proposed activities will have no effect on ESA-listed species. On December 22, 2023, USFWS agreed with BOEM’s no effect determination. As a result, consultation was not necessary.

G.1.2 National Marine Fisheries Service

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

Mr. Michael Pentony
Regional Administrator
Greater Atlantic Regional Fisheries Office
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930

Dear Mr. Pentony:

The Bureau of Ocean Energy Management (BOEM) has received and is reviewing a Site Assessment Plan (SAP) amendment for Equinor's (Beacon Wind LLC) Beacon Wind Project as described below. This letter is to initiate an informal consultation under the Endangered Species Act (ESA) for activities that were not fully described in the programmatic consultation for site characterization and site assessment activities. The activity not previously considered is foundation testing as part of site assessment activities in Lease Area OCS-A 0520 (Lease Area). BOEM has made the determination that the proposed activity may affect, but is not likely to adversely affect, any species listed as threatened or endangered by NMFS under the ESA of 1973, as amended. Our supporting analysis is provided in the attached analysis.

If BOEM approves the SAP amendment, Beacon Wind would be authorized to carry out the foundation testing, as described in the attachment. The purpose of the foundation testing is to collect site-specific data during installation and removal of a single suction bucket foundation at up to 26 locations within the Lease Area. The foundation tests are necessary to assess site conditions and gather information to support engineering design of foundations for wind turbine generators and offshore substations in support of the construction and operations plan for the Beacon Wind project.

Thank you for your continued coordination on the proposed Project. Please contact Kyle Baker (kyle.baker@boem.gov) with any questions or additional information that may be required. We request your concurrence with this determination.

Sincerely,

JESSICA STROMBERG
Digitally signed by JESSICA STROMBERG
Date: 2023.12.21 11:29:32 -05'00'

Jessica Stromberg Acting for David Diamond
Deputy Chief for Operations,
Atlantic Outer Continental Shelf
Office of Renewable Energy Programs

Attachment

BEACON WIND FOUNDATION TESTING
REVISED BIOLOGICAL ASSESSMENT

Proposed Project

The Bureau of Ocean Energy Management (BOEM) is reviewing the Site Assessment Plan (SAP) amendment submitted by Beacon Wind to conduct foundation testing in Lease Area OCS-A 0520 (Lease Area) as part of Beacon Wind's site assessment activities. If BOEM approves the SAP amendment, Beacon Wind would be authorized to carry out the foundation testing, as described below. The purpose of the foundation testing is to collect site-specific data during installation and removal of a single suction bucket foundation at up to 26 locations within the Lease Area. The foundation tests are necessary to assess site conditions and gather information to support engineering design of foundations for wind turbine generators and offshore substations in support of the construction and operations plan for the Beacon Wind project.

The proposed foundation testing includes the installation and removal of a single steel suction bucket foundation at up to 26 sites within the Lease Area (**Figure 1, Table 1**). Multiple suction bucket tests are anticipated at some of the 26 sites, resulting in a total of 35 tests. Each test site (i.e., the area in which testing activities would occur) would be a 984 by 984-foott (300 by 300-meter) area centered on a proposed location for wind turbine generator installation in the Lease Area. Foundation testing activities would not disturb the entire test site, but all benthic-disturbing activities would occur within the site. For each test, the suction bucket foundation would be installed and removed once over a period of approximately six to nine hours (three to five hours for installation and three to four hours for removal). In total, foundation testing at all 26 locations is planned to be conducted over a period of 10 to 15 days, plus additional days for inclement weather or other potential delays. Foundation testing activities could occur at any time within a 24-hour period. Foundation testing could begin as early as July 2024, pending agency approval, and would be completed no later than July 2026.

For each test, a steel reference frame would be lowered to the seabed prior to installation of the suction bucket foundation, where it would remain stationary for the duration of the test. The reference frame would be used to assist with the placement of the foundation onto the targeted location, ensuring accurate positioning of the suction bucket. The footprint of the frame would be approximately 11 square feet (one square meter). Studs at the edge of the reference frame may penetrate approximately 2 inches (5 centimeters) into the seabed. No anchoring would occur, and structure would temporary and would be removed after the completion of each test.

Once the reference frame is in place, the suction bucket would be lowered into place at a rate of approximately 13 inches (30 centimeters) per second (0.7 miles [1.1 kilometers] per hour) or less. The suction bucket would be 36 to 39 feet (11 to 12 meters) in height with a diameter of 30 to 39 feet (9 to 12 meters) and a thickness of 2 to 2.8 inches (5 to 7 centimeters), with a footprint of 1,195 square feet (111 square meters). The foundation would weigh approximately 200 tons (181 metric tons) and would be designed to penetrate 33 to 39 feet (10 to 12 meters) into the seabed. Up to two remotely-operated vehicles (ROVs), which would be operated from the foundation testing vessel, may be used to assist in positioning the suction bucket. After the suction bucket has settled into the sediment, a low-flow suction pump mounted to the top of the bucket would remove water from within the bucket, creating an area of reduced pressure that would assist in installing the suction bucket to the target penetration depth. The pump is expected to operate at an estimated mean distance above the seabed of 19 feet (6 meters) and at a typical flow rate of approximately 1,320 gallons per minute (5 cubic meters per minute), with a pump velocity of 5.2 feet per second (1.6 meters per second) and a maximum intake diameter of 7 inches (18 centimeters) while pumping water from the water column into the suction bucket. The suction pump would not be screened to avoid potential pressure losses due to clogging of the screen (e.g., if a small piece of debris became suctioned to the screen), which would cause the pump to malfunction. Although the intake would be open, the single opening is localized and small enough to pose a negligible risk of impingement or entrapment of any listed species.

In total up to 1,775 cubic yards (1,357 cubic meters) of water may be removed from inside the suction bucket and released into the water column immediately outside the bucket. The hydraulic zone of influence of the pump, defined as area in the water column that would experience an increased flow velocity of greater than 10 percent towards the intake, is expected to be up to 20 square feet.[1] The suction pump would generate noise during operation, but observations conducted at other OSW facilities suggest that noise from suction pumps would attenuate to background noise levels at a relatively short distance from the pump. At the Borkum Riffgrund 2 wind farm in the North Sea, where the background noise level was 137 decibels referenced to 1 micropascal (dB re 1 µPa), noise from the suction pumps could not be measured beyond 1,640 feet (500 meters) from the pumps (Koschinski and Lüdemann 2020).

During installation of the suction bucket, imaging equipment mounted inside the top of the suction bucket would be used to monitor the soil plug and to gather data to be used in refinement of foundation engineering for the Beacon Wind project. Imaging equipment may include sonar and/or an echosounder. The sonar would be operated at frequencies of 600 to 900 kilohertz, and the echosounder would be operated at 400 to 600 kilohertz. The ROV(s) may also be used to observe and gather data on the penetration process during installation. Additionally, Beacon Wind would conduct acoustic monitoring to document sound levels produced during suction bucket installation. The acoustic monitoring would utilize three baseplate moorings, deployed on the seabed at various distances from the suction bucket. This bottom-mounted system would avoid noise introduced by water flow past the instrument. Each baseplate mooring would be approximately 3.3 feet (1 meter) long, 1.6 feet (0.5 meter) wide, and 3.3 feet (1 meter) high. All three moorings would be retrieved using an ROV at the completion of each monitored test and deployed at the next testing site for acoustic monitoring.

After installation has been completed and the necessary information has been gathered as described above (e.g., soil plug information gathered via internal imaging equipment, observations on suction bucket penetration obtained via ROV), the suction pump would reverse flow, moving water into the suction bucket and increasing the pressure within the bucket, which would assist in removal from the seabed. The suction pump is expected to operate with the same

[1] Stream function theory was used to model the zone of influence based on the pump flow rate and ambient ocean current data collected from the Lease Area by Beacon Wind during site assessment activities. Modeling results indicated that the zone of influence would have a radial distance of 2.5 feet (0.8 meter) and a depth of 1 foot (0.3 meter) in the fall, resulting in a total area of 20 square feet (1.9 square meters). In the other seasons, the radial distance of the zone of influence would be reduced to 2 feet (0.6 meter), resulting in a total area of 13 square feet (1.2 square meters).

pump velocity during removal as during installation (i.e., 5.2 feet per second [1.6 meters per second]). During removal, the ROV(s) may be used to observe and gather data on the process of recovering the foundation from the seabed. Once the bucket is released from the seabed, it would be lifted vertically with a crane and placed back aboard the testing vessel. Then the reference frame would be lifted vertically with a separate winch and brought aboard the vessel. If weather conditions make lifting the bucket onboard hazardous, the bucket may be left suspended under the vessel as the vessel transits at 1 to 2 knots (2 to 4 kilometers per hour) to the next testing location. The reference frame can be brought aboard regardless of weather conditions due to its smaller size and would not be transported suspended under the vessel at any time.

At the completion of testing, no materials or debris would remain on the seabed. Photo documentation of all installed and removed equipment would be used to ensure that no equipment is left in place. A post-test photographic survey using ROVs would be conducted to confirm that the seabed has been cleared of any obstructions created by the foundation testing activities. Additionally, Beacon Wind would use sector scanning sonar for the site clearance survey. The sonar equipment under consideration would be operated at frequencies at or above 300 kilohertz.

Table 1 – Coordinates for potential test sites for foundation testing

Wind Turbine Location Name	Latitude (Center of Foundation Testing area)	Longitude (Center of Foundation Testing area)
AW42	40.97132	-70.3722
AZ40	40.92075	-70.4151
BC41	40.87099	-70.3921
BC37	40.86989	-70.4800
BD35	40.85264	-70.5235
BE33	40.83538	-70.5671
BE34	40.83567	-70.5451
BE36	40.83625	-70.5012
BE37	40.83654	-70.4792
BF30	40.81778	-70.6325
BF36	40.81957	-70.5008
BG33	40.80202	-70.5663
BG34	40.80232	-70.5443
BG35	40.80261	-70.5224
BG37	40.80318	-70.4785
BG38	40.80346	-70.4565
BH35	40.78593	-70.5220
BJ31	40.76806	-70.6094
BK30	40.75108	-70.6309
BK28	40.75045	-70.6748
BK27	40.75013	-70.6967
BM28	40.71709	-70.6739
BM29	40.71741	-70.6520
BM31	40.71803	-70.6082
BN28	40.70042	-70.6735
BK26	40.74980	-70.7186

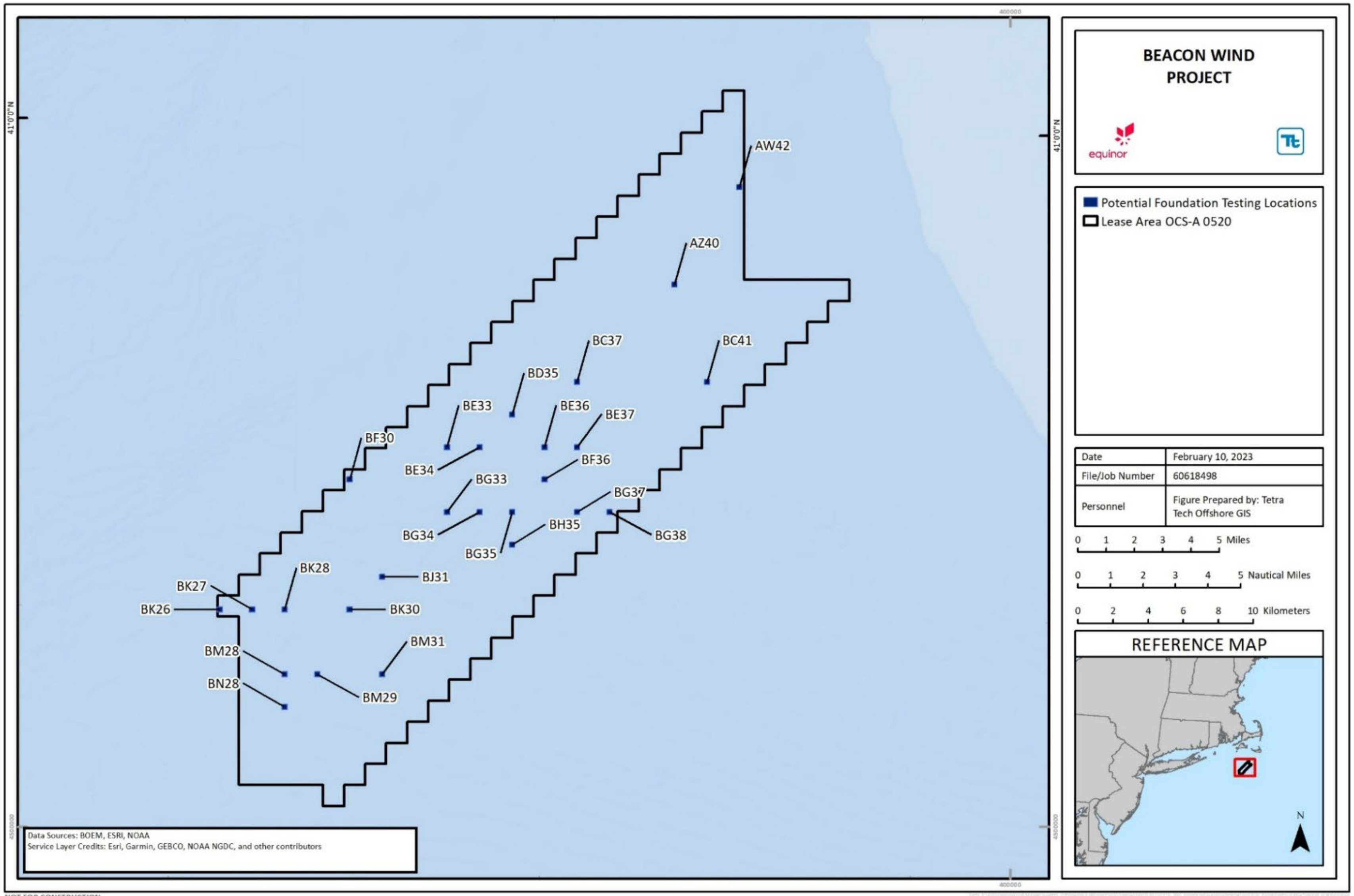

Figure 1 – Potential testing sites for foundation testing

A single vessel equipped with dynamic positioning (DP) thrusters and multiple cranes would be utilized for foundation testing. No anchoring is required with the DP system. The vessel would be approximately 515 feet (157 meters) in length with a maximum draft of approximately 28 feet (8.5 meters). The operational speed of the vessel during testing and transit, when not under speed restrictions, would be 11 to 12 knots (20 to 22 kilometers per hour). The vessel would be equipped with multiple work-class ROVs. The ROVs would be tethered to and operated from the vessel to support foundation testing, as described above, and would operate within the water column using hydraulic propellers or thrusters so as not to make contact with the seabed.

The vessel will travel from Europe, with the suction bucket, to ports in Canada and/or U.S. where the crew will mobilize. Ports currently under consideration include Halifax, Nova Scotia; New Bedford, Massachusetts; Providence, Rhode Island; and Davisville, Rhode Island. From the mobilization port(s), the vessel will make a single trip to the Lease Area to conduct the foundation testing; once testing is complete, the vessel will depart the Lease Area for ports in eastern Canada or the eastern U.S. to demobilize the crew.

Beacon Wind would conform with the applicable best management practices (BMPs) and project design criteria (PDCs) from the *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* (BOEM 2021). Accordingly, Beacon Wind proposes to implement the following measures to avoid or minimize potential impacts of foundation testing activities on ESA-listed species:

- The vessel would utilize its DP thrusters during suction bucket installation and removal, which will avoid anchoring impacts to benthic resources in accordance with BMP 1.1 under PDC 1;
- Foundation testing would be conducted at sites without sensitive benthic habitats (e.g., hard bottom, seagrass), which will avoid impacts to these benthic resources in accordance with BMP 1.1 under PDC 1;
- Beacon Wind would conduct marine debris awareness training, as described in BMP 3.1 under PDC 3 and submit a training compliance report, as described in BMP 3.2 under PDC 3;
- Beacon Wind would recover marine trash and debris resulting from the proposed project that could cause undue harm or damage to natural resources, in accordance with BMP 3.4 under PDC 3;
- Beacon Wind would comply with measures to minimize vessel interactions with protected species, as described under PDC 5, including maintaining a vigilant watch for protected species (BMP 5.1), maintenance of a 1,640-foot (500-meter) minimum separation distance from any sighted ESA-listed species and implementation of vessel strike avoidance procedures (BMP 5.2), and the use of trained lookouts (BMPs 5.2 and 5.3, as well as BMPs 7.2, 7.4, and 7.5 under PDC 7). These measures are described in more detail in the assessment of vessel traffic effects below.
- The foundation testing vessel, regardless of length, would observe a 10-knot speed restriction in the Block Island Sound Seasonal Management Area from November 1 through April 30 and any Dynamic Management Areas or Slow Zones when in effect, in accordance with BMPs 5.4 and 5.5 under PDC 5;

- Beacon Wind would ensure that all vessel operators check for information regarding mandatory or voluntary ship strike avoidance and daily information regarding North Atlantic right whale (NARW) sightings, in accordance with BMP 5.6 under PDC 5; and
- In compliance with the Beacon Wind lease (Lease OCS-A 0520), the foundation testing vessel would operate at 10 knots or less in all U.S. waters between November 1 and July 31; and
- Beacon Wind would comply with the reporting requirements described under PDC 8.

In addition to the use of lookouts during transit proposed by Beacon Wind, as described above, BOEM would require Protected Species Observers (PSOs) or trained project personnel to monitor for listed species in the area prior to and during deployment and retrieval of the suction bucket and reference frame and work would be stopped if ESA-listed species are observed within 1,640 feet (500 meters) of the vessel.

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). For this project, the action area includes the Lease Area (**Figure 1**) and the transit corridor between the vessel's port of origin in Europe, the mobilization/demobilization port(s), and the Lease Area. This area is expected to encompass all of the effects of the proposed project.

Habitat within the action area was described in BOEM's (2014) *Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts*, which is incorporated here by reference. The Lease Area is 128,811 acres (521 square kilometers) in size and located in the center of the Massachusetts Wind Energy Area (WEA), approximately 20 miles (32 kilometers) south of Nantucket, Massachusetts and 60 miles (97 kilometers) east of Montauk, New York. Water depths in the Lease Area range from 118 to 223 feet (36 to 62 meters) (Beacon Wind 2024). Videographic data demonstrate that the seabed within the action area is characterized by soft-bottom habitat composed primarily of fine sediment (i.e., very fine sand and silt) (Beacon Wind 2023, 2024). No hard-bottom substrates or sensitive habitats/communities were identified at any testing sites (Beacon Wind 2024).

NMFS Listed Species and Critical Habitat in the Action Area

Five ESA-listed marine mammal species, four ESA-listed sea turtle species, and three ESA-listed fish species could potentially occur in the Massachusetts WEA (**Table 2**). Descriptions for most of these species were provided in (BOEM 2014), which is incorporated here by reference, and are updated below with new data and information that has been collected since publication of BOEM (2014); the giant manta ray (*Manta birostris*) and oceanic whitetip shark (*Carcharhinus longimanus*) were listed under the ESA since publication of BOEM (2014). Information on these species is also provided in this section.

Table 2 – ESA-listed species that could occur in the Massachusetts WEA

Species	DPS	ESA Status	Listing Date	Recovery Plan
Marine Mammals				
Blue whale *Balaenoptera musculus*	N/A	Endangered	1970 (35 FR 18319)	NMFS 2020b
Fin whale *B. physalus*	N/A	Endangered	1970 (35 FR 18319)	NMFS 2010a
North Atlantic right whale *Eubalaena glacialis*	N/A	Endangered	2008 (73 FR 12024)	NMFS 2005
Sei whale *B. borealis*	N/A	Endangered	1970 (35 FR 18319)	NMFS 2011
Sperm whale *Physeter macrocephalus*	N/A	Endangered	1970 (35 FR 18319)	NMFS 2010b
Sea Turtles				
Green sea turtle *Chelonia mydas*	North Atlantic	Threatened	2016 (81 FR 20057)	NMFS and USFWS 1991
Kemp's ridley sea turtle *Lepidochelys kempii*	N/A	Endangered	1970 (35 FR 18319)	NMFS and USFWS 2011
Leatherback sea turtle *Dermochelys coriacea*	N/A	Endangered	1970 (35 FR 8491)	NMFS and USFWS 1992
Loggerhead sea turtle *Caretta caretta*	Northwest Atlantic	Threatened	2011 (76 FR 58868)	NMFS and USFWS 2008
Fish				
Atlantic sturgeon *Acipenser oxyrhinchus oxyrhinchus*	Gulf of Maine	Threatened	2012 (77 FR 5880)	N/A
	New York Bight	Endangered	2012 (77 FR 5880)	N/A
	Chesapeake Bay	Endangered	2012 (77 FR 5880)	N/A
	Carolina	Endangered	2012 (77 FR 5914)	N/A
	South Atlantic	Endangered	2012 (77 FR 5914)	N/A
Giant manta ray *Manta birostris*	N/A	Threatened	2018 (83 FR 2916)	N/A
Oceanic whitetip shark *Carcharhinus longimanus*	N/A	Threatened	2018 (83 FR 4153)	N/A

Marine Mammals

Blue whale: As described by BOEM (2014), blue whales are occasional visitors to waters of the U.S. East Coast and have the potential to occur occasionally in the Massachusetts WEA. This species was not documented in aerial surveys of the WEA (Kraus et al. 2016; O'Brien et al. 2020, 2021, 2022, 2023; Quintana et al. 2019) or aerial survey or vessel-based PSO data from the Lease Area (Beacon Wind 2024). Blue whales were acoustically detected by hydrophones deployed in the WEA from 2011 to 2015, with the highest detections in the winter months (i.e., December through February) and a low number of detections in August, September, and November (Kraus et al. 2016). Though the species was acoustically detected by hydrophones in the WEA, the calling whales may have been located far outside the WEA, given the estimated detection range for blue whales was more than 124 miles (200 kilometers) (Kraus et al. 2016). A hydrophone deployed off Martha's Vineyard in 2021 did not detect blue whales (WHOI 2021). Given the absence of this species in aerial survey data and recent passive acoustic monitoring, it would occur rarely, if at all, in the Lease Area. If blue whales do utilize the Lease Area, it would likely be as a migration corridor based on the seasonality of acoustic detections (Kraus et al. 2013). Based on the available information, blue whales are not expected to occur in the action area during foundation testing activities. Therefore, this species is not considered further in this evaluation.

<u>Fin whale:</u> As described by BOEM (2014), fin whales may occur in the WEA throughout the year and may utilize the area for foraging during the summer. This species was sighted in aerial surveys of the WEA in most months, with the majority of sightings occurring in the spring and summer (April through August) (Kraus et al. 2016; O'Brien et al. 2020, 2021; Quintana et al. 2019). Fin whale was detected acoustically in all months (Kraus et al. 2016). During site-specific surveys of the Lease Area, fin whale was observed during aerial surveys and by vessel-based PSOs (Beacon Wind 2024). Based on the aerial survey data, PSO sightings, and passive acoustic data, fin whale is expected to be found commonly in the Lease Area and could occur year-round. Monthly density estimates in the Lease Area are provided in **Table 3**. Fin whales with calves have been sighted in the Massachusetts WEA aerial surveys (Kraus et al. 2016), indicating that life stages from calves to adults could occur in the Lease Area. Fin whales have been observed feeding during aerial surveys of the Massachusetts WEA in the spring and summer months (Kraus et al. 2016; O'Brien et al. 2023; Quintana et al. 2019), indicating that fin whales may potentially use the WEA for foraging. Based on the available information, fin whale calves, juveniles, or adults may be moving through or foraging in the action area during foundation testing activities.

<u>North Atlantic right whale:</u> As described by BOEM (2014), NARW may occur in the WEA throughout the year. This species was sighted in aerial surveys of the Massachusetts WEA in all seasons, with highest sightings in the winter months followed by the spring (Kraus et al. 2016; O'Brien et al. 2020, 2021, 2022; Quintana et al. 2019). Based on sighting data from 2012 to 2015, a NARW spring hotspot was identified that overlaps with the Lease Area (Kraus et al. 2016). In more recent years, most NARW sightings generally occurred outside the WEA (O'Brien et al. 2020, 2021, 2023). During site-specific surveys of the Lease Area, NARWs were not identified. However, this species was observed in the Lease Area by vessel-based PSOs (Beacon Wind 2024). NARWs were detected acoustically in all seasons with the greatest detections occurring in the late winter and early spring (i.e., February through April) (Kraus et al. 2016). Based on sightings and acoustic data, NARW are expected to occur commonly in the Lease Area during winter and spring and could occur less frequently in the other seasons. Monthly density estimates in the Lease Area are provided in **Table 3**. NARWs with calves have been sighted in aerial surveys of the Massachusetts WEA (O'Brien et al. 2020, 2022), indicating that life stages from calves to adults could occur in the Lease Area. Pregnant females have also been documented in these aerial surveys (O'Brien et al. 2022). NARW have been observed feeding during aerial surveys of the Massachusetts WEA (O'Brien et al. 2020, 2022; Quintana et al. 2019), though in later years of the survey feeding occurred outside the WEA. The presence of foraging NARWs in aerial surveys indicates that this species may use the Lease Area for foraging. Surface active groups of NARW have been documented in aerial surveys of the Massachusetts WEA (Kraus et al. 2016; O'Brien et al. 2022, 2023), indicating that the Lease

Area could potentially be used for mating activities. Based on the available information, NARW calves, juveniles, or adults may be moving through, foraging in, or engaging in courtship activities within the action area during foundation testing activities.

Sei whale: As described by BOEM (2014), sei whales are relatively uncommon in the Massachusetts WEA. In aerial surveys of the Massachusetts WEA, sei whales were sighted in the spring and summer (Kraus et al. 2016; O'Brien et al. 2020, 2022, 2023; Quintana et al. 2019). During site-specific surveys of the Lease Area, sei whales were not identified. However, this species was observed in the Lease Area by vessel-based PSOs (Beacon Wind 2024). A hydrophone deployed off Martha's Vineyard in 2021 detected sei whales from January through April and October, with the highest detections observed in March (WHOI 2021). Based on the visual and acoustic detections for sei whales, this species is expected to occur commonly in the Lease Area, predominantly in spring. Monthly density estimates in the Lease Area are provided in **Table 3**. Sei whales with calves were documented during aerial surveys of the Massachusetts WEA (Kraus et al. 2016), indicating that life stages from calves to adults have the potential to occur in the Lease Area. Sei whales have been observed feeding during the Massachusetts WEA aerial surveys (Kraus et al. 2016), indicating that the Lease Area may be utilized for foraging. Based on the available information, sei whale calves, juveniles, or adults may be moving through or foraging in the action area during foundation testing activities.

Sperm whale: As described by BOEM (2014), sperm whales are relatively uncommon in the Massachusetts WEA. Sperm whales were sighted infrequently during the spring, summer, and fall seasons in aerial surveys of the Massachusetts WEA (Kraus et al. 2016; O'Brien et al. 2020). In contrast to fin whales, NARWs, and sei whales, there were multiple survey years in which this species was not sighted (e.g., Quintana et al. 2019; O'Brien et al. 2021, 2022, 2023). Sperm whales were not observed during site-specific surveys in the Lease Area (Beacon Wind 2024). Based on sightings data, sperm whales may occur uncommonly in the Lease Area, with the greatest likelihood of occurrence during summer. Monthly density estimates in the Lease Area are provided in **Table 3**. Based on the available information, sperm whale juveniles or adults may infrequently transit through the action area during foundation testing activities.

Table 3 – Mean monthly density estimates for ESA-listed marine mammals in Lease Area OCS-A 0520

Species	Mean Monthly Density Estimates Animals/39 Square Miles (100 Square Kilometers)[1, 2]											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fin whale	0.214	0.165	0.122	0.155	0.271	0.257	0.424	0.330	0.235	0.068	0.050	0.139
NARW	0.471	0.539	0.498	0.477	0.331	0.060	0.032	0.022	0.033	0.054	0.091	0.278
Sei whale	0.038	0.023	0.047	0.115	0.188	0.057	0.014	0.011	0.018	0.037	0.083	0.066
Sperm whale	0.036	0.014	0.014	0.003	0.014	0.029	0.046	0.142	0.074	0.058	0.035	0.024

Source: COP Appendix L, Table 32; Beacon Wind 2024a.
[1] Based on Lease Area OCS-A 0520 with a 6.2-mile (10-kilometer) buffer.
[2] Density estimates are from habitat-based density modeling of the entire U.S. Atlantic EEZ from Roberts et al. (2016, 2022).

Sea Turtles
Green sea turtle: As described by BOEM (2014), green sea turtles are not expected to occur regularly in the WEA. This species was not sighted in aerial surveys of the Massachusetts WEA (Kraus et al. 2016; O'Brien et al. 2020, 2021, 2022, 2023; Quintana et al. 2019) or the Lease

Area (Beacon Wind 2024). Monthly density estimates in the Lease Area are provided in **Table 4**. Only the juvenile life stage is expected to occur in the region (BOEM 2014). Based on the available information, juvenile green sea turtles may infrequently transit through the action area during foundation testing activities.

Kemp's ridley sea turtle: As described by BOEM (2014), Kemp's ridley sea turtles may occur in the region in the summer and early fall. This species was the least commonly observed sea turtle species in aerial surveys of the Massachusetts WEA and was only observed in the fall (Kraus et al. 2016), though this species' small size makes it difficult to detect in aerial surveys. A single Kemp's ridley sea turtle was observed during site-specific aerial surveys of the Lease Area in July (Beacon Wind 2024). Monthly density estimates in the Lease Area are provided in **Table 4**. Kemp's ridley sea turtles that occur in the Lease Area would most likely be juveniles (BOEM 2014). Based on the available information, juvenile Kemp's ridley sea turtles may transit through or forage in the action area during foundation testing activities.

Leatherback sea turtle: As described by BOEM (2014), leatherback sea turtle may occur in the WEA from late spring through the late fall. This species was the most commonly sighted sea turtle in aerial surveys of the Massachusetts WEA and was observed from the spring through the fall with the greatest number of sightings documented in the summer (Kraus et al. 2016; O'Brien et al. 2020, 2021, 2022, 2023; Quintana et al. 2019). Though leatherback sea turtles were documented in the WEA during aerial surveys, they occurred in greater numbers closer to Nantucket, north of the WEA. Nantucket Shoals has previously been identified as a hotspot for this species (BOEM 2014). This species was not observed during site-specific aerial surveys of the Lease Area (Beacon Wind 2024). Monthly density estimates in the Lease Area are provided in **Table 4**. Adults and juveniles may occur in the Lease Area (BOEM 2014). Based on the available information, juvenile and adult leatherback sea turtles may transit through or forage in the action area during foundation testing activities.

Loggerhead sea turtle: As described by BOEM (2014), loggerhead sea turtle may occur in the WEA from late spring into the fall. This species was observed from the spring through the fall in aerial surveys of the Massachusetts WEA, with the highest occurrence in the fall or summer (Kraus et al. 2016; O'Brien et al. 2020, 2021, 2022, 2023; Quintana et al. 2019). A single loggerhead sea turtle was observed during site-specific aerial surveys of the Lease Area in July (Beacon Wind 2024). Monthly density estimates in the Lease Area are provided in **Table 4**. Though both adults and juveniles could occur in the Lease Area, a majority of loggerheads in the region are juveniles (BOEM 2014). Based on the available information, juvenile and adult loggerhead sea turtles may transit through the action area during foundation testing activities.

Table 4 – Mean monthly density estimates for ESA-listed sea turtles in Lease Area OCS-A 0520

Species	Mean Monthly Density Estimates Animals/39 Square Miles (100 Square Kilometers)[1, 2]											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Green	0.000	0.000	0.000	0.000	0.000	0.021	0.095	0.091	0.088	0.015	0.002	0.000
Kemp's ridley	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.004	0.004	0.003	<0.001	0.000
Leatherback	<0.001	<0.001	<0.001	<0.001	0.002	0.042	0.104	0.170	0.244	0.146	0.025	0.002
Loggerhead	0.002	<0.001	<0.001	0.001	0.003	0.011	0.020	0.021	0.026	0.026	0.012	0.003

Source: COP Appendix L, Table 34; Beacon Wind 2024.
[1] Based on Lease Area OCS-A 0520 with a 6.2-mile (10-kilometer) buffer.
[2] Density estimates are obtained from DiMatteo et al. (2023).

Fish
Atlantic sturgeon: As described by BOEM (2014), Atlantic sturgeon have been caught in offshore trawl and gillnet fisheries, but this species is expected to largely remain in waters with depths less than 66 feet (20 meters). Sub-adult and adult Atlantic sturgeon occur in the offshore marine environment from the summer through the winter (Stein et al. 2004), indicating that these life stages could be present in the Lease Area during these seasons. In the marine environment, this species forages in soft-bottom habitats of the continental shelf (Dunton et al. 2015). Any of the five distinct population segments (DPSs) of Atlantic sturgeon listed under the ESA could occur in the WEA, though the majority are expected to belong to the New York Bight DPS based on genetic analysis of Atlantic sturgeon collected through the Northeast Fishery Observer Program (BOEM 2014). Based on the available information, sub-adult or adult Atlantic sturgeon from any listed DPS may infrequently migrate through or opportunistically forage in the action area during foundation testing activities if the activities occur outside of the spring months.

Giant manta ray: Sightings of giant manta rays in the Mid-Atlantic and in New England are rare, though individuals have been documented as far north as New Jersey and Block Island (Gudger 1922; Miller and Klimovish 2017). Sightings of unidentified rays were occasionally documented in early aerial surveys of the Massachusetts WEA (Kraus et al. 2016), but as these sightings were not identified to species they cannot confirm the occurrence of giant manta ray in the WEA. Giant manta ray was not documented in site-specific aerial surveys of the Lease Area (Beacon Wind 2024). Given the rarity of this species in the region, giant manta ray is not expected to occur in the action area during foundation testing activities. Therefore, this species is not considered further in this evaluation.

Oceanic whitetip shark: Oceanic whitetip shark is generally found in tropical and subtropical oceans worldwide, inhabiting deep, offshore waters (NMFS 2022). In the western Atlantic, oceanic whitetips occur as far north as Maine but are generally found at latitudes below 30° N (NMFS 2016). This species exhibits a strong preference for water temperatures at or above 68°F (20°C) (NMFS 2016). Oceanic whitetip shark has not been documented in aerial surveys of the Massachusetts WEA (Kraus et al. 2016; O'Brien et al. 2020, 2021, 2022, 2023; Quintana et al. 2019), though some sharks could not be identified to species. A single oceanic whitetip shark was documented in August during site-specific aerial surveys of the Lease Area (Beacon Wind 2024). Based on its habitat preference, oceanic whitetip shark is not expected to occur in the action area during foundation testing activities. Therefore, this species is not considered further in this evaluation.

North Atlantic Right Whale Critical Habitat
The foundation testing vessel would likely transit through the southern edge of NARW critical habitat Unit 1, the feeding areas in Cape Cod Bay, Stellwagen Bank, and the Great South Channel, when traveling between its origin/destination port in Europe and the mobilization/demobilization port(s) for the proposed project. The Lease Area is approximately 38 miles (61 kilometers) south of NARW critical habitat Unit 1.

The physical and biological features of NARW foraging critical habitat (i.e., Unit 1) identified as essential to conservation of the species include:

- The physical oceanographic conditions and structures of the Gulf of Maine and Georges Bank region that combine to distribute and aggregate *Calanus finmarchicus* for right whale foraging, namely prevailing currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, and temperature regimes;
- Low flow velocities in Jordan, Wilkinson, and Georges Basins that allow diapausing *C. finmarchicus* to aggregate passively below the convective layer so that the copepods are retained in the basins;
- Late stage *C. finmarchicus* in dense aggregations in the Gulf of Maine and Georges Bank region; and
- Diapausing *C. finmarchicus* in aggregations in the Gulf of Maine and Georges Bank region.

Effects Determination
Benthic Habitat Disturbance
Installation and removal of the suction bucket and the placement and removal of the reference frame would result in temporary disturbance of benthic habitat in the action area. As described above, the suction bucket would occupy approximately 1,195 square feet (111 square meters) of seabed, and the reference frame would occupy approximately 11 square feet (1 square meter), resulting in a total of approximately 1,206 square feet (114 square meters) of seabed disturbance at each test site. Additionally, approximately 15.8 square feet (1.5 square meters) would be temporarily disturbed by acoustic monitoring equipment at each site. Across 26 testing sites, up to 0.7 acres (2,873 square meters) would be disturbed during foundation testing, including the suction bucket, reference frame, and acoustic monitoring equipment footprints. It is conservatively assumed that all benthic organisms within the footprint of the suction bucket and reference frame, which benthic foragers may feed upon, would suffer mortality. This benthic organism mortality would be localized, and recolonization and recovery of benthic species is expected to occur within a few months to one year (Wilbur and Clarke 2007).

<u>Marine Mammals</u>
Since none of the ESA-listed marine mammals that may occur in the action area are benthic foragers, benthic habitat disturbance would have *no effect* on fin whale, NARW, sei whale, or sperm whale.

<u>Sea Turtles</u>
As green sea turtles, leatherback sea turtles, and loggerhead sea turtles do not forage in the soft-bottom habitats present in the action area, benthic habitat disturbance would have *no effect* on

these species. Juvenile Kemp's ridley sea turtles that may occur in the Lease Area do forage in this type of habitat. However, the anticipated benthic prey mortality would be temporary and would be localized to a very small portion of the action area. Given the temporary, short-term nature of the prey reduction and the availability of equivalent foraging habitat in the area, any effect on the foraging success of Kemp's ridley sea turtles due to benthic habitat disturbance as a result of foundation testing are extremely unlikely to occur would therefore be *discountable*.

When this project is completed, it would not result in permanent loss or disturbance of soft bottom habitat, and thus, there would be no prey mortality or reduction in foraging habitat in the future. We have also considered the likelihood that an increase benthic habitat disturbance related to the activities associated with the proposed project would generally reduce prey availability or foraging habitat in the action area, in addition to baseline conditions. As described above, the foundation testing would cause localized prey mortality in the footprint of the suction bucket and reference frame. Given the relatively small affected area in addition to existing habitat disturbance associated with ongoing activities in the action area, reductions in foraging success of Kemp's ridley sea turtle are extremely unlikely to occur. Therefore, effects of habitat disturbance would be *discountable*.

Fish

Atlantic sturgeon are benthic foragers that forage in soft-bottom habitats. Therefore, this species may experience a reduction in prey availability and foraging opportunities due to benthic habitat disturbance as a result of foundation testing. However, ample foraging habitat is available to fish in the surrounding area and the prey mortality from suction bucket testing would be temporary and localized to a very small portion of the action area. Given the temporary and localized nature of potential prey mortality that may occur and the large area of soft-bottom habitat that would remain available for foraging animals, potential effects of prey mortality on the foraging success of Atlantic sturgeon are extremely unlikely to occur and would therefore be *discountable*.

When this project is completed, it would not result in permanent loss or disturbance of soft bottom habitat, and thus, there would be no prey mortality or reduction in foraging habitat in the future. We have also considered the likelihood that an increase benthic habitat disturbance related to the activities associated with the proposed project would generally reduce prey availability or foraging habitat in the action area, in addition to baseline conditions. As described above, the foundation testing would cause localized prey mortality in the footprint of the suction bucket and reference frame. Given the relatively small affected area in addition to existing habitat disturbance associated with ongoing activities in the action area, reductions in foraging success of Atlantic sturgeon are extremely unlikely to occur. Therefore, effects of habitat disturbance would be *discountable*.

Turbidity

The installation and removal of the suction bucket and the placement and removal of the reference frame would result in temporary increases in suspended sediment concentrations at the testing sites. As suction bucket foundations require less benthic disturbance compared to other offshore wind foundation types (Horwath et al. 2021), suspended sediment concentrations associated with installation and removal of the suction bucket and reference frame would be expected to be similar to or lesser than suspended sediment concentrations associated site preparation activities for other foundation types (e.g., dredging for sand bedform clearing). Modeling results of cutterhead dredging indicate that suspended sediment concentrations above background levels would be present throughout the bottom 6 feet (1.8 meters) of the water column for a distance of approximately 1,000 feet (305 meters) (NMFS 2020c citing USACE 1983). Elevated suspended sediment levels are expected to be present only within a 984 to 1,640 feet (300 to 500 meters) radius of the cutterhead dredge (NMFS 2020c citing Hayes et al. 2000; NMFS 2020c citing LaSalle 1990; NMFS 2020c citing USACE 1983). Suspended sediment concentrations associated with cutterhead dredge sediment plumes typically range from 11.5 to 282.0 milligrams per liter with the highest levels (550.0 milligrams per liter) detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (NMFS 2020c citing Nightingale and Simenstad 2001; NMFS 2020c citing USACE 2005, 2010, 2015). Based on this information, the localized sediment plume generated by the proposed foundation testing may extend 984 to 1,640 feet (300 to 500 meters) along the seabed with suspended sediment concentrations of 282 milligrams per liter or less, with higher concentrations possible immediately adjacent to suction bucket upon removal. The plume is expected to dissipate rapidly.

Marine Mammals

As described in Johnson (2018), NMFS has determined that elevated turbidity could result in effects on ESA-listed marine mammal species under specific circumstances, such as high turbidity levels over long periods during dredging operations; however, the turbidity levels associated with the proposed project would be small. In general, marine mammals are not subject to the types of impacts that injure fish (e.g., gill clogging, smothering of eggs and larvae), so physiological effects are unlikely. Behavioral impacts, including avoidance or changes in behavior, increased stress, and temporary loss of foraging opportunity could occur but only at high concentrations of suspended sediment (Johnson 2018). Turbidity associated with the proposed project would be temporary and localized to within 6 feet (1.8) meters of the seabed due to installation and removal of the suction bucket. Placement and removal of the suction bucket and reference frame are not expected to result in behavioral impacts on ESA-listed marine mammals, which would not be expected to occur in such proximity to the seabed in the Lease Area. Therefore, the effects of turbidity associated with foundation testing on fin whale, NARW, sei whale, or sperm whale are extremely unlikely to occur and are therefore *discountable*.

When this project is completed, it will not result in a permanent increase in turbidity in the action area, and thus, there is no potential for behavioral impacts in the future. We have also considered the likelihood that an increase in turbidity related to the activities associated with the proposed project would generally increase risk of behavioral disruption of marine mammals in the action area, in addition to baseline conditions. The placement and removal of the suction bucket and reference frame would cause a localized, short-term increase in turbidity. Given the short duration and the localized area of increased suspended sediment concentrations above existing levels in the action area, behavioral impacts are extremely unlikely to occur. Therefore, effects of turbidity would be *discountable*.

Sea Turtles

There are no data to indicate that suspended sediment has physiological effects on sea turtles. However, elevated suspended sediment may cause alterations to normal movements or behavioral disruption as sea turtles would be expected to avoid the area of elevated suspended sediment. Given the localized nature of the sediment plume and the rapid dissipation of the plume, any effects of behavioral reactions in green, Kemp's ridley, leatherback, or loggerhead sea turtles due to turbidity associated with foundation testing would be too small to be meaningfully measured, detected, or evaluated and would therefore be *insignificant*.

Elevated suspended sediment concentrations can affect benthic communities, which could impact Kemp's ridley sea turtle as this species forages in soft-bottom habitats. Suspended sediment concentrations high enough to result in adverse impacts to the benthic community (i.e., above 390 milligrams per liter [USEPA 1986]) are not expected throughout most of the plume. Based on plumes generated by hydraulic dredging, it may be possible that suspended sediment concentrations would exceed this threshold immediately adjacent to the suction bucket upon removal. If this threshold were exceeded, prey availability or foraging opportunities may be temporarily reduced in the area immediately outside the footprint of the suction bucket. Given the temporary, short-term nature of the prey reduction, the small scale of the reduction, and the large area of soft-bottom habitat that would remain available for foraging, any effect of a reduction in prey availability or foraging opportunities for Kemp's ridley sea turtle due to increased turbidity as a result of foundation testing would be too small to be meaningfully detected, measured, or evaluated and would therefore be *insignificant*.

When this project is completed, it will not result in a permanent increase in turbidity in the action area, and thus, there is no potential for behavioral reactions or prey impacts in the future. We have also considered the likelihood that an increase in turbidity related to the activities associated with the proposed project would generally increase risk of behavioral disruption of sea turtles or mortality of benthic prey in the action area, in addition to baseline conditions. The placement and removal of the suction bucket and reference frame would cause a localized, short-term increase in turbidity. Given the short duration and the localized area of increased suspended sediment concentrations above existing levels in the action area, effects of behavioral impacts or reductions in foraging success due to prey impacts would be too small to be meaningfully detected, measured, or evaluated. Therefore, effects of turbidity would be *insignificant*.

<u>Fish</u>

Turbidity levels shown to have adverse effects on fish are typically above 1,000 milligrams per liter (see Burton 1993 and Wilber and Clarke 2001). Potential physiological effects of suspended sediment on fish include gill clogging and increased stress (NMFS 2017). Increased turbidity can also result in behavioral effects in fish, such as foraging interference or inhibition of movement (NMFS 2017). However, increased turbidity is not expected to impact the ability of Atlantic sturgeon to forage as they are not visual foragers. Sturgeon rely on their barbels to detect prey and are known to forage during nighttime hours (NMFS 2017). Suspended sediment concentrations below those associated with physiological impacts (i.e., above 1,000 milligrams per liter) are not expected to inhibit sturgeon movement (NMFS 2017). As the suspended sediment concentrations associated with foundation testing are not expected to exceed 1,000 milligrams per liter, turbidity effects on Atlantic sturgeon are extremely unlikely to occur and would therefore be *discountable*.

As noted above, suspended sediment concentrations immediately adjacent to the suction bucket upon removal could potentially result in adverse impacts to the benthic community. However, such a reduction, if it were to occur, would be temporary, short-term, and small scale, and a large area of soft-bottom habitat would remain available for Atlantic sturgeon foraging. Therefore, any effect of a reduction in prey availability or foraging opportunities for Atlantic sturgeon due to increased turbidity as a result of foundation testing would be too small to be meaningfully detected, measured, or evaluated and would therefore be *insignificant*.

When this project is completed, it will not result in a permanent increase in turbidity in the action area, and thus, there is no potential for prey impacts in the future. We have also considered the likelihood that an increase in turbidity related to the activities associated with the proposed project would generally increase risk of benthic prey mortality in the action area, in addition to baseline conditions. The placement and removal of the suction bucket and reference frame would cause a localized, short-term increase in turbidity. Given the short duration and the localized area of increased suspended sediment concentrations above existing levels in the action area, effects of reductions in foraging success due to prey impacts would be too small to be meaningfully detected, measured, or evaluated. Therefore, effects of turbidity would be *insignificant*.

Entrainment and Impingement
Operation of the suction pump would pull ambient water through the pump, potentially resulting in entrainment or impingement of marine organisms. As described above, up to 1,775 cubic yards (1,357 cubic meters) of water may be pumped out of the suction bucket during each installation. An equivalent amount of water may be pumped back into the suction bucket during each removal event. During 35 tests, up to 25.1 million gallons (94,990 cubic meters) of water would be pumped through the suction pump out of and into the suction bucket. Entrainment of ichthyoplankton during foundation testing was estimated based on this total volume and ichthyoplankton densities collected during the Ecosystem Monitoring (EcoMon) survey program between 1977 and 2019 (**Table 5**). The number of larval fish estimated to be entrained per test would be 9,289 fish across all species (**Table 6**), based on average August[2] plankton densities measured during the EcoMon survey program. This level of entrainment for a single test represents a fraction of the eggs produced by a single female in many fish species. Total entrainment estimated for 35 foundation installation tests is provided in **Table 7**. Based on these estimates, entrainment during suction pump operation is not expected to result in measurable impacts on plankton or fish populations in the action area.

<u>Marine Mammals</u>
Juvenile and adult fin whales, NARWs, and sei whales consume plankton that could potentially be affected by entrainment during foundation testing. Though sperm whales forage in deep-water habitats, larval forms of their prey species could potentially be entrained during foundation testing. Entrainment of plankton and larvae from operation of the suction pump would be small compared to the natural mortality and the surrounding area in which whales typically feed. Therefore, entrainment of prey is extremely unlikely to reduce foraging success of fin whales, NARWs, sei whales, and sperm whales.

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[2] Ichthyoplankton densities were highest in the month of August and therefore resulted in the highest entrainment estimates.

ESA-listed whales are too large to be vulnerable to impingement on the suction pump. Therefore, impingement associated with foundation testing would have *no effect* on fin whale, NARW, sei whale, or sperm whale.

When this project is completed, it will not result in ongoing entrainment in the action area, and thus, there would be no entrainment of prey in the future. We have also considered the likelihood that entrainment related to the activities associated with the proposed project would generally reduce foraging success in the action area, in addition to baseline conditions. The installation and removal of the suction bucket during foundation testing would result in entrainment of a relatively small volume of water, and the planktonic animals within it, compared to the surrounding area. Given the relatively small level of potential prey mortality compared to existing levels in the action area, reductions in foraging success are extremely unlikely to occur. Therefore, effects of entrainment would be *discountable*.

Sea Turtles

Given the maximum pump opening during withdrawals from the water column (i.e., 7 inches [18 centimeters] in diameter) and the length of Kemp's ridley sea turtles (i.e., 24 inches [61 centimeters]) (NMFS 2023b), which are the smallest sea turtle species in the action area, sea turtles would not be vulnerable to entrainment through the pump. Juvenile Kemp's ridley sea turtles and juvenile and adult leatherback sea turtles may forage in the soft bottom and pelagic habitats in the Lease Area, respectively, and could therefore be affected by entrainment of planktonic larvae of their prey species. Though hard bottom foraging habitats for loggerhead sea turtles are not expected to occur in the Lease Area, planktonic larval stages of their prey could also potentially be affected by entrainment. However, entrainment of plankton from operation of the suction pump would be small compared to the surrounding area. Therefore, entrainment of prey is extremely unlikely to reduce foraging success of Kemp's ridley, leatherback, or loggerhead sea turtles. Therefore, the effects of entrainment on these species would be *discountable.* As green sea turtles forage on vegetation, entrainment associated with foundation testing would have *no effect* on this species.

As noted above, the pump velocity for the suction pump is estimated at 5.2 feet per second (1.6 meters per second). Sea turtles are capable of cruising (i.e., sustained swimming) at speeds of 3.3 to 4.4 feet per second (1 to 1.3 meters per second), and juveniles are known to forage in areas with currents of up to 3.4 feet per second (1 meter per second) (NMFS 2023a). However, sea turtles may be capable of burst speeds of up to 6.6 feet per second (2 meters per second) for a few seconds (Prange 1976), indicating that sea turtles would be able to escape the pump. Additionally, as described above, the hydraulic zone of influence of the pump would be 20 square feet or less. A sea turtle is unlikely to occur within the radius (up to 2.5 feet [0.8 meter]) of the hydraulic zone of influence while the suction pump is in operation. Therefore, effects of impingement on the suction pump on green, Kemp's ridley, leatherback, and loggerhead sea turtles are extremely unlikely to occur and would be *discountable*.

Table 5 – Mean monthly larval density estimates in Lease Area OCS-A 0520[1] for abundant fish taxa collected in the EcoMon survey program from 1977 to 2019

Species	Mean Monthly Density Estimates Larvae/3,531 Cubic Feet (100 Cubic Meters)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
American plaice	0	0	0.2	0	0.4	0.5	0	0	0	0	0	0
Atlantic cod	2	1.5	2.3	2	0.2	0	0	0	0	0	0.6	3.8
Atlantic croaker	0	0	0	0	0.3	0	0	0	0	<0.1	<0.1	0
Atlantic herring	13.3	4.7	3.6	0	0	0	0	0	0	0.1	260.2	202.7
Atlantic mackerel	0	0	0	0	0.6	1.2	0.3	0	0	0	0	0
Atlantic menhaden	0	0	0	0	0	0	0	0	0	<0.1	9.2	0
Bluefish	0	0	0	0	0	0.1	0	0.7	0	0	0	0
Bristlemouths	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	0	1.1	17.2	1.2	0.1	<0.1	0
Cunner	0	0	0	0	0	0	0.7	0.5	0	0	0	0
Fourbeard rockling	0	0	0	0	0.2	2.8	1.4	0	0	0.2	<0.1	0.2
Fourspot flounder	0	0	0	0	0	0	1.4	34.6	4.8	1.1	0	0.1
Frigate tunas	0	0	0	0	0	0	0	4.7	0	0	0	0
Grubby	0	0	<0.1	0	0	0	0	0	0	0	0	0
Gulf Stream flounder	0	0	0	0	0	0	0.3	145.8	190.2	4.4	0.1	0
Haddock	0	<0.1	0.4	0	0.9	0.8	0	0	0	0	0	0
Hakes	0	0	0	0	0	0.3	14.4	114	80.4	25.4	3.2	0
Lanternfishes	0	0	0	0	0	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0	0	2.2	0.3	<0.1	0
Lefteye flounders	0	0	0	0	0	0	0	0	<0.1	0.2	0	0
Longhorn sculpin	0	0.4	1.1	0.2	0	0	0	0	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0	0	0	0.1	0	0
Monkfish	0	0	0	0	0	0.1	0	0.1	<0.1	0	0	0
Offshore hake	0	0	0	0	0	0	0	0	0	0.4	0	0
Pollock	<0.1	0.7	1.2	0	0	0	0	0	0	0	0	0
Rock gunnel	0	0.1	<0.1	0	0	0	0	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0	0	0	0	0	0
Sand lances	24.7	236.9	90.1	29.6	0.1	0.1	0	0	0	0	0	0
Sea robins	0	0	<0.1	0	0	0	0	0.8	<0.1	0	0	0
Silver hake	<0.1	0	0	0	0	0.3	5.3	21.2	4.5	16.8	3.7	1.1

Species	Mean Monthly Density Estimates Larvae/3,531 Cubic Feet (100 Cubic Meters)											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Summer flounder	0	<0.1	<0.1	0	0	0	0	0	26.2	12.5	11.7	1.3
Windowpane	0	0	0	0	0.8	2.6	0	1.9	9.5	1.8	1.3	0
Winter flounder	0	<0.1	1.6	0	9.2	2.5	0	0	0	0	0	0
Witch flounder	0	0	0	0	0.9	0.4	0.4	0.1	0	0	0	0
Wolffishes	0	0	0	0	0	0	0	0	0	0	0	0
Yellowtail flounder	0	0	<0.1	0	3.1	25.9	1.1	0.1	0	0	0	0
Total	**40.1**	**244.6**	**100.8**	**31.7**	**16.7**	**37.6**	**26.3**	**342**	**319.1**	**63.5**	**290.1**	**209.2**

Source: NCEI 2023.

[1] Based on survey stations located within a 10-nautical mile (18.5-kilometer) radius of the center point of the Lease Area.

Table 6 – Estimates of larval entrainment for each suction bucket test by month

Species	Estimated Entrainment (Number of Larvae)[1]											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
American plaice	0	0	5	0	11	13	0	0	0	0	0	0
Atlantic cod	56	41	64	54	7	0	0	0	0	0	16	103
Atlantic croaker	0	0	0	0	8	0	0	0	0	3	2	0
Atlantic herring	360	128	98	0	0	0	0	0	0	4	7,062	5,503
Atlantic mackerel	0	0	0	0	18	34	10	0	0	0	0	0
Atlantic menhaden	0	0	0	0	0	0	0	0	0	2	250	0
Bluefish	0	0	0	0	0	4	0	20	0	0	0	0
Bristlemouths	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	0	29	467	32	5	2	0
Cunner	0	0	0	0	0	0	19	15	0	0	0	0
Fourbeard rockling	0	0	0	0	6	75	39	0	0	6	2	6
Fourspot flounder	0	0	0	0	0	0	39	941	130	31	0	4
Frigate tunas	0	0	0	0	0	0	0	129	0	0	0	0
Grubby	0	0	2	0	0	0	0	0	0	0	0	0
Gulf Stream flounder	0	0	0	0	0	0	9	3,957	5,163	119	3	0
Haddock	0	2	11	0	25	23	0	0	0	0	0	0
Hakes	0	0	0	0	0	8	390	3,096	2,184	690	88	0
Lanternfishes	0	0	0	0	0	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0	0	60	7	1	0

Species	Estimated Entrainment (Number of Larvae)[1]											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lefteye flounders	0	0	0	0	0	0	0	0	2	5	0	0
Longhorn sculpin	0	12	29	5	0	0	0	0	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0	0	0	4	0	0
Monkfish	0	0	0	0	0	4	0	4	2	0	0	0
Offshore hake	0	0	0	0	0	0	0	0	0	11	0	0
Pollock	2	19	32	0	0	0	0	0	0	0	0	0
Rock gunnel	0	4	2	0	0	0	0	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0	0	0	0	0	0
Sand lances	670	6,430	2,447	804	3	4	0	0	0	0	0	0
Sea robins	0	0	3	0	0	0	0	23	2	0	0	0
Silver hake	3	0	0	0	0	8	144	576	122	456	100	30
Summer flounder	0	3	2	0	0	0	0	0	711	339	318	36
Windowpane	0	0	0	0	23	72	0	53	259	50	35	0
Winter flounder	0	2	44	0	249	68	0	0	0	0	0	0
Witch flounder	0	0	0	0	25	12	10	4	0	0	0	0
Wolffishes	0	0	0	0	0	0	0	0	0	0	0	0
Yellowtail flounder	0	0	2	0	84	704	29	4	0	0	0	0
Total	**1,091**	**6,641**	**2,741**	**863**	**459**	**1,029**	**718**	**9,289**	**8,667**	**1,732**	**7,879**	**5,682**

[1] Based on larval densities provided in **Table 5** and a maximum volume of displaced seawater of 716,963 gallons (2,714 cubic meters).

Table 7 – Estimates of total larval entrainment for suction bucket testing by month

Species	Estimated Entrainment (Number of Larvae)[1]											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
American plaice	0	0	175	0	385	455	0	0	0	0	0	0
Atlantic cod	1,960	1,435	2,240	1,890	245	0	0	0	0	0	560	3,605
Atlantic croaker	0	0	0	0	280	0	0	0	0	105	70	0
Atlantic herring	12,600	4,480	3,430	0	0	0	0	0	0	140	247,170	192,605
Atlantic mackerel	0	0	0	0	630	1,190	350	0	0	0	0	0
Atlantic menhaden	0	0	0	0	0	0	0	0	0	70	8,750	0
Bluefish	0	0	0	0	0	140	0	700	0	0	0	0
Bristlemouths	0	0	0	0	0	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	0	1,015	16,345	1,120	175	70	0
Cunner	0	0	0	0	0	0	665	525	0	0	0	0

Species	Estimated Entrainment (Number of Larvae)[1]											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Fourbeard rockling	0	0	0	0	210	2,625	1,365	0	0	210	70	210
Fourspot flounder	0	0	0	0	0	0	1,365	32,935	4,550	1,085	0	140
Frigate tunas	0	0	0	0	0	0	0	4,515	0	0	0	0
Grubby	0	0	70	0	0	0	0	0	0	0	0	0
Gulf Stream flounder	0	0	0	0	0	0	315	138,495	180,705	4,165	105	0
Haddock	0	70	385	0	875	805	0	0	0	0	0	0
Hakes	0	0	0	0	0	280	13,650	108,360	76,440	24,150	3,080	0
Lanternfishes	0	0	0	0	0	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0	0	2,100	245	35	0
Lefteye flounders	0	0	0	0	0	0	0	0	70	175	0	0
Longhorn sculpin	0	420	1,015	175	0	0	0	0	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0	0	0	140	0	0
Monkfish	0	0	0	0	0	140	0	140	70	0	0	0
Offshore hake	0	0	0	0	0	0	0	0	0	385	0	0
Pollock	70	665	1,120	0	0	0	0	0	0	0	0	0
Rock gunnel	0	140	70	0	0	0	0	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0	0	0	0	0	0
Sand lances	23,450	225,050	85,645	28,140	105	140	0	0	0	0	0	0
Sea robins	0	0	105	0	0	0	0	805	70	0	0	0
Silver hake	105	0	0	0	0	280	5,040	20,160	4,270	15,960	3,500	1,050
Summer flounder	0	105	70	0	0	0	0	0	24,885	11,865	11,130	1,260
Windowpane	0	0	0	0	805	2,520	0	1,855	9,065	1,750	1,225	0
Winter flounder	0	70	1,540	0	8,715	2,380	0	0	0	0	0	0
Witch flounder	0	0	0	0	875	420	350	140	0	0	0	0
Wolffishes	0	0	0	0	0	0	0	0	0	0	0	0
Yellowtail flounder	0	0	70	0	2,940	24,640	1,015	140	0	0	0	0
Total	**38,185**	**232,435**	**95,935**	**30,205**	**16,065**	**36,015**	**25,130**	**325,115**	**303,345**	**60,620**	**275,765**	**198,870**

[1] Based on entrainment estimates per test provided in **Table 6** and a maximum of 35 tests conducted during foundation testing (i.e., a maximum volume of 25.1 million gallons [94,900 cubic meters]).

When this project is completed, it will not result in ongoing entrainment in the action area, and thus, there would be no entrainment of prey or risk of impingement in the future. We have also considered the likelihood that entrainment related to the activities associated with the proposed project would generally reduce foraging success in the action area, in addition to baseline conditions. The installation and removal of the suction bucket during foundation testing would result in entrainment of a relatively small volume of water, and the planktonic animals within it, compared to the surrounding area. Given the relatively small level of potential prey mortality compared to existing levels in the action area, reductions in foraging success are extremely unlikely to occur. Therefore, effects of entrainment would be *discountable*.

Fish

Given the maximum pump opening during withdrawals from the water column (i.e., 7 inches [18 centimeters] in diameter) and that Atlantic sturgeon that may be found in the Lease Area are expected to exceed 30 inches (76 centimeters) in length (i.e., migrating subadults or older [ASSRT 2007]), this species would not be vulnerable to entrainment through the pump. Sub-adult and adult Atlantic sturgeon may forage in the Lease Area and may therefore be affected by entrainment of prey species (e.g., sand lance larvae, planktonic polychaete larvae). However, as entrainment levels are not expected to measurably reduce prey populations in the action area, the effects of any reduction in prey availability on sub-adult and adult Atlantic sturgeon would be too small to be meaningfully measured, detected, or evaluated and would therefore be *insignificant*.

As noted above, the pump velocity for the suction pump is estimated at 5.2 feet per second (1.6 meters per second). Studies of swimming performance in juvenile and sub-adult Atlantic sturgeon, white sturgeon (*Acipenser transmontanus*), and lake sturgeon (*A. fulvescens*) demonstrated that sturgeon at these life stages are capable of sustained swimming at speeds of approximately 1.5 feet per second (0.5 meter per second) and burst speeds of approximately 2.1 feet per second (0.7 meter per second) (Clarke 2011). A study of sub-adult and adult green sturgeon (*A. medirostris*) demonstrated that older sturgeon may be capable of burst speeds up to 7 feet per second (2.1 meters per second) (Kelly and Klimley 2012). Based on anticipated swimming capabilities of sub-adult and adult sturgeon, any Atlantic sturgeon occurring in the Lease Area would be able to escape the pump. Given the demersal life style of sturgeon and the anticipated location of the pump (i.e., 19 feet [6 meters] above the seabed and the estimated size of the pump's zone of influence (i.e, 20 square feet [1.8 square meters]), it is unlikely that Atlantic sturgeon would encounter the area of elevated velocity around the pump. Therefore, effects of impingement on the suction pump on Atlantic sturgeon are extremely unlikely to occur and would be *discountable*.

When this project is completed, it will not result in ongoing entrainment in the action area, and thus, there would be no entrainment of prey or risk of impingement in the future. We have also considered the likelihood that entrainment related to the activities associated with the proposed project would generally reduce foraging success in the action area, in addition to baseline conditions. The installation and removal of the suction bucket during foundation testing would result in entrainment of a relatively small volume of water, and the planktonic animals within it, compared to the surrounding area. Given the relatively small level of potential prey mortality compared to existing levels in the action area, reductions in foraging success are extremely unlikely to occur. Therefore, effects of entrainment would be *discountable*.

Underwater Noise
The foundation testing vessel, the ROVs, the suction pump, and the imaging equipment inside the suction bucket would produce noise during foundation testing activities. Sector scanning sonar, which is currently being evaluated for potential use during the site clearance survey would also produce noise. Vessels generate low frequency, non-impulsive noise that could affect aquatic species. Source levels for transiting large vessels range from 177 to 188 dB re 1 μPa at 3 feet (1 meter) with most of the energy below 1 kilohertz and peaks in the 20–100 hertz range (McKenna et al. 2017). Jimenez-Arranz et al. (2019) measured dynamic positioning noise generated by a Mobile Offshore Drilling Unit, and, based on these measurements, estimated source levels produced by dynamic positioning would peak at approximately 188 dB re 1 μPa in the 31.5 Hz one-third octave band. Warner and McCrodan (2011) measured vessel self-noise during dynamic positioning of a geophysical and geotechnical survey vessel at less than 145 dB re 1 μPa approximately 361 feet (110 meters) from the vessel and observed that frequencies generated by the dynamic positioning thrusters varied between 110 and 140 Hz; based on measured root mean square sound levels, Warner and McCrodan (2011) estimated that sound levels generated by the vessel during dynamic positioning would fall below 170 dB re 1 μPa at 3 feet (1 meter) from the vessel. Noise associated with survey ROVs equipped with acoustic imaging equipment was previously evaluated for site characterization surveys in the Lease Area (Equinor 2020), and NMFS (2020a) determined exposure to disturbing levels of sound due to operation of the survey ROV was extremely unlikely to occur. Sound levels produced by the suction pump are anticipated to fall below ambient noise levels within relatively short distances from the pump (i.e., 1,640 feet [500 meters] (Koschinski and Lüdemann 2020). As described above, the imaging equipment inside the suction bucket would be operated at frequencies at or above 400 kilohertz, and the sector scanning sonar would be operated at frequencies at or above 300 kilohertz; noise produced at these frequencies would be inaudible to marine organisms. Therefore, imaging equipment noise and sector scanning sonar noise do not have the potential to affect ESA-listed species in the action area.

<u>Marine Mammals</u>
Vessel noise overlaps with the hearing range of marine mammals and may cause behavioral responses (e.g., startle responses, behavioral changes, and avoidance), stress responses, and masking (Erbe et al. 2018, 2019; Nowacek et al. 2007; Southall et al. 2007). In NARW, vessel noise is known to increase stress hormone levels, which may contribute to suppressed immunity and reduced reproductive rates and fecundity (Hatch et al. 2012; Rolland et al. 2012). Masking may interfere with detection of prey and predators and reduce communication distances. Modeling results indicate that vessel noise has the potential to substantially reduce communication distances for NARWs (Hatch et al. 2012). As noted above, noise associated with survey ROVs equipped with acoustic imaging equipment was previously evaluated for site characterization surveys in the Lease Area (Equinor 2020). NMFS (2020) determined that the likelihood of marine mammal take resulting from operation of the survey ROV was so low as to be discountable. Therefore, operation of the ROVs under the Proposed Action, which would not utilize acoustic imaging equipment, is not expected to result in behavioral disturbance of marine mammals. Suction pump noise is not anticipated to exceed injury thresholds for marine

mammals, but source levels may exceed the 120 dB re 1 μPa behavioral disturbance threshold for non-impulsive noise (Koschinski and Lüdemann 2020). If source levels exceed the behavioral disturbance threshold, sound levels would be expected to attenuate to non-disturbing levels within a relatively short distance (i.e., 1,640 feet [500 meters]). Noise produced during foundation testing is not expected to exceed injury thresholds for marine mammals but could exceed the behavioral disturbance threshold. Short-term, localized behavioral responses may occur, but these responses would dissipate once the test is complete and the vessel or marine mammal leaves the area. Given the temporary nature of the effects, the short duration of individual tests (i.e., up to 9 hours), and the short overall duration of foundation testing (i.e., up to 15 days), any effects of behavioral disturbance on fin whale, NARW, sei whale, or sperm whale due to noise associated with foundation testing would be too small to be meaningfully measured, detected, or evaluated and would therefore be *insignificant*.

When this project is completed, it will not result in underwater noise in the action area, and thus, there would be no underwater noise impacts in the future. We have also considered the likelihood that underwater noise associated with the proposed project would generally increase behavioral disturbance of marine mammals in the action area, in addition to baseline conditions. The proposed project would temporarily generate low levels of noise that may be audible to marine mammals. Given the short duration of activities and relatively low source levels compared to existing anthropogenic noise sources in the action area, the effects of underwater noise would be too small to be meaningfully measured, detected, or evaluated and would therefore be *insignificant*.

<u>Sea Turtles</u>
Based on anticipated sound levels for vessels, noise from the foundation testing vessel may elicit behavioral responses in sea turtles, including startle responses and changes in diving patterns, or a temporary stress response (NSF and USGS 2011; Samuel et al. 2005). As noted above, noise associated with survey ROVs equipped with acoustic imaging equipment was previously evaluated for site characterization surveys in the Lease Area (Equinor 2020). NMFS (2020) determined that the likelihood of behavioral disturbance of marine mammals resulting from operation of the survey ROV was so low as to be discountable. As marine mammals have a lower behavioral disturbance threshold than sea turtles, operation of the ROVs under the Proposed Action, which would not utilize acoustic imaging equipment, is not expected to result in behavioral disturbance of sea turtles. Suction pump noise is not anticipated to exceed the injury threshold or the 175 dB re 1 μPa behavioral disturbance threshold for sea turtles (Koschinski and Lüdemann 2020). Any behavioral responses to foundation testing noise would be short-term and localized to the area around the testing site or the transiting foundation testing vessel; effects of any elicited behavioral response would dissipate once the test is complete and the vessel or sea turtle leaves the area. Given the temporary nature of the effects, the short duration of individual tests, and the short overall duration of foundation testing, any effects of behavioral disturbance on green, Kemp’s ridley, leatherback, or loggerhead sea turtles due to noise associated with foundation testing would be too small to be meaningfully measured, detected, or evaluated and would therefore be *insignificant*.

When this project is completed, it will not result in underwater noise in the action area, and thus, there would be no underwater noise impacts in the future. We have also considered the likelihood that underwater noise associated with the proposed project would generally increase behavioral disturbance of sea turtles in the action area, in addition to baseline conditions. The proposed project would temporarily generate low levels of noise. Given the short duration of activities and relatively low source levels compared to existing anthropogenic noise sources in the action area, the effects of underwater noise would be too small to be meaningfully measured, detected, or evaluated and would therefore be *insignificant*.

<u>Fish</u>
Continuous sounds produced by marine vessels have been reported to change fish behavior, causing fish to change swimming speed, direction, or depth in the water column; induce avoidance of affected areas by fish; or alter schooling behavior (De Robertis and Handegard 2013; Engås et al. 1995, 1998; Misund and Aglen 1992; Mitson and Knudsen 2003; Sand et al. 2008; Sarà et al. 2007). It is possible that vessel noise could elicit behavioral responses in Atlantic sturgeon, but these responses would be temporary with effects dissipating once the vessel or sturgeon has left the area. As noted above, ROVs are not anticipated to generate significant levels of underwater noise and are not expected to disturb marine life (Equinor 2020; NMFS 2020). Suction pump noise is not anticipated to exceed the 150 dB re 1 μPa behavioral disturbance threshold for Atlantic sturgeon (Koschinski and Lüdemann 2020). If behavioral effects were to occur, they would be temporary and localized and are expected to be too small to be meaningfully measured, detected, or evaluated and would therefore be *insignificant*.

When this project is completed, it will not result in underwater noise in the action area, and thus, there would be no underwater noise impacts in the future. We have also considered the likelihood that underwater noise associated with the proposed project would generally increase behavioral disturbance of fish in the action area, in addition to baseline conditions. The proposed project would temporarily generate low levels of noise. Given the short duration of activities and relatively low source levels compared to existing anthropogenic noise sources in the action area, the effects of underwater noise would be too small to be meaningfully measured, detected, or evaluated and would therefore be *insignificant*.

Vessel Traffic
A single vessel would be utilized during the proposed foundation testing. As the vessel is expected to exceed 65 feet (20 meters) in length, the foundation testing vessel would be subject to a 10-knot (18.5-kilometer per hour) speed restriction from November 1 through July 31. If the proposed foundation testing were to take place outside of the November-July time period, the foundation testing vessel would comply with any Dynamic Management Area or Slow Zone in effect during foundation testing activities. As summarized in the *Proposed Project* section above, the vessel would also comply with additional measures to minimize vessel interactions with protected species described in *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection* (BOEM 2021), including the following:

- The vessel captain and crew will maintain a vigilant watch for all protected species and reduce speed, stop the vessel, or alter course, as appropriate, to avoid striking any listed species;
- Anytime the vessel is underway, the vessel will maintain a 1,640-foot (500-meter) separation distance from ESA-listed species, including unidentified large whales, and a

trained lookout will monitor a Vessel Strike Avoidance Zone of at least 1,640 feet (500 meters);

- If the trained lookout is a vessel crew member, this will be their designated role and primary responsibility, and they will receive training on protected species identification, vessel strike minimization procedures, how and when to communicate with the vessel captain, and reporting requirements;
- All vessel crew members will be briefed in the identification of protected species that may occur in the action area and in regulations and best practices for avoiding vessel collisions. Reference materials for identification of ESA-listed species will be available on board the vessel, and Beacon Wind will clearly communicate, and post in highly visible locations, the expectation and process for reporting of protected species sightings;
- If an ESA-listed whale or unidentified large whale is observed within 1,640 feet (500 meters) of the forward path of the vessel, the operator will steer a course away from the whale at 10 knots (18.5 kilometers per hour) or less until the 1,640-foot (500-meter) minimum separation distance has been established. The vessel operator may also shift to idle if feasible;
- If a large whale is sighted within 656 feet (200 meters) of the forward path of a vessel, the vessel operator will reduce speed and shift the engine to neutral. Engines will not be engaged until the whale has moved outside of the vessel’s path and beyond 1,640 feet (500 meters). If stationary, the vessel will not engage engines until the large whale has moved beyond 1,640 feet (500 meters);
- If a sea turtle of manta ray is sighted at any distance within the operating vessel’s forward path, the vessel operator will slow down to 4 knots (7.4 kilometers per hour) and steer away (unless unsafe to do so). The vessel may resume normal vessel operations once the vessel has passed the individual;
- During times of year when sea turtles are known to occur in the action area, the vessel will avoid transiting through areas of visible jellyfish aggregations or floating vegetation (e.g., sargassum lines or mats). In the event that operational safety prevents avoidance of such areas, the vessel will slow to 4 knots (7.4 kilometers per hour) while transiting through such areas;
- A trained lookout will be posted during all times to avoid interactions with ESA-listed species when a vessel is underway (transiting or surveying) by monitoring in all directions; during any nighttime transits, the lookout will be equipped with night vision and/or infrared equipment to aid in detection of ESA-listed species;
- All crew members responsible for navigation duties will receive site-specific training on ESA-listed species sighting/reporting and vessel strike avoidance measures;
- The vessel will not divert course to approach any ESA-listed species or other marine mammal species;
- The vessel will reduce speed to 10 knots (18.5 kilometers per hour) or less while operating in any Slow Zone, except in areas within a portion of a visually designated Dynamic Management Area or Slow Zone where it is not reasonable to expect the presence of NARWs (e.g., Long Island Sound, shallow harbors); and
- The vessel operator will check for information regarding mandatory or voluntary ship strike avoidance (Seasonal Management Areas and Dynamic Management Areas [or Slow Zones that are also designated as Dynamic Management Areas]) and daily information regarding NARW sighting locations. These media may include, but are not

limited to: NOAA weather radio, U.S. Coast Guard NAVTEX and channel 16 broadcasts, Notices to Mariners, the Whale Alert app, or WhaleMap website.

Marine Mammals

Vessel strikes are a major source of mortality and injury for many marine mammal species (Hayes et al. 2021; Laist et al. 2001; Moore and Clarke 2002), including NARW (Kite-Powell et al. 2007). Almost all sizes and classes of vessels have been involved in collisions with marine mammals around the world (Dolman et al. 2006). Marine mammals are expected to be most vulnerable to vessel strikes when within the vessel's draft and not detectable by visual observers (e.g., animal below the surface or poor visibility conditions such as bad weather or low light), and probability of vessel strike increases with increasing vessel speed (Pace and Silber 2005; Vanderlaan and Taggart 2007). NARWs are at highest risk for vessel strike when vessels travel in excess of 10 knots (Vanderlaan and Taggart 2007); serious injury to cetaceans due to vessel collision rarely occurs when vessels travel below 10 knots (Laist et al. 2001). Given that a single vessel will be used for the proposed foundation testing and the mitigation measures to avoid vessel strike described above, including vessel speed restrictions, use of trained lookouts, minimum separation distances, and vessel strike avoidance procedures, a collision between the vessel and an ESA-listed marine mammal is extremely unlikely to occur. Therefore, the effects of vessel traffic on fin whale, NARW, sei whale, and sperm whale are expected to be *discountable.*

When this project is completed, it will not result in an increased number of vessels in the action area, and thus, there is no increased risk of vessel strike in the future. We have also considered the likelihood that an increase in vessel traffic related to the activities associated with the proposed project would generally increase the risk of interactions between marine mammals and vessels in the action area, in addition to baseline conditions. The use of the single foundation testing vessel would cause a small, localized, temporary increase in vessel traffic. Given the extremely small increase in vessel traffic above existing levels in action area and the mitigation measures proposed, vessel strikes are extremely unlikely to occur, and effects to marine mammals would be *discountable*.

Sea Turtles

Vessel strikes are a known source of injury and mortality for sea turtles (Chaloupka et al. 2008). Though sea turtles spend a majority of their time (greater than 90 percent) submerged (Lutcavage and Lutz 1997), most of their submerged time (60 to 75 percent) occurs within 32 feet (10 meters) of the surface for hard-shelled species (i.e., green, Kemp's ridley, and loggerhead sea turtles) (Borcuk et al. 2017; Watwood and Buonantony 2012), indicating that these species may be vulnerable to vessel strike, particularly by deep draft vessels, approximately 66 to 81 percent of the time. Leatherback sea turtles spend less time within 32 feet (10 meters) of the surface (approximately 20 percent) (Borcuk et al. 2017; Watwood and Buonantony 2012), indicating that this species may be less vulnerable to vessel strike that the other sea turtle species in the action area. Sea turtles are expected to be most vulnerable to vessel strikes in coastal foraging areas and may not be able to avoid collisions when vessel speeds exceed 2 knots (4 kilometers per hour) (Hazel et al. 2007). Given that a single vessel will be used for the proposed Foundation Testing and the mitigation measures to avoid vessel strike described above, including use of trained lookouts, minimum separation distances, and vessel strike avoidance procedures, a collision between the vessel and a sea turtle is extremely unlikely to occur. Therefore, the effects of vessel traffic on green, Kemp's ridley, leatherback, and loggerhead sea turtle are expected to be *discountable.*

When this project is completed, it will not result in an increased number of vessels in the action area, and thus, there is no increased risk of vessel strike in the future. We have also considered the likelihood that an increase in vessel traffic related to the activities associated with the proposed project would generally increase the risk of interactions between sea turtles and vessels in the action area, in addition to baseline conditions. The use of the single foundation testing vessel would cause a small, localized, temporary increase in vessel traffic. Given the extremely small increase in vessel traffic above existing levels in action area and the mitigation measures proposed, vessel strikes are extremely unlikely to occur, and effects to sea turtles would be *discountable*.

<u>Fish</u>

Vessel strikes are a documented source of mortality for Atlantic sturgeon in riverine habitats (Balazik et al. 2012; Brown and Murphy 2010; Krebs et al. 2019). In the marine environment, where the foundation testing vessel will be operating, demersal Atlantic sturgeon would have much more separation from vessel hulls due to deeper water and less constrained ability to avoid vessels (i.e., as opposed to within the narrow confines of a shallower river); therefore, the risk of vessel strike may be significantly lower compared to the estuarine/riverine environment. Given that a single vessel will be used for the proposed foundation testing and the demersal nature of Atlantic sturgeon, a collision between the vessel and an Atlantic sturgeon is extremely unlikely to occur. Therefore, the effects of vessel traffic on Atlantic sturgeon are expected to be *discountable*.

When this project is completed, it will not result in an increased number of vessels in the action area, and thus, there is no increased risk of vessel strike in the future. We have also considered the likelihood that an increase in vessel traffic related to the activities associated with the proposed project would generally increase the risk of interactions between Atlantic sturgeon and vessels in the action area, in addition to baseline conditions. The use of the single foundation testing vessel would cause a small, localized, temporary increase in vessel traffic. Given the extremely small increase in vessel traffic above existing levels in action area and the anticipated location of sturgeon in the water column, vessel strikes are extremely unlikely to occur, and effects to Atlantic sturgeon would be *discountable*.

Physical Interactions with Foundation Testing Equipment

There is the potential for the frame or suction bucket to come into contact with an ESA-listed species while being lowered. However, the structures would be lowered at a low speed (0.7 miles per hour [1.1 kilometers per hour]) and in a controlled manner. In the unlikely event that weather conditions make onboarding the suction bucket at the end of the test hazardous, the suction bucket may be suspended under the vessel as it transits to the next testing site, as described above, posing an opportunity for potential physical interactions with ESA-listed species during transit. However, the transit would be conducted at low speed (i.e., 1 to 2 knots [2 to 4 kilometers per hour]). There is also the potential for interactions with operating ROVs or acoustic moorings being deployed.

Marine Mammals
An ESA-listed marine mammal would have to be directly below the suction bucket, reference frame, or acoustic mooring as it is being lowered or in the water column immediately in front of the operating ROV or the suction bucket during vessel transit to experience a physical interaction during movement of foundation testing equipment. Additionally, the rate of lowering the bucket and frame (i.e., 13 inches [33 centimeters] per second) at each testing site and the slow transit speed during suspended transit of the suction bucket should allow marine mammals to avoid interaction. Additionally, BOEM would require that no lowering or retrieval of the suction bucket be permitted if any listed species are sighted within 1,640 feet (500 meters) of the installation vessel. Based on this information and the relatively small number of tests for proposed foundation testing, physical interactions between fin whale, NARW, sei whale, or sperm whale and foundation testing equipment are extremely unlikely to occur and would therefore be *discountable*.

When this project is completed, it will not result in an increased risk of physical interactions in the future. We have also considered the likelihood that an increase in physical interaction risk related to the activities associated with the proposed project would generally increase the risk of interactions with marine mammals in the action area, in addition to baseline conditions. The lowering of the suction bucket and reference frame and the potential suspended transit of the suction bucket could potentially result in physical interactions. Given the slow lowering and suspended transit speeds and the mitigation measure prohibiting the lowering of equipment when ESA-listed species are withing 1,640 feet (500 meters) of the foundation testing vessel, physical interactions are extremely unlikely to occur, and effects to marine mammals would be *discountable*.

Sea Turtles
A sea turtle would have to be directly below the suction bucket, reference frame, or acoustic mooring as it is being lowered or in the water column immediately in front of the operating ROV or the suction bucket during vessel transit to experience a physical interaction during movement of foundation testing equipment. Additionally, the slow rate of lowering the bucket and frame at each testing site and the slow transit speed during suspended transit of the suction bucket should allow sea turtles to avoid interaction. Additionally, BOEM would require that no lowering or retrieval of the suction bucket be permitted if any listed species are sighted within 1,640 feet (500 meters) of the foundation testing vessel. Based on this information and the relatively small number of tests for proposed Foundation Testing, physical interactions between green, Kemp's ridley, leatherback, and loggerhead sea turtles and foundation testing equipment are extremely unlikely to occur and would therefore be *discountable*.

When this project is completed, it will not result in an increased risk of physical interactions in the future. We have also considered the likelihood that an increase in physical interaction risk related to the activities associated with the proposed project would generally increase the risk of interactions with sea turtles in the action area, in addition to baseline conditions. The lowering of the suction bucket and reference frame and the potential suspended transit of the suction bucket could potentially result in physical interactions. Given the slow lowering and suspended transit speeds and the mitigation measure prohibiting the lowering of equipment when ESA-listed species are withing 1,640 feet (500 meters) of the foundation testing vessel, physical interactions are extremely unlikely to occur, and effects to sea turtles would be *discountable*.

Fish

An Atlantic sturgeon would have to be on the seabed directly below the suction bucket, reference frame, or acoustic mooring as it is being lowered or in the water column immediately in front of the operating ROV or the suction bucket during vessel transit to experience a physical interaction with foundation testing equipment. Additionally, the slow rate of lowering should allow Atlantic sturgeon to avoid interaction. As suspended transit of the suction bucket would occur in the water column, Atlantic sturgeon are not expected to be vulnerable to physical interactions during suction bucket movement in inclement weather conditions. Based on this information and the relatively small number of tests for proposed foundation testing, physical interactions between Atlantic sturgeon and foundation testing equipment are extremely unlikely to occur and would therefore be *discountable*.

When this project is completed, it will not result in an increased risk of physical interactions in the future. We have also considered the likelihood that an increase in physical interaction risk related to the activities associated with the proposed project would generally increase the risk of interactions with Atlantic sturgeon in the action area, in addition to baseline conditions. The lowering of the suction bucket and reference frame could potentially result in physical interactions. Given the slow lowering speed, physical interactions are extremely unlikely to occur, and effects to Atlantic sturgeon would be *discountable*.

North Atlantic Right Whale Critical Habitat

As stated above, the foundation testing vessel would likely transit through the southern edge of NARW critical habitat Unit 1 when traveling between its origin/destination port in Europe and the mobilization/demobilization port(s) for the proposed project, resulting in up to two one-way transits through designated critical habitat. Vessel transits would not affect the physical and biological features of designated critical habitat for NARW foraging, including *C. finmarchicus* aggregations or the physical conditions or structures that distribute or aggregate *C. finmarchicus*. An accidental release from the vessel could potentially affect *C. finmarchicus* aggregations. However, such a release is extremely unlikely to occur. Therefore, effects of the proposed project on designated critical habitat for NARW would be *discountable*.

Conclusions

Based on the analysis that all effects of the proposed action will be insignificant and/or discountable (i.e., extremely unlikely to occur), we have determined that approval of Beacon Wind's SAP amendment, which would authorize foundation testing in the Lease Area, may affect, but is not likely to adversely affect any listed species under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis.

Literature Cited

Atlantic Sturgeon Status Review Team (ASSRT). 2007. *Status Review of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)*. 175 pp.

Balazik, M. T., K. J. Reine, A. J. Spells, C. A. Fredrickson, M. L. Fine, G. C. Garman, and S. P. McInich. 2012. The Potential for Vessel Interactions with Adult Atlantic Sturgeon in the James River, Virginia. *North American Journal of Fisheries Management* 32:1062–1069.

Beacon Wind. 2023. *Site Assessment Plan Amendment: Beacon Wind Massachusetts Wind Energy Lease Area OCS-A 0520*. March 2, 2023. 48 pp.

Beacon Wind. 2024. *Beacon Wind Project: Beacon Wind 1 and Beacon Wind 2 Construction and Operations Plan, Volumes I and II*. Appendix L revised February 2024. Other content revised June 2023.

Borcuk, J. R., G. H. Mitchell, S. L. Watwood, T. E. Moll, E. M. Oliveira, and E. R. Robinson. 2017. *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-Southern California Training and Testing Study Areas*. NUWC-NPT Technical Report 12,243. June 2017. 121 pp.

Brown, J. J., and G. W. Murphy. 2010. Atlantic Sturgeon Vessel-Strike Mortalities in the Delaware Estuary. *Fisheries* 35:72–83.

Bureau of Ocean Energy Management (BOEM). 2014. *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts: Revised Environmental Assessment*. Bureau of Ocean Energy Management, Office of Renewable Energy Programs. BOEM 2014-603. 674 pp.

Bureau of Ocean Energy Management (BOEM). 2021. *Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection*. United Stated Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Atlantic OCS Region. Revised 11/22/2021. 18 pp.

Burton, W. H. 1993. *Effects of Bucket Dredging on Water Quality in the Delaware River and the Potential for Effects on Fisheries Resources*. Prepared for Delaware Basin Fish and Wildlife Management Cooperative. June 1993. 31 pp.

Chaloupka, M., T. M. Work, G. H. Balazs, S. K. K. Murakawa, and R. Morris. 2008.Cause-specific Temporal and Spatial Trends in Green Sea Turtle Strandings in the Hawaiian Archipelago (1982–2003). *Marine Biology* 154:887–898.

Clarke, D. 2011. *Sturgeon Protection*. Dredged Material Assessment and Management Seminar. 24-26 May, 2011, Jacksonville, Florida.

De Robertis, A., and N. O. Handegard. 2013. Fish Avoidance of Research Vessels and the Efficacy of Noise-Reduced Vessels: A Review. *ICES Journal of Marine Science* 70:34–45.

DiMatteo, A. D., J. J. Roberts, D. Jones, L. Garrison, K. M. Hart, R. D. Kenney, C. B. Khan, W. A. McLellan, K. Lomac-MacNair, et al. 2023. *Sea Turtle Density Surface Models along the United States Atlantic Coast*. Manuscript in progress.

Dolman, S., V. Williams-Grey, R. Asmutis-Silvia, and S. Isaac. 2006. *Vessel Collisions and Cetaceans: What Happens when They Don't Miss the Boat*. A WDCS Science Report.

Dunton, K. J., A. Jordaan, D. O. Conover, K. A. McKown, L. A. Bonacci, and Frisk M. G. 2015. Marine Distribution and Habitat Use of Atlantic Sturgeon in New York Lead to Fisheries Interactions and Bycatch. *Marine and Coastal Fisheries*. 7:18–32.

Engås, A., E. K. Haugland, and J. T. Øverdal. 1998. Reactions of Cod (*Gadus morhua* L.) in Pre-vessel Zone to an Approaching Trawler under Different Light Conditions. *Hydrobiologia* 371/372:199–206.

Engås, A., O. A. Misund, A. V. Soldal, B. Horvei, and A. Solstad. 1995. Reactions of Penned Herring and Cod to Playback of Original, Frequency-filtered and Time-smoothed Vessel Sound. *Fisheries Research* 22:243–254.

Equinor. 2020. Letter of Concurrence Request for Site Characterization Surveys in the Area of Leases OCS-A 0520 and OCS-A 0512. March 11, 2020. 4 pp.

Erbe, C., R. Dunlop, and S. Dolman. 2018. Effects of Noise on Marine Mammals. Pages 277–309 in H. Slabbekoorn, R. J. Dooling, A. N. Popper, and R. R. Fay (eds.), *Effects of Anthropogenic Noise on Animals*. New York, NY: Springer.

Erbe, C., S. A. Marley, R. P. Schoeman, J. N. Smith, L. E. Trigg, and C. B. Embling. 2019. The Effects of Ship Noise on Marine Mammals—A Review. *Frontiers in Marine Science* 6: Article 606.

Gudger, E. W. 1922. The most northerly record of the capture in Atlantic waters of the United States of the giant ray, *Manta birostris*. *Science* 55:338–340.

Hatch, L. T., C. W. Clark, S. M. van Parijs, A. S. Frankel, and D. M. Ponirakis. 2012. Quantifying Loss of Acoustic Communication Space for Right Whales in and around a U.S. National Marine Sanctuary. *Conservation Biology* 26:983–994.

Hayes, S. A., E. Josephson, K. Maze-Foley, P. E. Rosel, and J. Turek. 2021. *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2020.* NOAA Tech. Mem. NMFS-NE-271. 394 pp.

Hazel, J., I. R. Lawler, H. Marsh, and S. Robson. 2007. Vessel Speed Increases Collision Risk for the Green Turtle *Chelonia mydas*. *Endangered Species Research* 3:105–113.

Horwath, S., J. Hassrick, R. Grismalda, E. Diller, J. Krebs, and R. Manhard. 2021. *Comparison of Environmental Effects from Different Offshore Wind Turbine Foundations*. OCS Study BOEM 2021-053. 48 pp.

Jimenez-Arranz, G., D. Hedgeland, S. Cook, N. Banda, P. Johnston, and E. Oliver. 2019. Acoustical characterization of a Mobile Offshore Drilling Unit. *Proceedings of Meetings on Acoustics* 37:070005.

Johnson, A. 2018. *White Paper on the Effects of Increased Turbidity and Suspended Sediment on ESA Listed Species from Projects Occurring in the Greater Atlantic Regions*. Greater Atlantic Region Policy Series 18-02. NOAA Fisheries. Available: https:/www.greateratlantic.fisheries.noaa.cov/policyseriesindex.phpGARPS/article/view/8/8.

Kelly, J. T., and A. P. Klimley. 2012. Relating the Swimming Movements of Green Sturgeon to the Movement of Water Currents. *Environmental Biology of Fishes* 93:151–167.

Kite-Powell, H. L., A. Knowlton, and M. Brown. 2007. *Modeling the Effect of Vessel Speed on Right Whale Ship Strike Risk*. Unpublished Report for NOAA/NMFS Project NA04NMF47202394. 8 pp. Available: https://tethys.pnnl.gov/sites/default/files/publications/Kite-Powell-et-al-2007.pdf.

Koschinski, S., and K. Lüdemann. 2020. *Noise Mitigation for the Construction of Increasingly Large Offshore Wind Turbines: Technical Options for Complying with Noise Limits*. Report commissioned by the Federal Agency for Nature Conservation, Isle of Vilm, Germany. March 2020. 40 pp.

Kraus, S. D., J. K. D. Taylor, B. Wikgren, R. D. Kenney, C. Mayo, L. Ganley, P. Hughes, C. W. Clark, and A. N. Rice. 2013. *Field Surveys of Whales and Sea Turtles for Offshore Wind Energy Planning in Massachusetts. 2011-2012*. Massachusetts Clean Energy Center.

Kraus, S. D., S. Leiter, K. Stone, B. Wikgren, C. Mayo, P. Hughes, R. D. Kenney, C. W. Clark, A. N. Rice, B. Estabrook, and J. Tielens. 2016. *Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles. Final Report*.

U.S. Department of the Interior, Bureau of Ocean Energy Management, Sterling, Virginia. OCS Study BOEM 2016-054. Available: https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/Northeast-Large-Pelagic-Survey-Collaborative-Aerial-and-Acoustic-Surveys-for-Large-Whales-and-Sea-Turtles.pdf.

Krebs, J., C. Manhard, F. Jacobs. 2019. *Risks to Atlantic sturgeon from commercial vessels on the Hudson River. Final Report*. Submitted in accordance with Conservation Recommendation #8 NMFS Biological Opinion NER-2018-14953. 93 pp.

Laist, D. W., A. R. Knowlton, J. G. Mead, A. S. Collet, and M. Podesta. 2001. Collisions between Ships and Whales. *Marine Mammal Science* 17:35–75.

Lutcavage, M. E., and P. L. Lutz. 1997. Diving Physiology Pages 277–296 in P. L. Lutz and J. A. Musick (eds.), *The Biology of Sea Turtles*. Boca Raton, FL: CRC Press.

McKenna, M. F., C. Gabriele, and B. Kipple. 2017. Effects of Marine Vessel Management in the Underwater Acoustic Environment of Glacier Bay National Park, AK. *Ocean & Coastal Management* 139:102–112.

Misund, O. A., and A. Aglen. 1992. Swimming Behaviour of Fish Schools in the North Sea During Acoustic Surveying and Pelagic Trawl Sampling. *ICES Journal of Marine Science* 49:325–334.

Miller, M. H., and C. Klimovish. 2017. *Endangered Species Act Status Review Report: Giant Manta Ray (Manta birostris) and Reef Manta Ray (Manta alfredi)*.

Mitson, R. B., and H. P. Knudsen. 2003. Causes and Effects of Underwater Noise on Fish Abundance Estimation. *Aquatic Living Resources* 16:255–263.

Moore, S. E., and J. T. Clarke. 2002. Potential Impact of Offshore Human Activities on Gray Whales (*Eschrichtius robustus*). *Journal of Cetacean Resource Management* 4:19–25.

National Centers for Environmental Information (NCEI). 2023. Zooplankton and Ichthyoplankton Abundance and Distribution in the North Atlantic Collected by the Ecosystem Monitoring (EcoMon) Project from 1977-02-13 to 2021-11-15. NCEI Accession 0187513. Available: https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.nodc:0187513.

National Marine Fisheries Service (NMFS). 2005. Recovery Plan for the North Atlantic Right Whale (*Eubalaena glacialis*).

National Marine Fisheries Service (NMFS). 2010a. Final Recovery Plan for the Fin Whale (*Balaenoptera physalus*).

National Marine Fisheries Service (NMFS). 2010b. Recovery Plan for the Sperm Whale (*Physeter macrocephalus*).

National Marine Fisheries Service (NMFS). 2011. Final Recovery Plan for the Sei Whale (*Balaenoptera borealis*).

National Marine Fisheries Service (NMFS). 2016. Proposed threatened listing determination for the oceanic whitetip shark under the Endangered Species Act (ESA). 81 FR 96304.

National Marine Fisheries Service (NMFS). 2017. *Biological Opinion. CENAP-OP-R-2016-0181-39 DRP Gibbstown Shipping Port and Logistic Center*. NER-2017-14371. GARFO-2017-00176. 223 pp.

National Marine Fisheries Service (NMFS). 2020a. Letter of Concurrence re: Survey ROV Operations. 1 p.

National Marine Fisheries Service (NMFS). 2020b. Recovery Plan for the Blue Whale *(Balaenoptera musculus*): First Revision to the July 1998 Recovery Plan for the Blue Whale.

National Marine Fisheries Service (NMFS). 2020c. Section 7 Effect Analysis: Turbidity in the Greater Atlantic Region. Available: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-effect-analysis-turbidity-greater-atlantic-region.

National Marine Fisheries Service (NMFS). 2020c. Citing Hayes, S. A., E. Josephson, K. Maze-Foley, and P. E. Rosel. 2020. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2019. NOAA Tech. Mem. NMFS-NE-264. 479 pp.

National Marine Fisheries Service (NMFS). 2020c. Citing LaSalle, M. W. 1990. Physical and chemical alterations associated with dredging. In C.A. Simenstad, ed. *Proceedings of the Workshop on the Effects of Dredging on Anadromous Pacific Coast Fishes*, pp. 1-12.

National Marine Fisheries Service (NMFS). 2020c. Citing Nightingale, B., and C. Simenstad. 2001. Dredging Activities. Marine Issues. 119 pp.

National Marine Fisheries Service (NMFS). 2020c. Citing U.S. Army Corps of Engineers (USACE). 1983. Dredging and dredged material disposal. U.S. Dept. Army Engineer Manual 111 0-2-5025.

National Marine Fisheries Service (NMFS). 2020c. Citing U.S. Army Corps of Engineers (USACE). 2005. Sediment and elutriate water investigation, Upper James River, Virginia.

National Marine Fisheries Service (NMFS). 2020c. Citing U.S. Army Corps of Engineers (USACE). 2010. Richmond Deepwater Terminal to Hopewell sediment and elutriate water investigation, Upper James River, Virginia.

National Marine Fisheries Service (NMFS). 2020c. Citing U.S. Army Corps of Engineers (USACE). 2015. New York and New Jersey Harbor Deepening Project – Dredge plume dynamics in New York/New Jersey Harbor: Summary of suspended sediment plume surveys performed during harbor deepening. 133 pp.

National Marine Fisheries Service (NMFS). 2022. Oceanic Whitetip Shark. Available: https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark. Accessed: January 31, 2022.

National Marine Fisheries Service (NMFS). 2023a. Continued Operation of Salem and Hope Creek Nuclear Generation Stations. GAR-2020-02842. Biological Opinion. 263 pp.

National Marine Fisheries Service (NMFS). 2023b. Kemp's ridley turtle. Available at https://www.fisheries.noaa.gov/species/kemps-ridley-turtle. Accessed: December 2023.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1991. Recovery Plan for U.S. Population of Atlantic Green Turtle (*Chelonia mydas*).

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1992. Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico (*Dermochelys coriacea*).

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2008. Recovery Plan for the Northwest Atlantic population of the loggerhead sea turtle (*Caretta caretta*). Second revision.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2011. Determination of Nine Distinct Population Segments of Loggerhead Sea Turtles as Threatened or Endangered. 76 FR 58868.

National Science Foundation (NSF) and U.S. Geological Survey (USGS). 2011. *Final Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey.* 514 pp. Available: https://www.nsf.gov/geo/oce/envcomp/usgs-nsf-marine-seismic-research/nsf-usgs-final-eis-oeis_3june2011.pdf.

Nowacek, D. P., L. H. Thorne, D. W. Johnston, and P. L. Tyack. 2007. Responses of Cetaceans to Anthropogenic Noise. *Mammal Review* 37:81–115.

O'Brien, O, McKenna, K, Hodge, B, Pendleton, D, Baumgartner, M, and Redfern, J. 2020. *Megafauna Aerial Surveys in the Wind Energy Areas of Massachusetts and Rhode Island with Emphasis on Large Whales: Summary Report Campaign 5, 2018-2019*. OCS Study BOEM 2021-033. 83 pp.

O'Brien, O., K. McKenna, M. Baumgartner, and J. Redfern. 2021. *Megafauna Aerial Surveys in the Wind Energy Areas of Massachusetts and Rhode Island with Emphasis on Large Whales: Interim Report Campaign 6A, 2020*. OCS Study BOEM 2021-054. 32 pp.

O'Brien, O, McKenna, K, Pendleton, D, and Redfern, J. 2022. *Megafauna Aerial Surveys in the Wind Energy Areas of Massachusetts and Rhode Island with Emphasis on Large Whales: Final Report Campaign 6B, 2020-2021*. Massachusetts Clean Energy Center. 40 pp.

O'Brien, O., McKenna, K., Hsu, S., Pendleton, D., Ganley, L., and Redfern, J. 2023. *Megafauna Aerial Surveys in the Wind Energy Areas of Southern New England with Emphasis on Large Whales: Final Report Campaign 7, 2022*. OCS Study BOEM 2023-061. 61 pp.

Pace, R. M., and G. K. Silber. 2005. *Simple Analysis of Ship and Large Whale Collisions: Does Speed Kill?* Presentation at the Sixteenth Biennial Conference on the Biology of Marine Mammals, San Diego, CA, December.

Prange, H. D. 1976. Energetics of Swimming of a Sea Turtle. *Journal of Experimental Biology* 64:1–12.

Quintana, E., S. Kraus, and M. Baumgartner. 2019. *Megafauna Aerial Surveys in the Wind Energy Areas of Massachusetts and Rhode Island with Emphasis on Large Whales: Summary Report Campaign 4, 2017-2018.* New England Aquarium, Anderson Cabot Center for Ocean Life, Boston, Massachusetts, and Woods Hole Oceanographic Institution, Woods Hole, Maine.

Roberts J. J., B. D. Best, L. Mannocci, E. Fujioka, P. N. Halpin, D. L. Palka, L. P. Garrison, K. D. Mullin, T. V. N. Cole, C. B. Khan, W. M. McLellan, D. A. Pabst, and G. G. Lockhart. 2016. Habitat-based Cetacean Density Models for the U.S. Atlantic and Gulf of Mexico. *Scientific Reports* 6:22615.

Roberts, J., T. Yack, and P. Halpin. 2022. Habitat-based Marine Mammal Density Models for the U.S. Atlantic. Updated June 20, 2022. Available: https://seamap.env.duke.edu/models/Duke/EC/.

Rolland, R. M., S. E. Parks, K. E. Hunt, M. Castellote, P. J. Corkeron, D. P. Nowacek, S. K. Wasser, and S. D. Krauss. 2012. Evidence that Ship Noise Increases Stress in Right Whales. *Proceedings of the Royal Society B* 279:2363–2368.

Samuel, Y., S. J. Morreale, C. W. Clark, C. H. Greene, and M. E. Richmond. 2005. Underwater, Low-Frequency Noise in a Coastal Sea Turtle Habitat. *Journal of the Acoustical Society of America* 117:1465–1472.

Sand, O., H. E. Karlsen, and F. R. Knudsen. 2008. Comment on “Silent research vessels are not quiet” [J. Acoust. Soc. Am. 121, EL145-EL-150] (L). *Journal of the Acoustical Society of America* 123:1831–1833.

Sarà, G., J. M. Dean, D. D. Amato, G. Buscaino, A. Oliveri, S. Genovese, S. Ferro, G. Buffa, M. Lo Martire, and S. Mazzola. 2007. Effect of Boat Noise of the Behaviour of Bluefin Tuna *Thunnus thynnus* in the Mediterranean Sea. *Marine Ecology Progress Series* 331:243–253.

Southall, B. L., A. E. Bowles, W. T. Ellison, J. J. Finneran, R. L. Gentry, C. R. Greene Jr., D. Kastak, D. R. Ketten, J. H. Miller, P. E. Nachtigall, W. J. Richardson, J. A. Thomas, and P. L. Tyack. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. *Aquatic Mammals* 33:411–521.

Stein, A. B., K. D. Friedland, and M. Sutherland. 2004. Atlantic Sturgeon Marine Distribution and Habitat Use along the Northeastern Coast of the United States. *Transactions of the American Fisheries Society* 133:527–537.

U.S. Environmental Protection Agency (USEPA). 1986. *Quality Criteria for Water*. EPA 440/5-86-001.

Vanderlaan, A. S. M., and C. T. Taggart. 2007. Vessel Collisions with Whales: The Probability of Lethal Injury Based on Vessel Speed. *Marine Mammal Science* 23:144–156.

Warner, G., and A. McCrodan. 2011. *Chapter 3 Underwater Sound Measurements*. Pages 2.1–3.83 in K. Hartin, L. Bisson, S. Case, D. Ireland, and D. Hannay (eds.), Marine Mammal Monitoring and Mitigation During Site Clearance and Geotechnical Surveys by Statoil E&P Inc. In The Chukchi Sea, August-October 2011: 90-Day Report. Anchorage, AK.

Watwood, S. L. and D. M. Buonantony. 2012. *Dive Distribution and Group Size Parameters for Marine Species Occurring in Navy Training and Testing Aras in the North Atlantic and North Pacific Oceans.* Newport, Rhode Island. NUWC-NPT Technical Document 12,085. March 2012. Available: https://apps.dtic.mil/sti/pdfs/ADA560975.pdf. Accessed June 2022.

Wilber, D. H., and D. G. Clarke. 2001. Biological effects of suspended sediments: A review of suspended sediment impacts on fish and shellfish with relation to dredging activities in estuaries. *North American Journal of Fisheries Management* 21:855–875.

Wilber, D. H., and D. G. Clarke. 2007. Defining and Assessing Benthic Recovery Following Dredging and Dredged Material Disposal. Pages 603–618 in R.E. Randall (ed.), Proceedings of the XVIII World Dredging Congress. Lake Buena Vista, FL, USA. Newman Printing Co., Bryan, TX, USA.

Woods Hole Oceanographic Institution. (WHOI). 2021. Robots4Whales. Woods Hole Oceanographic Institution. Available: http://dcs.whoi.edu/. Accessed November 2023.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
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March 7, 2024

David Diamond
Deputy Chief for Operations,
Atlantic Outer Continental Shelf
Office of Renewable Energy Programs
Bureau of Ocean Energy Management
45600 Woodland Road
Sterling, Virginia 20166

RE: Beacon Wind Site Assessment Plan Amendment - Suction Bucket Testing

Dear Mr. Diamond:

We have completed consultation under Section 7 of the Endangered Species Act (ESA) in response to your December 21, 2023 request for consultation and your revised Biological Assessment received on February 27, 2024, regarding the Bureau of Ocean Energy Management's (BOEM) proposed approval of Beacon Wind's Site Assessment Plan (SAP) amendment. The SAP amendment would allow Beacon Wind to conduct proposed suction bucket foundation testing at up to 26 sites within the Beacon Wind lease area (OCS-A 0520). Based on our review and assessment of the best available scientific information, including our knowledge, expertise, and the information and analysis in your BA, we concur with your conclusion that the proposed SAP amendment may affect but is not likely to adversely affect (NLAA) any ESA-listed species or critical habitat under our jurisdiction. Therefore, no further consultation pursuant to Section 7 of the ESA is required.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in this letter of concurrence would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

Reinitiation of consultation is required and shall be requested by you or us, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this consultation or; (c) if a new species is listed or critical habitat designated that may be affected by the identified action. No take is anticipated or exempted. If there is any incidental take, reinitiation would be required. Should you have any questions about this correspondence please contact Nick Sisson at (978) 281-9179 or by email (nick.sisson@noaa.gov).

Sincerely,

Julia E. Crocker
for
Jennifer Anderson
Assistant Regional Administrator
for Protected Resources

ec: Sisson, Crocker – GAR PRD

File Code: Section 7/BOEM/ Informals/2023/ Beacon Wind Suction Bucket Testing
GARFO-2024-00441

G.2 Magnuson-Stevens Fishery Conservation and Management Act

Beacon Wind Foundation Testing

Essential Fish Habitat Assessment with NOAA Trust Resources

January 2024

For the National Marine Fisheries Service

U.S. Department of the Interior

Bureau of Ocean Energy Management
Office of Renewable Energy Programs

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Abbreviations

APM	Applicant Proposed Mitigation
ASFMC	Atlantic States Marine Fisheries Commission
Beacon Wind	Beacon Wind, LLC
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
CMECS	Coastal and Marine Ecological Classification Standard
COP	Construction and Operations Plan
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EPM	Environmental Protection Measures
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
HAPC	Habitat Areas of Particular Concern
HRG	high-resolution geophysical
Lease Area	Lease Area OCS-A 0520
MAFMC	Mid-Atlantic Fishery Management Council
MA WEA	Massachusetts Wind Energy Area
MBES	multibeam echo sounder
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NMFS	National Marine Fisheries Service
OCS	Outer Continental Shelf
ROV	remotely operated vehicle
SAP	Site Assessment Plan
SAV	submerged aquatic vegetation
sf	sub-female
SMAST	School for Marine Science and Technology
SPI/PV	sediment profile imaging and plan view
SPL	sound pressure level
SSS	side scan sonar
TSS	total suspended sediment
USACE	U.S. Army Corps of Engineers
YOY	young-of-year

Unit Abbreviations

°C	degrees Celsius
dB	decibels
°F	degrees Fahrenheit
ft^2	square feet
Hz	hertz
m^2	square meters
m^3	cubic meters
mg/L	milligrams per liter
mm	millimeters
ppt	parts per thousand
µm	micrometers

1. Introduction

The Energy Policy Act of 2005, Public Law No. 109-58, added Section 8(p)(1)I to the Outer Continental Shelf Lands Act, which grants the Secretary of the Interior the authority to issue leases, easements, or rights-of-way on the Outer Continental Shelf (OCS) for the purpose of renewable energy development (43 United States Code [USC] § 1337(p)(1)(C)). The Secretary delegated this authority to the former Minerals Management Service, now the Bureau of Ocean Energy Management (BOEM). On April 22, 2009, BOEM (formerly the Bureau of Ocean Energy Management, Regulation, and Enforcement) promulgated final regulations implementing this authority at 30 Code of Federal Regulations (CFR) § 585.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires Federal agencies to consult with the Secretary of Commerce, through the National Marine Fisheries Service (NMFS), with respect to "any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act," 16 U.S.C. § 1855(b)(2). This process is guided by the requirements of the Essential Fish Habitat (EFH) regulation at 50 CFR 600.905. BOEM will be the lead Federal agency for the consultation and will coordinate with any other Federal agencies that may be issuing permits or authorizations for this project, as necessary, for one consultation that considers the effects of all relevant Federal actions, including in offshore and inshore coastal environments [e.g., issuance of permits by the U.S. Army Corps of Engineers (USACE)]. Pursuant to the MSA, each Fishery Management Plan (FMP) must identify and describe EFH for the managed fishery, and the statute defines EFH as "those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity" 16 U.S.C. § 1853(a)(7) and § 1802(10). NMFS's regulations further define EFH adding, "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

The EFH final rule published in the Federal Register on January 17, 2002, defines an adverse effect as: "any impact which reduces the quality and/or quantity of EFH." The rule further states that an adverse effect may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat and other ecosystems components, if such modifications reduce the quality and/or quantity of EFH. The EFH final rule also states that the loss of prey may have an adverse effect on EFH and managed species. As a result, actions that reduce the availability of prey species, either through direct harm or capture, or through adverse impacts to the prey species' habitat may also be considered adverse effects on EFH. Adverse effects to EFH may result from action occurring within EFH or outside EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

On June 3, 2014, BOEM issued a Finding of No Significant Impact (FONSI) based on a Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts (BOEM 2014; referred to herein as the "2014 EA"). On December 8, 2020, Beacon Wind, LLC (Beacon Wind) submitted a Site Assessment Plan (SAP) in support of site assessment activities consisting of installation and operation of metocean equipment, with updated versions submitted April 27, 2021, and June 28, 2021. The 2014 EA addressed the activities included in the SAP, and the SAP was approved by BOEM on September 24, 2021. The metocean equipment was deployed in Lease Area OCS-A 0520 (Lease Area) on November 10, 2021.

On March 2, 2023, Beacon Wind submitted a SAP Amendment in support of additional site assessment activities in the Lease Area not included in the 2020 SAP, to consist of short-term deployment and subsequent removal of representative wind turbine/offshore substation foundation components (Proposed Action). The Proposed Action includes repeated tests of a single suction bucket within the Lease Area, at selected areas planned for eventual installation of wind turbines. The suction bucket would be similar to those considered within the Beacon Wind Construction and Operations Plan (COP) for the suction bucket jacket foundation, which may support wind turbines and/or offshore substations. Approval of the SAP Amendment, authorizing the Proposed Action, would enable Beacon Wind to adequately assess wind and environmental resources of the Beacon Wind Lease Area to determine if areas within the Lease Area are suitable for, and could support, commercial-scale wind energy production. The Proposed Action will be conducted to further assess the site conditions and to gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area.

The SAP Amendment submitted by Beacon Wind was intended to add the Proposed Action to the approved activities under the previously submitted SAP, to be conducted during the site assessment term of the Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf and prior to BOEM approval of the COP for the Lease Area. This EFH Assessment describes the Proposed Action and presents an assessment of the potential for the Proposed Action to adversely affect EFH and managed species.

This EFH assessment provides a comprehensive description of the Proposed Action, defines the area where the Proposed Action would occur, describes EFH and EFH species potentially impacted by the Proposed Action, and provides an analysis and determination of how the Proposed Action may affect EFH and EFH species.

2. Proposed Action

The Proposed Action consists of a series of 35 deployments and removals of a single suction bucket foundation at 26 locations (Figure 2-1) to gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area. The suction bucket will be similar to those considered within the COP (Beacon Wind 2023a) for the suction bucket jacket foundations, which may be used for some of the wind turbines and/or offshore substations if seabed geology necessitates. Suction bucket foundations are an alternative foundation design to traditional pile-driven foundations. This technology secures a steel bucket-shaped foundation by penetrating the sediment and pumping water from within the bucket to create an area of reduced pressure against the seafloor. Potential advantages of suction bucket foundations include reduced noise and depth disturbance during installation compared to pile-driven foundations.

The proposed foundation testing locations would be within the Beacon Wind Lease Area in the vicinity of wind turbine foundation positions that are currently part of the Project design for the wind farm. At each site, activities will occur within a 984- x 984- foot (300- x 300-meter) square, which is centered on the location for eventual installation of the proposed wind turbines as described in the COP (Beacon Wind 2023a). This area is conservative and would cover all foundation testing activities at each location, including the possibility of multiple tests at a single location, such that up to 35 total trials would be conducted.

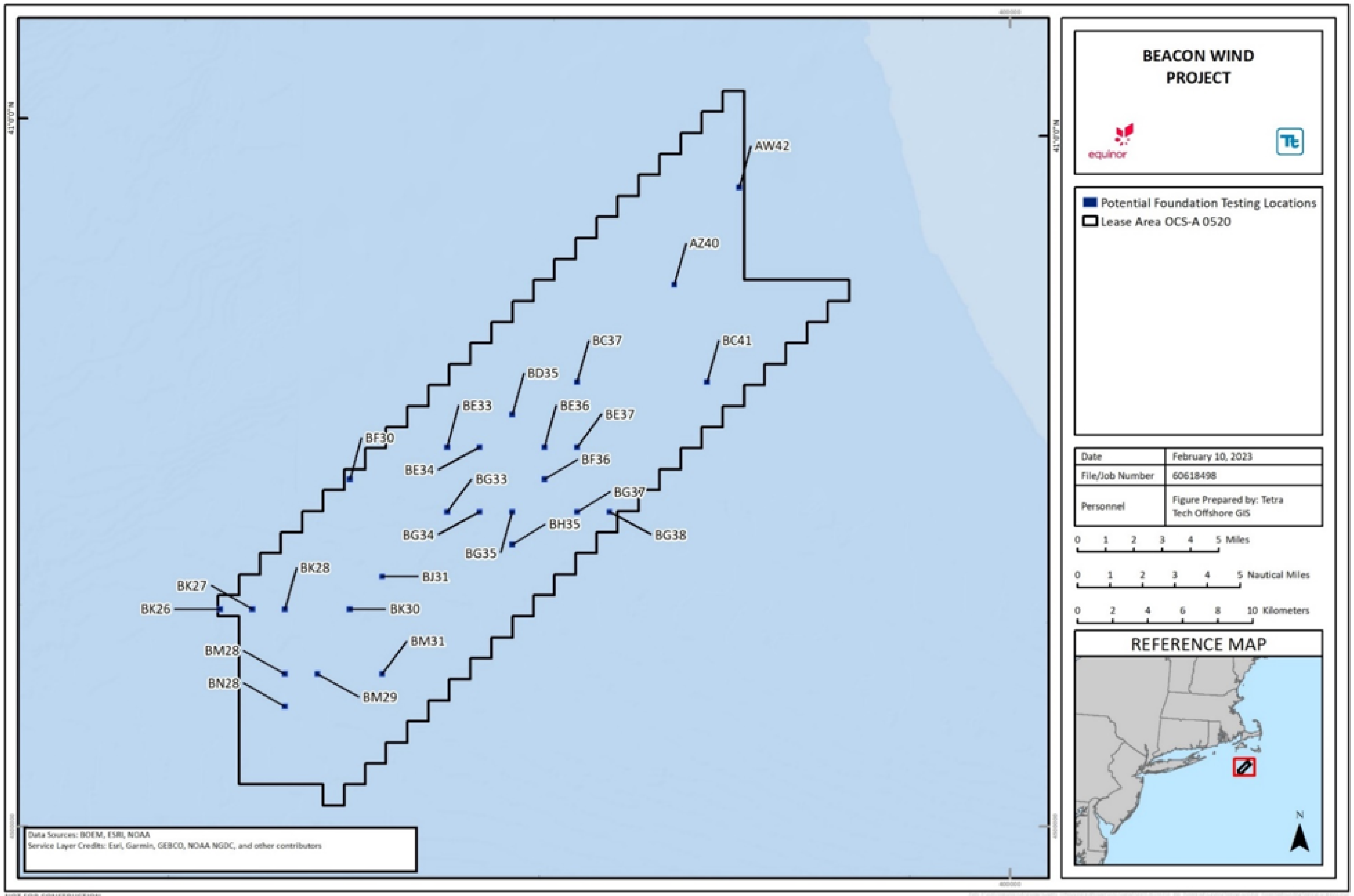

Figure 2-1. Locations for the Proposed Action

2.1. Foundation Testing

Beacon Wind plans to proceed with foundation testing between February and August 2024. Foundation testing would be conducted at-sea over a 10- to 15-day period within the Lease Area, plus additional days for inclement weather or other potential delays. No foundation materials or other survey equipment would be detached from the vessel or remain in the water for a period exceeding the duration of the suction bucket trial at each site. The vessel would use dynamic positioning; therefore, no anchors or jack-up legs would be used. No equipment would be left in the water at the conclusion of the Proposed Action.

The suction bucket used during the Proposed Action would have a diameter of 30 to 39 feet (9 to 12 meters), a height of 36 to 39 feet (11 to 12 meters), and a weight of approximately 200 tons (181.4 mt). The suction bucket is designed to penetrate into the seafloor to a maximum depth of 33 to 39 feet (10 and 12 meters). This depth of penetration is significantly less than that assessed in the 2014 EA, which assumed that metocean tower foundations would be pile-driven up to 100 feet (30 meters) below the seafloor. The final design of the Proposed Action is currently in development. A representative photograph is shown in Figure 2-2. Note that the photographed suction bucket includes chains on the side which will not be present in the suction bucket used for the Proposed Action.

Figure 2-2. Representative Photograph of a Suction Bucket

A low-flow suction pump would be mounted to the top of the suction bucket (Figure 2-3) approximately 19 feet (6 meters) above the seabed. After the bucket has settled into the seafloor, the suction pump would slowly remove water from within the bucket to create an area of reduced pressure which would assist in completing penetration to the target depth. The suction pump would generate noise during operation, but observations conducted at other OSW facilities suggest that noise from suction pumps would attenuate to background noise levels at a relatively short distance from the pump. For instance, in noise measurements conducted during operation of underwater suction pumps at the OSW facility Borkum Riffgrund 2 in the North Sea, the average sound pressure level ($L_{eq}50$) did not differ from the background noise level (137 decibels referenced to 1 micropascal) at a distance of 2,460 feet (750 meters), and the noise of the suction pumps could not be measured beyond 1,640 feet (500 meters) from the source (Koschinski and Lüdemann 2020). During suction bucket testing, Beacon Wind would conduct acoustic monitoring to document sound levels produced during suction bucket installation. The acoustic monitoring would utilize three baseplate moorings, deployed on the seabed at various distances from the suction bucket. Each baseplate mooring would be approximately 3.3 feet (1 meter) long, 1.6 feet (0.5 meter) wide, and 3.3 feet (1 meter) high. All three moorings would be retrieved using a remotely operated vehicle (ROV) at the completion of each monitored test and deployed at the next testing site for acoustic monitoring. This bottom-mounted acoustic monitoring system would avoid noise introduced by water flow past the instrument.

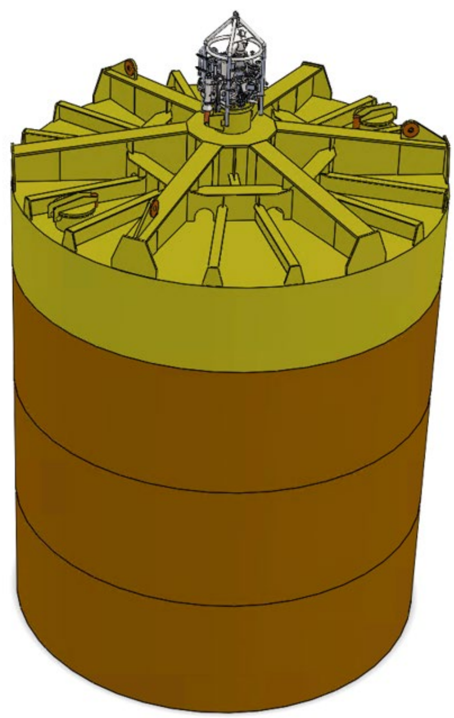

Figure 2-3. Indicative Drawing of a Suction Pump Mounted atop a Suction Bucket

The suction pump would operate at a nominal rate of 1,320 gallons per minutes (5 cubic meters [m^3] per minute), and the removed water would be released immediately outside the bucket. The volume of seawater removed would be limited to the volume inside the bucket, with a maximum of 358,504 gallons (1,357 m^3) removed per test. The suction pump would not be screened to avoid potential pressure losses due to clogging of the screen (e.g., if a small piece of debris became suctioned to the screen), which would cause the pump to malfunction. At the completion of each test, the pump would slowly return water to the interior of the bucket to create positive pressure inside the bucket, allowing it to be removed from the seafloor.

Measurement equipment would be deployed inside the bucket during testing to monitor the soil plug on the inside of the bucket and to gather data to assist with foundation engineering. Imaging equipment (e.g., sonar, echo sounder, sub-bottom profiler) would be mounted inside the lid of the bucket. The imaging equipment would be operated at frequencies at or above 400 kilohertz, which is inaudible to marine organisms. The imaging equipment is therefore not expected to be a source of noise disturbance for EFH species.

The Proposed Action may also use up to two ROVs to assist in positioning the precise location of the bucket during deployment, as well as to observe and gather data on the process of penetration and recovery and deploy and retrieve the acoustic monitoring moorings. The ROVs would be suspended in the water column and would not contact the seafloor. The ROVs would be controlled from on board the vessel and would navigate via hydraulic propellers or thrusters that do not generate significant underwater noise.

Prior to lowering the bucket to the seafloor, a reference frame (Figure 2-4) would be lowered to the seafloor to assist the vessel lowering the bucket onto the targeted location and to ensure accurate positioning of the bucket on the seafloor. The reference frame is made of steel with a maximum weight of approximately 1,100 pounds (500 kilograms). The footprint of the reference frame is approximately 11 square feet (ft^2) (1 square meter [m^2]). The reference frame would be directly lowered from the vessel onto the seafloor and would remain stationary on the seafloor for the duration of each foundation installation test, which is expected to take six to nine hours. The edge studs of the reference frame may penetrate the top 2 inches (5 centimeters) of the seabed. Upon completion of each trial, the reference frame would be raised vertically back onto the vessel.

Beacon Wind would proceed with foundation testing following BOEM approval of the Proposed Action, in February 2024 but no later than August 2024. Each foundation installation test is expected to take six to nine hours, including three to five hours for deployment (lowering and seabed penetration) and three to four hours for removal (reverse penetration, lifting, potential cleaning, and lifting onboard).

2.2. Vessel Activity

The Proposed Action would use a single large vessel, equipped with a crane rated to a minimum of 300-ton capacity. The vessel will transit from Europe with the suction bucket, will stop at ports in Canada and/or the U.S. to mobilize crew, and will then transit to the Lease Area to conduct testing. Once the vessel arrives at each foundation testing location, it would be positioned using dynamic positioning technology, without the use of anchors or jack-up legs. Once the suction bucket deployment is complete, retrieval would be initiated. The onboard crane would lift it from the seabed to the surface. The bucket would then be lifted back on the vessel deck, followed by lifting and onboarding of the reference frame. After all equipment is onboard and secure, the vessel would transit to the next trial location and the above process would be repeated. If the weather conditions are hazardous, the bucket may be left suspended under the vessel and above the seabed as the vessel transits at low speed (1 to 2 knots) to next location to ensure safe operations. Once testing at all sites is complete, crew and materials would transit back to their respective ports and demobilize.

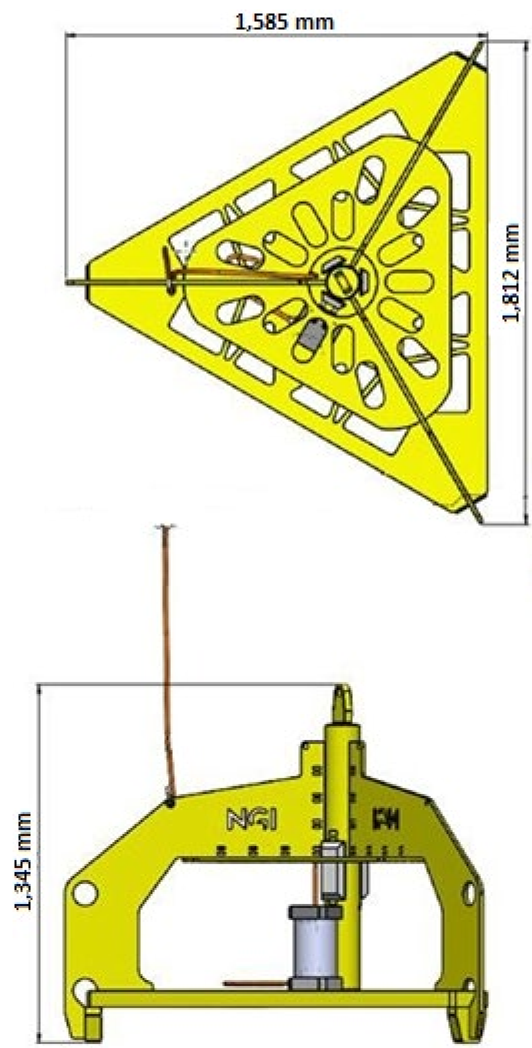

Figure 2-4. Top and Side View of a Representative Reference Frame with Dimensions Provided in Millimeters

2.3. Site Clearance Survey

Because the foundation testing would be a temporary activity and no facilities would be installed, no decommissioning would be required. Foundation testing is not expected to result in any trash or bottom debris. However, following the completion of testing, Beacon Wind would ensure that the seafloor has been cleared of all obstructions created by the Proposed Action. This would be accomplished via photo documentation of all deployed and retrieved equipment. Additionally, to confirm that all equipment was retrieved from the site, Beacon Wind would carry out photographic bottom survey using an ROV. Beacon Wind is also evaluating the potential to use sector scanning sonar for the site clearance survey. The sonar equipment under consideration operates at frequencies of 300 kilohertz or higher, indicating that sector scanning sonar, if utilized, would not produce sound that is audible to marine organisms.

3. Existing Environment

The existing environment consists of the characteristics of the water column (e.g., depth, temperature, salinity) and the seabed (e.g., sediment composition, morphology) in the Lease Area that are relevant to defined EFH for fish and invertebrates. To characterize the distribution and relative abundance of fish and invertebrate habitat within the Lease Area, Beacon Wind performed high-resolution geophysical (HRG) and benthic surveys. For the purposes of this assessment, the results of those surveys were supplemented with data from earlier trawl surveys, and video and grab sampling conducted by others. Those earlier sampling efforts included:

- Beam trawls and grab samples collected in 2016 by BOEM for preliminary characterization of the Lease Area (Guida et al. 2017);
- Northeast Fisheries Science Center (NEFSC) seasonal trawls and beam trawls (2003-2016);
- University of Massachusetts Dartmouth – School for Marine Science and Technology (SMAST) Video Survey Samples Collected in Wind Development Area in May 2012 and September 2013 (Stokesbury, 2012, 2014);
- Other reports and publications (e.g., NAS 2018; Walsh and Guida 2017; Hare et al. 2016; Walker et al. 2016 [scallop survey]; and others);
- Analysis of USGS sediment data, grab samples with infauna, and beam trawl surveys for regional habitat mapping of the Massachusetts Wind Energy Area (MA WEA) (Guida et al. 2017); and
- FMPs (Mid-Atlantic Fishery Management Council [MAFMC] 2017; New England Fishery Management Council [NEFMC] 2017; Atlantic States Marine Fisheries Commission [ASMFC] 2015, 2018a, 2018b), and regional analyses of species assemblages (e.g., Walsh et al. 2015; Hare et al. 2016; Selden et al. 2018).

Beacon Wind conducted benthic surveys including video, grab sampling, and sediment profile imaging and plan view (SPI/PV) in Summer 2021 at 157 foundation locations in the Lease Area (Figure 3-1). An additional 218 stations along the interarray cable were sampled using SPI/PV (Figure 3-2). At each of these locations, SPI/PV imagery was reviewed in real time to identify sensitive, rare, or unexpected species (including nonindigenous species) and to note any hardbottom habitat (gravel pavements, cobbles, boulders, exposed bedrock, etc.).

3.1. Benthic Habitat

Seafloor sediments within the Lease Area are typical of the U.S. North Atlantic continental shelf, dominated by very fine sand and silt (MAFMC 2019). The Lease Area is predominately sand in the shallower, more northerly portions with an increase of the silt/clay fraction at stations in the deeper, more southerly portion. Soft-bottom substrate includes unconsolidated material ranging from gravel (> 2,000 micrometers [µm]) to sand (62.5 to 2,000 µm), silt (4 to 62.5 µm), and clay (< 4 µm) (Williams et al. 2006), as well as empty shells and shell fragments of various sizes. Benthic surveys conducted by SMAST in the Lease Area in 2012 and 2013 corroborate the soft bottom, low rugosity, and limited habitat variability within the MA WEA. The MA WEA is characterized as silts and sand with a high occurrence of faunal beds dominated by sand shrimp and sand dollars (NYSERDA 2017; Guida et al. 2017; Stokesbury, 2012 and 2014). Unconsolidated sand, clay, and silt provide a matrix in which a variety of invertebrates reside, including both infaunal (living within the sediment matrix) and epifaunal (living on or in close association with the seafloor) organisms (Ward 2017). In general, assemblages of benthic invertebrate species tend to vary with depth/distance from shore, sediment type, and organic richness.

Beacon Wind conducted site-specific geophysical, geotechnical, and benthic surveys across the Lease Area in Summer 2021. The surveys were designed to identify the dominant substrates in the Lease Area and to establish a pre-construction baseline and characterize potentially sensitive or important seafloor areas that may serve as EFH. The benthic survey methods (e.g., recommended equipment, procedures, lab analyses, etc.) were selected to meet federal guidance, including BOEM benthic survey guidance and NMFS recommendations for mapping essential fish habitat. Results of Beacon Wind's extensive surveys of the Lease Area using multibeam echo sounder, digital imagery, grab samples, and SPI/PV were used to characterize benthic habitat as predominantly homogeneous consisting of silty sand with small areas of sandy mud and a high occurrence of faunal beds dominated by tube-building fauna and amphipods The Lease Area is predominately sand in the shallower, more northerly portions with an increase of the silt/clay fraction at stations in the deeper, more southerly portion (Figure 3-3). The geophysical and geotechnical surveys confirmed that the Lease Area is predominantly flat with low rugosity and slope. The interpretation of benthic substrate indicated by backscatter was well-correlated with SPI/PV results. Grain size distribution was analyzed in sediment grab samples to ground-truth the SPI/PV results; and benthic infauna was sampled at 44 priority stations. Priority stations were identified as those having potential homogeneity and heterogeneity of seafloor conditions based on HRG survey data.

Results from the grain size analysis across the Lease Area indicated that the foundation sites mainly consisted of fine-grained particles that included very fine sand (0.125 to 0.0625 mm) and silt (0.0625 to 0.0039 mm). No boulder (256 to 4,096 mm) or cobbles (64 to 256 mm) were observed in these samples and 42 out of 157 samples included pebbles (4 to 64 mm). Fifteen samples did not contain any particles greater than 2.0 mm with the majority of these stations located in the northern portion of the Lease Area. All habitat in the Lease Area was classified by NOAA Habitat Complexity Category as soft-bottom habitat. Grain size analysis from a subset of the selected suction bucket trial locations showed that total gravel ranged from 0.0 – 2.1 percent, total sand ranged from 37.7 – 90.5 percent, and total silt and clay combined ranged from 9.4 – 62.1 percent. Average sediment TOC concentrations across the entire Lease Area ranged from 0.064 – 1.20 percent. Average sediment TOC for the selected suction bucket trial locations ranged from 0.315 – 1.170 percent.

No complex, hard-bottom habitat was observed in the 2021 survey of the Lease Area, other than areas of pebbles and muddy sandy gravel. However, artificial hard bottom in the form of shipwrecks does provide complex structure in the Lease Area. Beacon Wind has performed surveys to identify potential undiscovered wrecks and obstructions and has identified four shipwrecks within the area. These shipwrecks were avoided during the selection of the foundation testing locations.

Backscatter data collected during the geotechnical and geophysical surveys were used to identify bedforms in the Lease Area (Figure 3-4). Bedforms were observed large portions of the Lease Area during Beacon Wind's geotechnical and geophysical survey and include pitted seabed, ripples, and sorted bedforms, all of which indicate that the bottom currents are actively and episodically scouring, sorting, and redepositing the seabed sediments. Bedforms in the Lease Area evolve from classic depressions in the north to sand ripples in the west central region. Bedforms are delimited by the areas of rippled seabed and are concentrated in two areas, in the north and the west central portions of the Lease Area. Two of the foundation testing locations overlap with sand ripples in the central portion of the Lease Area (Figure 3-5).

3.2. Pelagic Habitat

The pelagic environment is particularly important for EFH species because it supports the growth of phytoplankton that sustain marine food webs, and it provides a dispersal mechanism for planktonic larvae of many managed species. Water depth influences surface and bottom temperatures, light penetration, sediment movement, and other physical and chemical habitat parameters that define EFH in the pelagic environment. Based on information from the high-resolution geophysical survey of the Lease Area, water depths in the Lease Area range from a shoal depth of 122 feet (37.2 meters) in the northwest to 206 feet (62.9 meters) in the southeast (Figure 3-6). The entire Lease Area is in the photic zone (i.e., top 600 feet [200 meters]), the top layer of the pelagic environment where sunlight supports photosynthesis (Karleskint et al. 2006). Phytoplankton are consumed by zooplankton (i.e., tiny animals such as copepods and larval forms of crustaceans, bivalves, and other invertebrates) and ichthyoplankton (fish larvae). The most numerically abundant component of the pelagic fish community in the open waters of the Lease Area is the ichthyoplankton assemblage. Buoyant eggs and larvae of most marine fishes in Southern New England can remain in the plankton for weeks to months (Walsh et al. 2015).

A number of finfish and invertebrate species with pelagic life stages occur within the Lease Area. During NEFSC seasonal trawl surveys in the MA WEA from 2003-2016, Atlantic herring, which is pelagic throughout its life, was the most numerically abundant species during the cold season (Guida et al. 2017). Other finfish and invertebrates with pelagic life stages that were collected during the NEFSC trawl surveys include species that are pelagic throughout their life (e.g., Atlantic mackerel, butterfish), species that have pelagic egg and larval stages (e.g., black sea bass, red hake, silver hake, witch flounder), and species that have pelagic juvenile and adult stages (e.g., longfin inshore squid). Other pelagic species that inhabit the Lease Area include highly migratory species (e.g., tunas, swordfish, sharks).

3.3. Benthic Epifauna and Infauna

Benthic samples were collected during two NEFSC–sponsored cruises (Guida et al. 2017) in the MA WEA in March and April in 2014, including 23 beam trawls for benthic epifauna and 30 triplicate Van Veen grabs for benthic infauna. Among the epibenthic fauna as obtained in beam trawls, there were no dominant species, but sand shrimp and sand dollars were considered the most dominant taxa. These results were anticipated as the area was documented by Guida et al. (2017) as consisting of largely sandy sediments particularly in the northern most portions of the MA WEA. The deeper, southern station locations showed a mix of sands and silts, habitat that is preferred by amphipods and polychaetes. The benthic infaunal assemblages resembled those observed and found to be common among OceanSAMP stations, described by LaFrance et al. (2010) as dominated by the amphipod *Ampelisca agassizi* and the bivalve *Nucula annulata*. This pattern suggests that, absent significant disturbance, benthic infaunal assemblages can be stable over periods of many years (LaFrance, 2010). The large number of “core” taxa in these MA WEA samples suggests that benthic assemblages from this WEA are closely related.

Benthic video and SPI/PV imagery collected during Beacon Wind’s benthic survey of the Lease Area showed a biological assemblage with numerous burrows, bioturbation, polychaete/amphipod tubes, and macrobenthos. Three Coastal and Marine Ecological Classification Standard (CMECS) Components (Geoform, Biotic, and Substrate) were used to classify benthic habitats in the Lease Area. The foundation testing locations were classified into two Geoform Level 2 classes (Geologic-Flat or Biogenic-Burrows/Bioturbation), with twenty locations being classified as Geologic-Flat and six locations being classified as Biogenic-Burrows/Bioturbation (Figure 3-7). Testing locations were classified into one Biotic Subclass (Soft Sediment Fauna) and two Biotic Groups (Small Tube Building Fauna and Starfish Bed), with the majority of locations (81 percent) being classified as Small Tube Building Fauna (Figure 3-8). Testing locations were classified into three Substrate Groups (Muddy Sand, Sand, and Sandy Mud) with all but two of the 26 locations being classified as Muddy Sand (Figure 3-9). Three foundation testing locations were fully characterized during the benthic survey of the greater lease area, as summarized in

Table 3-1 below. The number of taxa identified at these locations ranged from nine to forty-seven. Arthropoda was the dominant taxon at two of these locations, and Annelida was the dominant taxon at the other location. Each of the three locations were classified as Muddy Sand.

Table 3-1. Summary of data for the three priority foundation testing locations

Lease Area Location	Number of Taxa	Dominant Taxa	Dominant Species	Successional Stage	Grain Size
BF36	47	Arthropoda (41%)	*Ampelisca vadorum*	I over III	Muddy Sand
BE37	51	Arthropoda (49%)	*Ampelisca vadorum*	I over III	Muddy Sand
BK30	9	Annelida (63%)	*Levinsenia gracilis*	I over III	Muddy Sand

The most dominant organism observed during Beacon Wind's benthic surveys were tube-dwelling amphipods, which were present at 85 percent of all stations. The dominant mobile epifauna was the sand dollar (*Echinarachnius parma*), followed by shrimp and hermit crabs. Sand dollars (*E. parma*) were observed in the northwestern portion of the Lease Area being most visually abundant at six stations. Sea stars (*Asterias* sp. and *Astropecten* sp.) were more abundant in the southern portion of the sampling area but were observed throughout the Lease Area (45 of 157 stations).

3.4. Demersal Fish and Invertebrates

The most commercially valuable demersal fish and invertebrates in the Lease Area include the Jonah crab, longfin squid, and silver hake. Other commercially valuable fish and invertebrates in the Lease Area include haddock, flounders, hakes, scup, black sea bass, bluefish, spiny dogfish, skates, groundfish species, horseshoe crab, ocean quahog, surfclam, sea scallops, lobsters, and Atlantic herring (Guida et al. 2017; Petruny-Parker et al. 2015). Although demersal fishes and invertebrates are closely associated with benthic habitats as adults, many species interact with overlying pelagic habitats through predator-prey interactions, early life stage dispersal, or seasonal migrations (Malek et al. 2014).

In anticipation of the development of offshore wind projects, experts from NOAA Fisheries and BOEM characterized fisheries resources within the MA WEA using long-term regional datasets and surveys within the WEA. The resulting habitat assessment highlighted several features of the Lease Area relevant to finfish and macroinvertebrates based upon analysis of data collected between 2003 and 2016: (1) the rarity of cod in the Lease Area; (2) the affinity of black sea bass with structures; (3) little skate, silver hake, and winter skate were dominant species in catches in both warm and cold seasons; (4) the other dominant species were seasonal migrants; (5) there has been a substantial seasonal shift in dominant species observed; (6) sea scallops and ocean quahogs were widespread and numerous; and (7) egg mops of longfin squid were not detected in the MA WEA (Guida et al. 2017).

Dominant commercially important species collected in NEFSC seasonal trawls (2003–2016) in the Lease Area were identified as Atlantic herring, little skate, silver hake, and winter skate in the cold season and butterfish, little skate, longfin squid, red hake, scup, silver hake, spiny dogfish, and winter skate in the warm season (Guida et al. 2017). Atlantic herring, butterfish, squid, and scup were seasonal migrants; the other species were year-round residents. Of the 56 taxa collected in cold-season NEFSC trawls, the little skate was dominant by percent catch by weight (greater than 40 percent) and frequency of catch (80 percent) in the cold season. Little skate was also the only species to occur consistently within the cold-season trawls in the Lease Area (Guida et al. 2017). The dominant species in the Lease Area by percentage of catch was Atlantic herring (55 percent). Warm-season NEFSC trawls in the Lease Area yielded 65 taxa (NEFSC 2021). The longfin squid was numerically dominant (approximately 35 percent of the total catch), with butterfish and scup making up the next 40 percent. Spiny dogfish were the dominant species by percent of catch by weight with 25 percent of the total species caught. For frequency of catch in the warm season, butterfish, little skate, long-finned squid, silver hake, and summer flounder had similar occurrences with 80 to 100 percent caught from each trawl (Guida et al. 2017).

Numerous fish species were observed during Beacon Wind's benthic survey in the Lease Area. The most abundant fish in the PV imagery were right eye flounders (Pleuronectidae, 30 individuals), unidentified fish (20 individuals), and sea robins (12 individuals). Skates were observed at 30 stations. Jonah crabs were present in 27 of the 375 PV images taken throughout the Lease Area. The results observed from the Lease Area benthic habitat study are congruent with the summary of resources in the Lease Area in Guida et al. (2017) and other sources, which reported the dominance of skates, specifically little skate and winter skate.

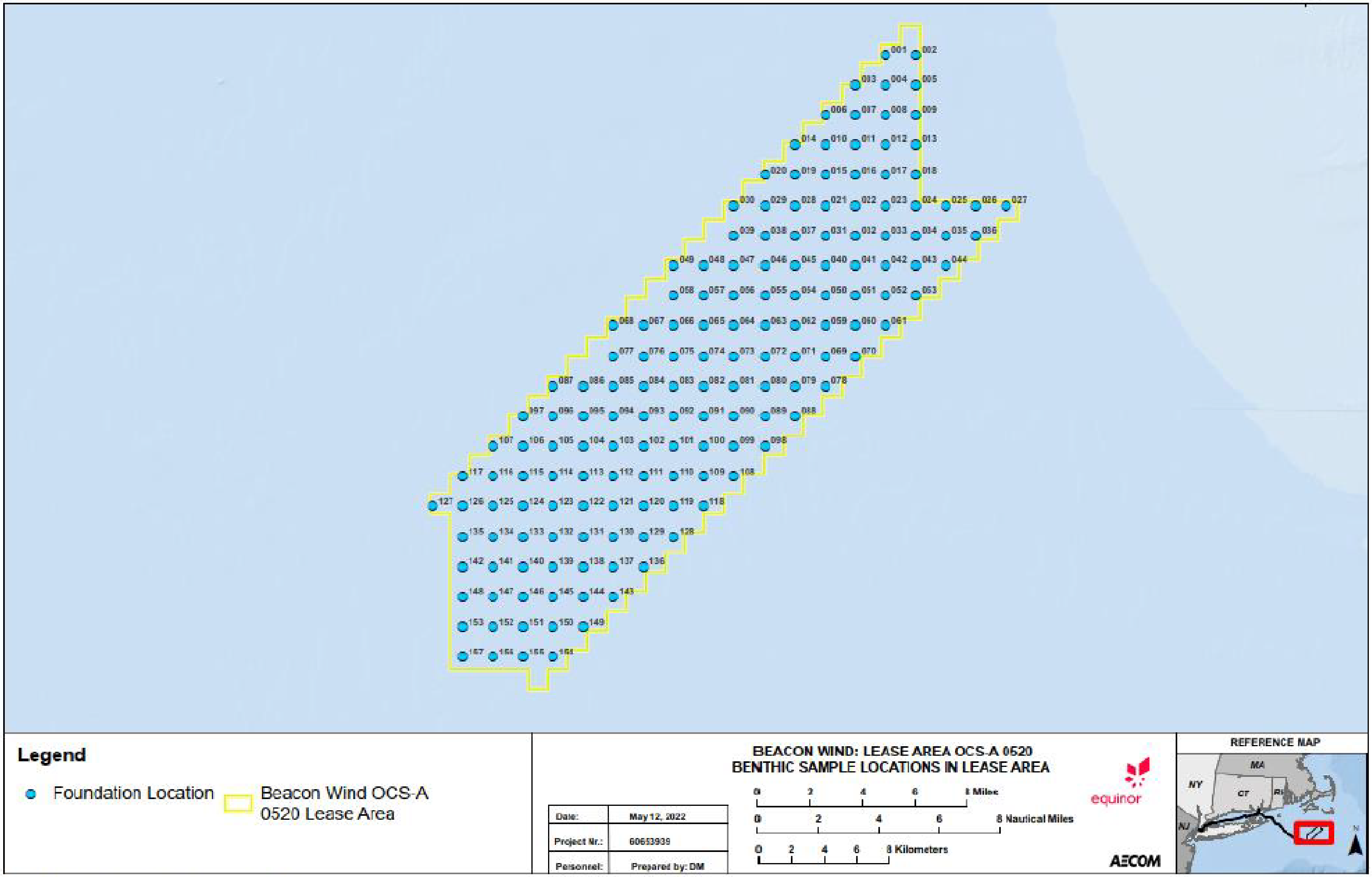

Figure 3-1. Foundation locations where SPI/PV and benthic grab samples were collected during surveys of the Lease Area in 2021

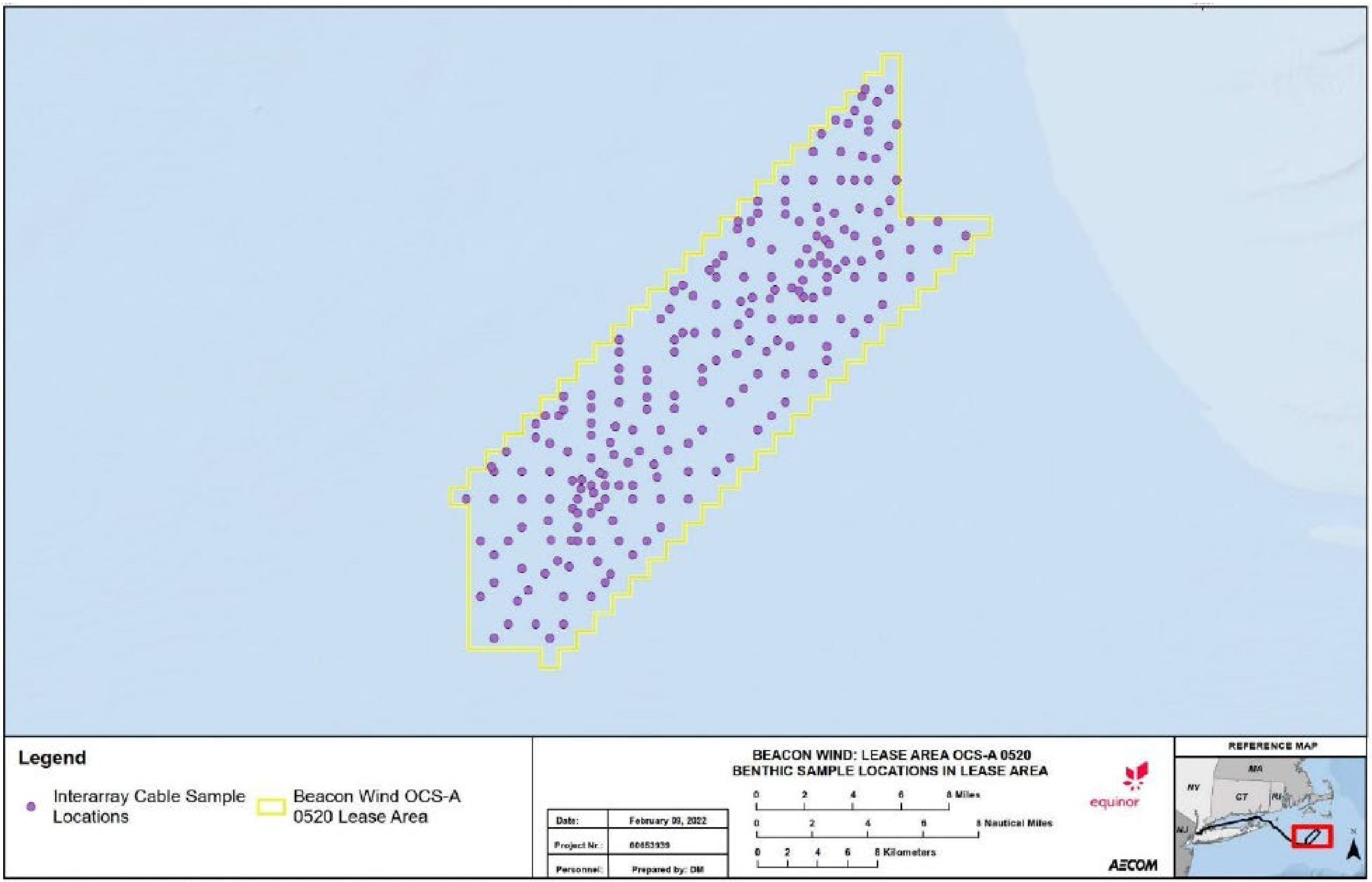

Figure 3-2. Interarray cable locations where SPI/PV samples were collected during surveys of the Lease Area in 2021

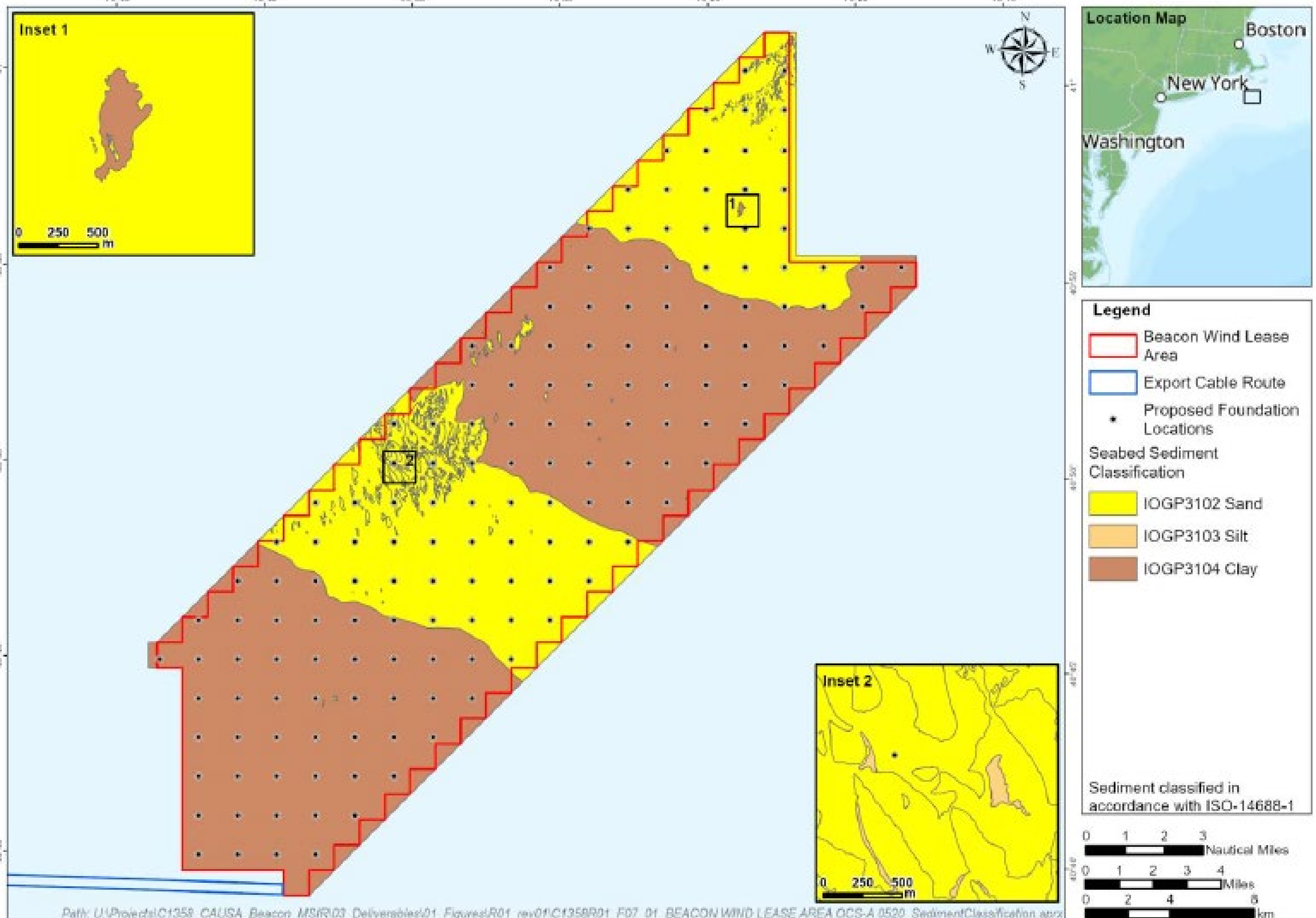

Figure 3-3. Seabed sediment types and features in the Lease Area

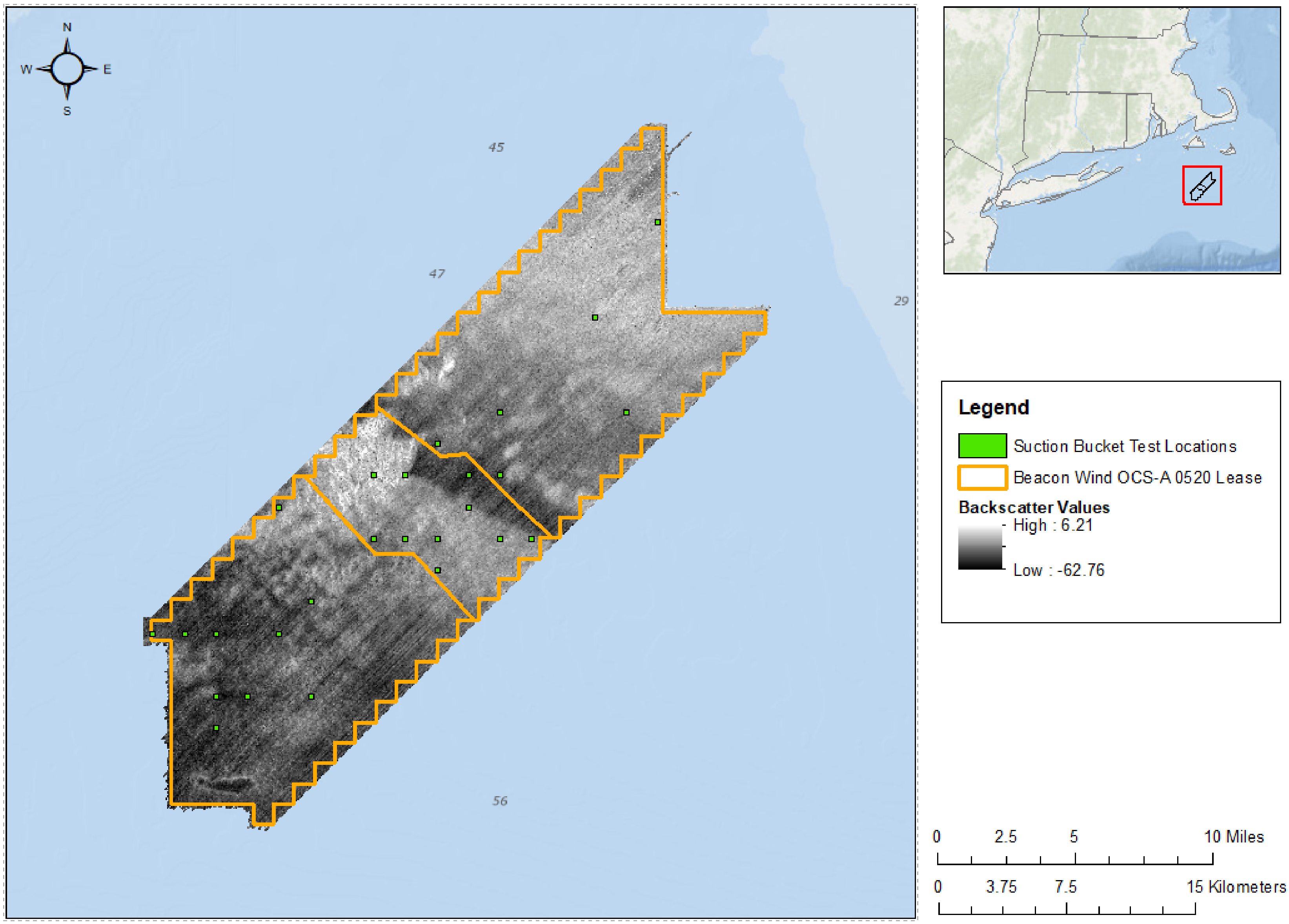

Figure 3-4. Backscatter profile in the Lease Area relative to foundation testing locations

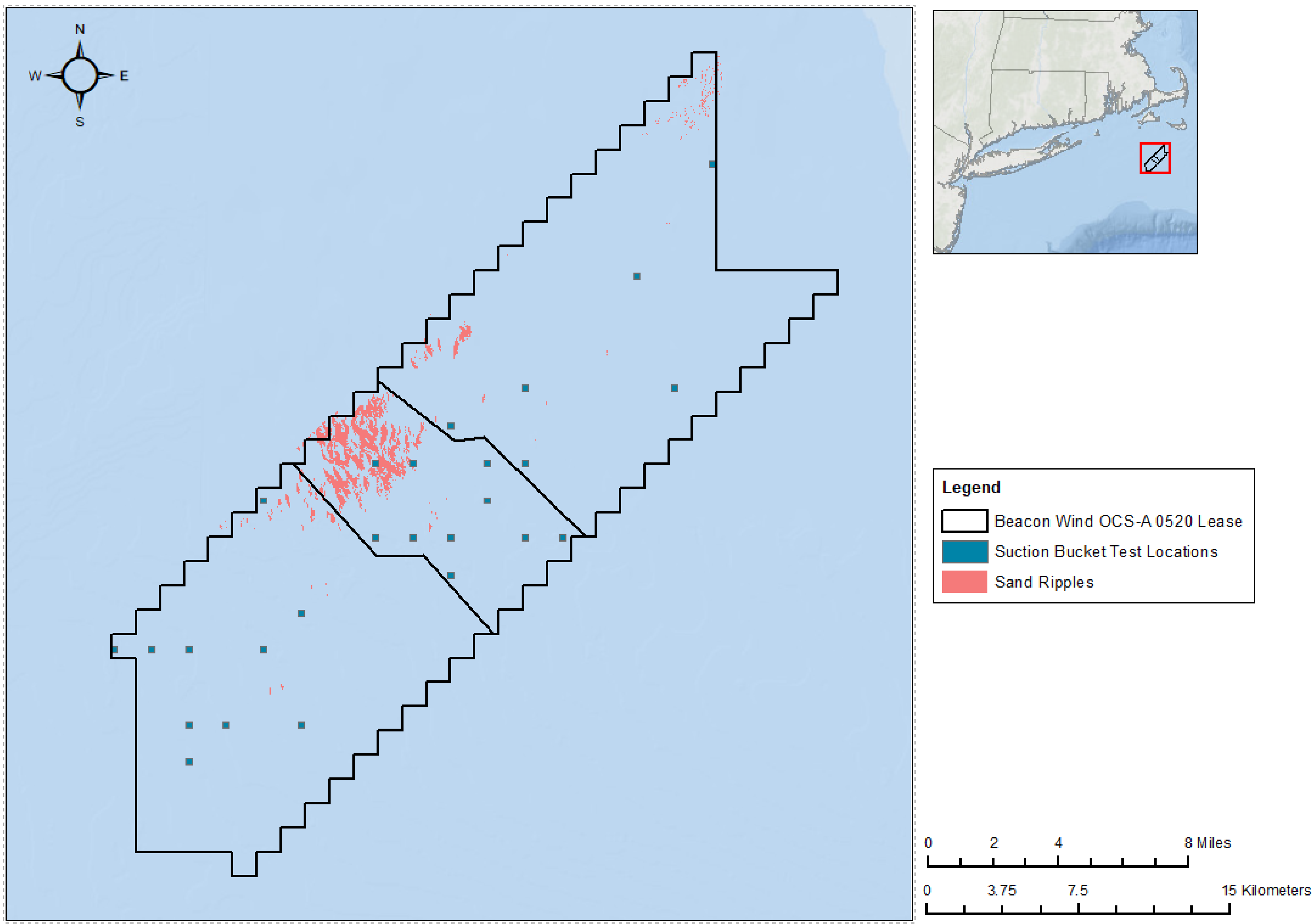

Figure 3-5. Bedform distribution in the Lease Area relative to foundation testing locations

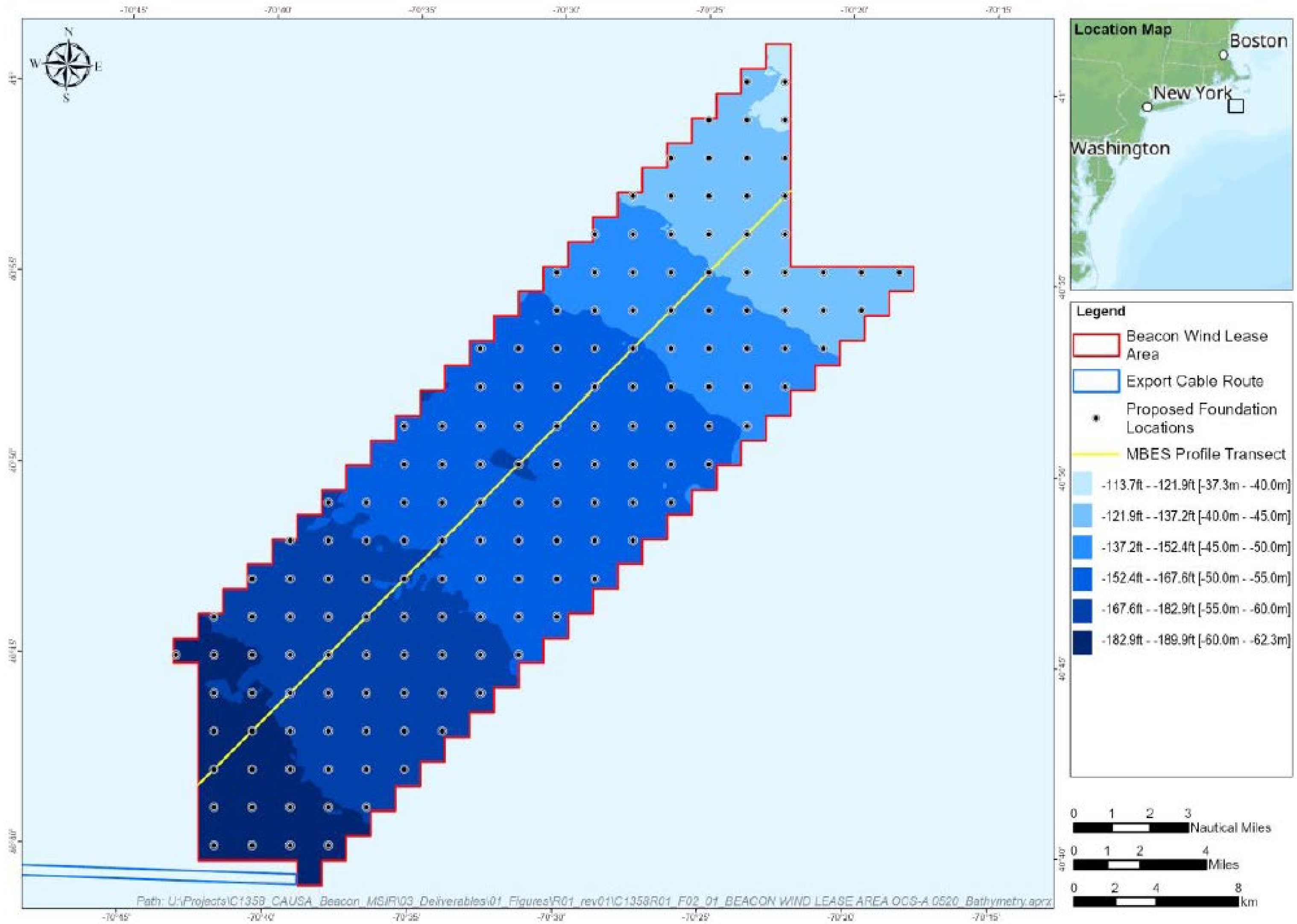

Figure 3-6. Bathymetry in the Lease Area

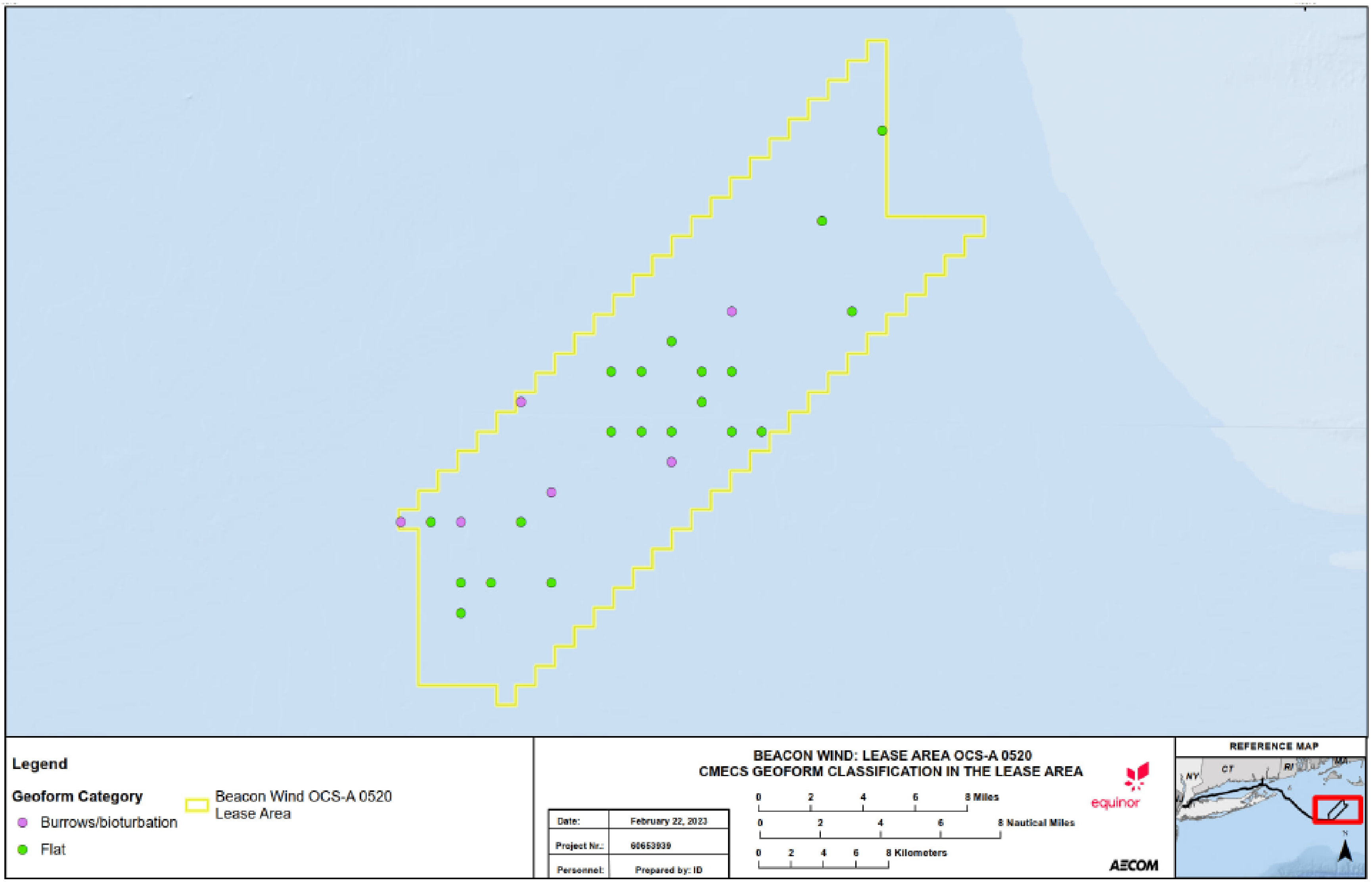

Figure 3-7. CMECS geoform classification at foundation testing locations

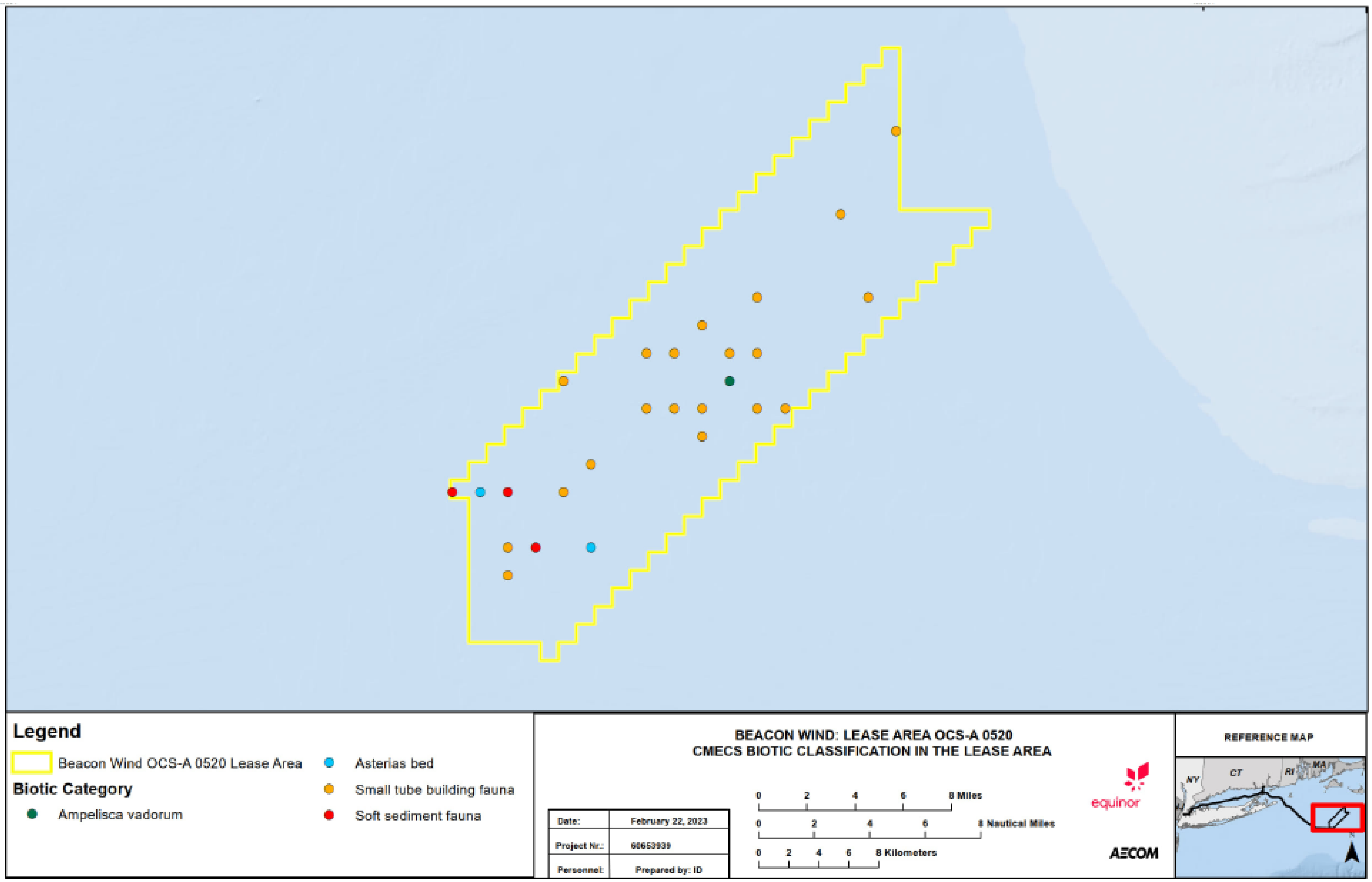

Figure 3-8. CMECS biotic classification at foundation testing locations

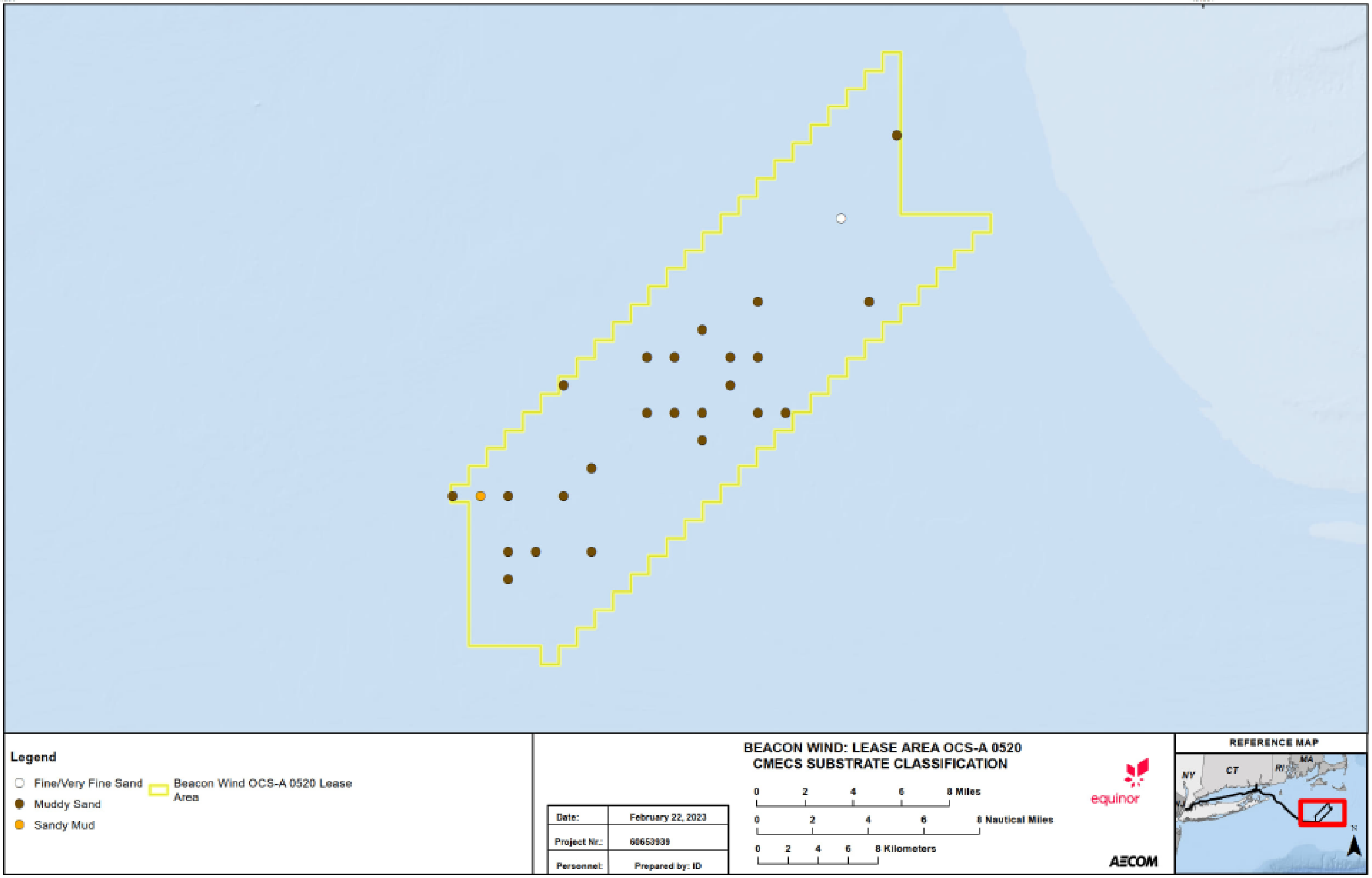

Figure 3-9. NMFS-modified CMECS classifications for the substrate components at foundation testing locations

4. Designated EFH

The Lease Area includes EFH designated by the New England Fishery Management Council (NEFMC), the Mid-Atlantic Fishery Management Council (MAFMC), and NMFS. EFH designations are made for species in association with a mapped grid of 10- by 10-minute quadrangles covering all marine habitat along the U.S. coast. The quadrangles are used by the NEFMC and the MAFMC to delineate specific areas for the purpose of EFH designations. Species and life stages with EFH in the vicinity of the Proposed Action were identified using the NMFS EFH Mapper (NMFS 2023). For the purposes of this assessment, EFH descriptions and habitat designations for all species and life stages identified using the NMFS EFH Mapper were primarily developed from NMFS EFH source documents, the Final Omnibus Essential Fish Habitat Amendment 2 (NEFMC 2017), and the Final Amendment 10 to the 2006 Consolidated Atlantic Highly Migratory Species FMP (NMFS 2017a).

The Lease Area includes designated EFH for 42 fish and invertebrate species, with varying species and life-stage distribution throughout that area. Resources are managed under various FMPs. NEFMC FMPs include Northeast Multispecies; Sea Scallop; Monkfish; Atlantic Herring; Skate, Small-Mesh Multispecies; and Spiny Dogfish. MAFMC FMPs include Summer Flounder, Scup, Black Sea Bass; Mackerel, Squid, Butterfish; Surfclam, Ocean Quahog; Bluefish; Spiny Dogfish; and Monkfish. NMFS FMPs include the Highly Migratory Species. Designated EFH occurrence by taxonomic grouping, individual species, and life stage is summarized in Tables 4-1 and 4-2.

Table 4-1. EFH-designated fish and invertebrate species within the Lease Area.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Gadids					
Atlantic cod *Gadus morhua*	●	●	●	●	**Eggs/Larvae**: Pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, and in the high-salinity zones of certain bays and estuaries. **Juveniles:** Intertidal and sub-tidal benthic habitats in the Gulf of Maine, southern New England, and on Georges Bank, to a maximum depth of 120 meters, including high salinity zones in the bays and estuaries. Structurally-complex habitats, including eelgrass, mixed sand and gravel, and rocky habitats (gravel pavements, cobble, and boulder) with and without attached macroalgae and emergent epifauna, are essential habitats for juvenile cod. In inshore waters, young-of-the-year juveniles prefer gravel and cobble habitats and eelgrass beds after settlement, but in the absence of predators also utilize adjacent un-vegetated sandy habitats for feeding. Survival rates for young-of-the-year cod are higher in more structured rocky habitats than in flat sand or eelgrass; growth rates are higher in eelgrass. Older juveniles move into deeper water and are associated with gravel, cobble, and boulder habitats, particularly those with attached organisms. Gravel is a preferred substrate for young-of-the-year juveniles on Georges Bank and they have also been observed along the small boulders and cobble margins of rocky reefs in the Gulf of Maine. **Adults**: Sub-tidal benthic habitats in the Gulf of Maine, south of Cape Cod, and on Georges Bank, between 30 and 160 meters, including high salinity zones in certain bays and estuaries. Structurally complex hard bottom habitats composed of gravel, cobble, and boulder substrates with and without emergent epifauna and macroalgae are essential habitats for adult cod. Adult cod are also found on sandy substrates and frequent deeper slopes of ledges along shore. South of Cape Cod, spawning occurs in nearshore areas and on the continental shelf, usually in depths less than 70 meters.
Haddock *Melanogrammus aeglefinus*	--	●	●	●	**Larvae:** Pelagic habitats in coastal and offshore waters in the Gulf of Maine, the Mid-Atlantic, and on Georges Bank. **Juveniles**: Sub-tidal benthic habitats between 40 and 140 meters in the Gulf of Maine, on Georges Bank and in the Mid-Atlantic region, and as shallow as 20 meters along the coast of Massachusetts, New Hampshire, and Maine. Essential fish habitat for adult haddock occurs on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel. Young-of-the-year juveniles settle on sand and gravel on Georges Bank but are found predominantly on gravel pavement areas within a few months after settlement. As they grow, they disperse over a greater variety of substrate types on the bank. Young-of-the-year haddock do not inhabit shallow, inshore habitats. **Adults:** Sub-tidal benthic habitats between 50 and 160 meters in the Gulf of Maine, on Georges Bank, and in southern New England. Essential fish habitat for adult haddock occurs on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel substrates. They also are found adjacent to boulders and cobbles along the margins of rocky reefs in the Gulf of Maine.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Pollock *Pollachius virens*	●	●	●	--	**Eggs**: Pelagic inshore and offshore habitats in the Gulf of Maine, on Georges Bank, and in southern New England, including certain bays and estuaries. **Larvae:** Pelagic inshore and offshore habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region, including certain bays and estuaries. **Juveniles:** Inshore and offshore pelagic and benthic habitats from the intertidal zone to 180 meters in the Gulf of Maine, in Long Island Sound, and Narragansett Bay, between 40 and 180 meters on western Georges Bank and the Great South Channel, and in mixed and full salinity waters in several bays and estuaries north of Cape Cod. Essential fish habitat for juvenile pollock consists of rocky bottom habitats with attached macroalgae (rockweed and kelp) that provide refuge from predators. Shallow water eelgrass beds are also essential habitats for young-of-the-year pollock in the Gulf of Maine. Older juveniles move into deeper water into habitats also occupied by adults.
Offshore hake *Merluccius albidus*	--	●	--	--	**Larvae:** Pelagic habitats along the outer continental shelf and slope between 60 and 1500 meters.
Red hake *Urophycis chuss*	●	●	●	●	**Eggs and Larvae:** Pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic, and in certain bays and estuaries. **Juveniles:** Intertidal and sub-tidal benthic habitats throughout the region on mud and sand substrates, to a maximum depth of 80 meters, including certain bays and estuaries. Bottom habitats providing shelter are essential for juvenile red hake, including: mud substrates with biogenic depressions, substrates providing biogenic complexity (e.g., eelgrass, macroalgae, shells, anemone and polychaete tubes), and artificial reefs. Newly settled juveniles occur in depressions on the open seabed. Older juveniles are commonly associated with shelter or structure and often inside live bivalves. **Adults:** Benthic habitats in the Gulf of Maine and the outer continental shelf and slope in depths of 50 – 750 meters and as shallow as 20 meters in several inshore estuaries and embayments as far south as Chesapeake Bay. Shell beds, soft sediments (mud and sand), and artificial reefs provide essential habitats for adult red hake. They are usually found in depressions in softer sediments or in shell beds and not on open sandy bottom.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Silver hake *Merluccius bilinearis*	●	●	●	●	**Eggs and Larvae:** Pelagic habitats from the Gulf of Maine to Cape May, New Jersey, including Cape Cod and Massachusetts Bays. **Juveniles:** Pelagic and benthic habitats in the Gulf of Maine, including certain coastal bays and estuaries, and on the continental shelf as far south as Cape May, New Jersey, at depths greater than 10 meters in coastal waters in the Mid-Atlantic and between 40 and 400 meters in the Gulf of Maine, on Georges Bank, and in the middle continental shelf in the Mid-Atlantic, on sandy substrates. Juvenile silver hake are found in association with sand-waves, flat sand with amphipod tubes, and shells, and in biogenic depressions. Juveniles in the New York Bight settle to the bottom at mid-shelf depths on muddy sand substrates and find refuge in amphipod tube mats. **Adults:** Pelagic and benthic habitats at depths greater than 35 meters in the Gulf of Maine and certain coastal bays and estuaries, between 70 and 400 meters on Georges Bank and the outer continental shelf in the northern portion of the Mid-Atlantic Bight, and in some shallower locations nearer the coast, on sandy substrates. Adult silver hake are often found in bottom depressions or in association with sand waves and shell fragments. They have also been observed at high densities in mud habitats bordering deep boulder reefs, resting on boulder surfaces, and foraging over deep boulder reefs in the southwestern Gulf of Maine.
White hake *Urophycis tenuis*	●	--	●	--	**Eggs:** Pelagic habitats in the Gulf of Maine, including Massachusetts and Cape Cod bays, and the outer continental shelf and slope. **Juveniles:** Intertidal and sub-tidal estuarine and marine habitats in the Gulf of Maine, on Georges Bank, and in southern New England, to a maximum depth of 300 meters. Pelagic phase juveniles remain in the water column for about two months. In nearshore waters, essential fish habitat for benthic phase juveniles occurs on fine-grained, sandy substrates in eelgrass, macroalgae, and un-vegetated habitats. In the Mid-Atlantic, most juveniles settle to the bottom on the continental shelf, but some enter estuaries, especially those in southern New England. Older young-of-the-year juveniles occupy the same habitat types as the recently-settled juveniles but move into deeper water (>50 meters).

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Flatfish					
American plaice *Hippoglossoides platessoides*	●	●	--	--	**Eggs:** Pelagic habitats in the Gulf of Maine and on Georges Bank, including the high salinity zones of the bays and estuaries. **Larvae:** Pelagic habitats in the Gulf of Maine, on Georges Bank, and in southern New England, including the high salinity zones of the bays and estuaries.
Summer flounder *Paralichthys dentatus*	●	●	●	●	**Eggs:** North of Cape Hatteras, EFH is the pelagic waters found over the continental shelf (from the coast out to the limits of the Exclusive Economic Zone [EEZ]). In general, summer flounder eggs are found between October and May, being most abundant between Cape Cod and Cape Hatteras, with the heaviest concentrations within 9 miles of shore off New Jersey and New York. Eggs abundance is highest at depths of 30 to 360 feet. **Larvae:** North of Cape Hatteras, EFH is the pelagic waters found over the continental shelf (from the coast out to the limits of the EEZ). Inshore, EFH is all estuaries where summer flounder were identified as being present (rare, common, abundant, or highly abundant) in the ELMR database, in the "mixing" (defined in ELMR as 0.5 to 25.0 parts per thousand [ppt]) and "seawater" (defined in ELMR as greater than 25 ppt) salinity zones. In general, summer flounder larvae are most abundant nearshore (12-50 miles from shore) at depths between 30 to 230 feet. They are most frequently found in the northern part of the Mid-Atlantic Bight from September to February, and in the southern part from November to May. **Juveniles:** North of Cape Hatteras, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ). Inshore, EFH is all estuaries where summer flounder were identified as being present (rare, common, abundant, or highly abundant) in the ELMR database for the "mixing" and "seawater" salinity zones. In general, juveniles use several estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas in water temperatures greater than 37 °F and salinities from 10 to 30 ppt range. **Adults:** 1) North of Cape Hatteras, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ). Inshore, EFH is the estuaries where summer flounder were identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. Generally, summer flounder inhabit shallow coastal and estuarine waters ranging in depths from 1 to 82 feet, with an extensive range of salinities, during warmer months and move offshore on the outer continental shelf at depths of 500 feet in colder months.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Winter flounder *Pseudopleuronectes americanus*	--	●	●	●	**Larvae:** Estuarine, coastal, and continental shelf water column habitats from the shoreline to a maximum depth of 70 meters from the Gulf of Maine to Absecon Inlet, and including Georges Bank, including mixed and high salinity zones in certain bays and estuaries. Larvae hatch in nearshore waters and estuaries or are transported shoreward from offshore spawning sites where they metamorphose and settle to the bottom as juveniles. They are initially planktonic but become increasingly less buoyant and occupy the lower water column as they age. **Juveniles:** Estuarine, coastal, and continental shelf benthic habitats from the Gulf of Maine to Absecon Inlet, and including Georges Bank, and in mixed and high salinity zones in certain bays and estuaries. Essential fish habitat for juvenile winter flounder extends from the intertidal zone to a maximum depth of 60 meters and occurs on a variety of bottom types, such as mud, sand, rocky substrates with attached macroalgae, tidal wetlands, and eelgrass. Young-of-the-year juveniles are found inshore on muddy and sandy sediments in and adjacent to eelgrass and macroalgae, in bottom debris, and in marsh creeks. They settle to the bottom in soft-sediment depositional areas where currents concentrate late-stage larvae and disperse into coarser-grained substrates as they age. **Adults:** Estuarine, coastal, and continental shelf benthic habitats extending from the intertidal zone to a maximum depth of 70 meters from the Gulf of Maine to Absecon Inlet, and including Georges Bank, and in mixed and high salinity zones in certain bays and estuaries. Essential fish habitat for adult winter flounder occurs on muddy and sandy substrates, and on hard bottom on offshore banks. In inshore spawning areas, essential fish habitat includes a variety of substrates where eggs are deposited on the bottom.
Windowpane flounder *Scophthalmus aquosus*	●	●	●	●	**Eggs/Larvae**: Pelagic habitats on the continental shelf from Georges Bank to Cape Hatteras and in mixed and high-salinity zones of coastal bays and estuaries throughout the region. **Juveniles:** Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to northern Florida, including mixed and high salinity zones in bays and estuaries. Essential fish habitat for juveniles occurs on mud and sand substrates and extends from the intertidal zone to a depth of 60 meters. **Adults:** Intertidal and sub-tidal benthic habitats in estuarine, coastal marine, and continental shelf waters from the Gulf of Maine to Cape Hatteras, including mixed and high salinity zones in bays and estuaries. Essential fish habitat for adults occurs on mud and sand substrates and extends from the intertidal zone to a depth of 70 meters.
Witch flounder *Glyptocephalus cynoglossus*	●	●	--	●	**Eggs and Larvae**: Pelagic habitats on the continental shelf throughout the Northeast region. **Adults:** Sub-tidal benthic habitats between 35 and 400 meters in the Gulf of Maine and as deep as 1500 meters on the outer continental shelf and slope, with mud and muddy sand substrates.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Yellowtail flounder *Limanda ferruginea*	●	●	●	●	**Eggs:** Coastal and continental shelf pelagic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic region as far south as the upper Delmarva peninsula, including high salinity zones of certain bays and estuaries. **Larvae:** Coastal marine and continental shelf pelagic habitats in the Gulf of Maine, and from Georges Bank to Cape Hatteras, including high salinity zones of bays and estuaries. **Juveniles:** Sub-tidal benthic habitats in coastal waters in the Gulf of Maine and on the continental shelf on Georges Bank and in the Mid-Atlantic, including the high salinity zones of certain bays and estuaries. Essential fish habitat for juvenile yellowtail flounder occurs on sand and muddy sand between 20 and 80 meters. In the Mid-Atlantic, young-of-the-year juveniles settle to the bottom on the continental shelf, primarily at depths of 40-70 meters, on sandy substrates. **Adults:** Sub-tidal benthic habitats in coastal waters in the Gulf of Maine and on the continental shelf on Georges Bank and in the Mid-Atlantic, including the high salinity zones of certain bays and estuaries. Essential fish habitat for adult yellowtail flounder occurs on sand and sand with mud, shell hash, gravel, and rocks at depths between 25 and 90 meters.
Other Finfish					
Atlantic butterfish *Peprilus triacanthus*	●	●	●	●	**Eggs:** EFH is pelagic habitats in inshore estuaries and embayments from Massachusetts Bay to the south shore of Long Island, New York, in Chesapeake Bay, and on the continental shelf and slope, primarily from Georges Bank to Cape Hatteras, North Carolina. EFH for Atlantic butterfish eggs is generally found over bottom depths of 1,500 meters or less where average temperatures in the upper 200 meters of the water column are 6.5-21.5°C. **Larvae:** EFH is pelagic habitats in inshore estuaries and embayments in Boston harbor, from the south shore of Cape Cod to the Hudson River, and in Delaware and Chesapeake bays, and on the continental shelf from the Great South Channel (western Georges Bank) to Cape Hatteras, North Carolina. EFH for Atlantic butterfish larvae is generally found over bottom depths between 41 and 350 meters where average temperatures in the upper 200 meters of the water column are 8.5-21.5°C. **Juveniles:** EFH is pelagic habitats in inshore estuaries and embayments from Massachusetts Bay to Pamlico Sound, North Carolina, in inshore waters of the Gulf of Maine and the South Atlantic Bight, and on the inner and outer continental shelf from southern New England to South Carolina. EFH for juvenile Atlantic butterfish is generally found over bottom depths between 10 and 280 meters where bottom water temperatures are between 6.5 and 27°C and salinities are above 5 ppt. Juvenile butterfish feed mainly on planktonic prey. **Adults:** EFH is pelagic habitats in inshore estuaries and embayments from Massachusetts Bay to Pamlico Sound, North Carolina, inshore waters of the Gulf of Maine and the South Atlantic Bight, on Georges Bank, on the inner continental shelf south of Delaware Bay, and on the outer continental shelf from southern New England to South Carolina. EFH for adult Atlantic butterfish is generally found over bottom depths between 10 and 250 meters where bottom water temperatures are between 4.5 and 27.5°C and salinities are above 5 ppt. Spawning probably does not occur at temperatures below 15°C. Adult butterfish feed mainly on planktonic prey, including squids and fishes.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Atlantic mackerel *Scomber scombrus*	●	●	●	●	**Eggs:** EFH is pelagic habitats in inshore estuaries and embayments from Great Bay, New Hampshire to the south shore of Long Island, New York, inshore and offshore waters of the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina (mostly north of 38°N). EFH for Atlantic mackerel eggs is generally found over bottom depths of 100 meters or less with average water temperatures of 6.5-12.5°C in the upper 15 meters of the water column. **Larvae:** EFH is pelagic habitats in inshore estuaries and embayments from Great Bay, New Hampshire to the south shore of Long Island, New York, inshore waters of the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina (mostly north of 38°N). EFH for Atlantic mackerel larvae is generally found over bottom depths between 21 and 100 meters with average water temperatures of 5.5-11.5°C in the upper 200 meters of the water column. **Juveniles:** EFH is pelagic habitats in inshore estuaries and embayments from Passamaquoddy Bay and Penobscot Bay, Maine to the Hudson River, in the Gulf of Maine, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina. EFH for juvenile Atlantic mackerel is generally found over bottom depths between 10 and 110 meters and in water temperatures of 5 to 20°C. Juvenile Atlantic mackerel feed primarily on small crustaceans, larval fish, and other pelagic organisms. **Adults:** EFH is pelagic habitats in inshore estuaries and embayments from Passamaquoddy Bay, Maine to the Hudson River, and on the continental shelf from Georges Bank to Cape Hatteras, North Carolina. EFH for adult Atlantic mackerel is generally found over bottom depths less than 170 meters and in water temperatures of 5 to 20°C. Spawning occurs at temperatures above 7°C, with a peak between 9 and 14°C. Adult Atlantic mackerel are opportunistic predators feeding primarily on a wider range and larger individuals of pelagic crustaceans than juveniles, but also on fish and squid.
Atlantic sea herring *Clupea harengus*	●	●	●	●	**Eggs:** Inshore and offshore benthic habitats in the Gulf of Maine and on Georges Bank and Nantucket Shoals in depths of 5-90 meters on coarse sand, pebbles, cobbles, and boulders and/or macroalgae at the locations shown in Map 98. Eggs adhere to the bottom, often in areas with strong bottom currents, forming egg “beds” that may be many layers deep. **Larvae:** Inshore and offshore pelagic habitats in the Gulf of Maine, on Georges Bank, and in the upper Mid-Atlantic Bight, and in certain bays and estuaries. Atlantic herring have a very long larval stage, lasting 4-8 months, and are transported long distances to inshore and estuarine waters where they metamorphose into early-stage juveniles (“brit”) in the spring. **Juveniles:** Intertidal and sub-tidal pelagic habitats to 300 meters throughout the region, including certain bays and estuaries. One and two-year old juveniles form large schools and make limited seasonal inshore-offshore migrations. Older juveniles are usually found in water temperatures of 3 to 15°C in the northern part of their range and as high as 22°C in the Mid-Atlantic. Young-of-the-year juveniles can tolerate low salinities, but older juveniles avoid brackish water. **Adults:** Sub-tidal pelagic habitats with maximum depths of 300 meters throughout the region, including certain bays and estuaries. Adults make extensive seasonal migrations between summer and fall spawning grounds on Georges Bank and the Gulf of Maine and overwintering areas in southern New England and the Mid-Atlantic region. They seldom migrate beyond a depth of about 100 meters and – unless they are preparing to spawn – usually remain near the surface. They generally avoid water temperatures above 10°C and low salinities. Spawning takes place on the bottom, generally in depths of 5 – 90 meters on a variety of substrates (see eggs).

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Black sea bass *Centropristis striata*	--	--	●	--	**Juveniles:** Offshore, EFH is the demersal waters over the continental shelf, from the Gulf of Maine to Cape Hatteras. Inshore, EFH is the estuaries where black sea bass are identified as being common, abundant, or highly abundant in the ELMR database for the mixing" and "seawater" salinity zones. Juveniles occur in estuaries in summer and spring. Generally, juveniles occur in waters warmer than 43°F with salinities greater than 18 ppt and coastal areas between Virginia and Massachusetts. Juveniles are usually found in association with rough bottom, shellfish and eelgrass beds, man-made structures in sandy shelly areas; offshore clam beds and shell patches may also be used during the wintering.
Bluefish *Pomatomus saltatrix*	--	●	●	●	**Larvae:** North of Cape Hatteras, pelagic waters over the continental shelf, most commonly above 49 feet (15 meters), from Montauk Point south to Cape Hatteras. Bluefish larvae are not generally collected inshore, so there is no EFH designation inshore for larvae. Generally, bluefish larvae are collected April through September in temperatures greater than 64 °F (18°C) in normal shelf salinities (> 30 ppt). **Juveniles:** 1) North of Cape Hatteras, pelagic waters found over the continental shelf from Nantucket Island south to Cape Hatteras and 2) all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida. Generally, juvenile bluefish occur in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from May through October, and South Atlantic estuaries March through December, within the "mixing" and "seawater" zones. Distribution of juveniles by temperature, salinity, and depth over the continental shelf is undescribed. **Adults:** 1) North of Cape Hatteras, over the continental shelf (from the coast out to the limits of the EEZ), from Cape Cod Bay south to Cape Hatteras and 2) all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida. Adult bluefish are found in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from April through October, and in South Atlantic estuaries from May through January in the "mixing" and "seawater" zones. Bluefish adults are highly migratory and distribution varies seasonally according to the size of the individuals comprising the schools. Bluefish are generally found in normal shelf salinities (> 25 ppt).

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Monkfish *Lophius americanus*	●	●	●	●	**Eggs and Larvae:** Pelagic habitats in inshore areas, and on the continental shelf and slope throughout the Northeast region. Monkfish eggs are shed in very large buoyant mucoidal egg "veils." Monkfish larvae are more abundant in the Mid-Atlantic region and occur over a wide depth range, from the surf zone to depths of 1000 to 1500 meters on the continental slope. **Juveniles:** Sub-tidal benthic habitats in depths of 50 to 400 meters in the Mid-Atlantic, between 20 and 400 meters in the Gulf of Maine, and to a maximum depth of 1000 meters on the continental slope. A variety of habitats are essential for juvenile monkfish, including hard sand, pebbles, gravel, broken shells, and soft mud; they also seek shelter among rocks with attached algae. Juveniles collected on mud bottom next to rock-ledge and boulder fields in the western Gulf of Maine were in better condition than juveniles collected on isolated mud bottom, indicating that feeding conditions in these edge habitats are better. Young-of-the-year juveniles have been collected primarily on the central portion of the shelf in the Mid-Atlantic, but also in shallow nearshore waters off eastern Long Island, up the Hudson Canyon shelf valley, and around the perimeter of Georges Bank. They have also been collected as deep as 900 meters on the continental slope. **Adults:** Sub-tidal benthic habitats in depths of 50 to 400 meters in southern New England and Georges Bank, between 20 and 400 meters in the Gulf of Maine, and to a maximum depth of 1000 meters on the continental slope. Essential fish habitat for adult monkfish is composed of hard sand, pebbles, gravel, broken shells, and soft mud. They seem to prefer soft sediments (fine sand and mud) over sand and gravel, and, like juveniles, utilize the edges of rocky areas for feeding.
Ocean pout *Macrozoarces americanus*	●	--	●	●	**Eggs**: Hard-bottom habitats in the Gulf of Maine, Georges Bank, and in the Mid-Atlantic Bight, as well as the high-salinity zones in certain estuaries. Eggs are laid in gelatinous masses, generally in sheltered nests, holes, or rocky crevices. Essential fish habitat for ocean pout eggs occurs in depths less than 100 meters on rocky bottom habitats. **Juveniles:** Intertidal and sub-tidal benthic habitats in the Gulf of Maine and on the continental shelf north of Cape May, New Jersey, on the southern portion of Georges Bank, and in the high salinity zones of bays and estuaries north of Cape Cod, extending to a maximum depth of 120 meters. Essential fish habitat for juvenile ocean pout occurs on a wide variety of substrates, including shells, rocks, algae, soft sediments, sand, and gravel. **Adults**: Sub-tidal benthic habitats between 20 and 140 meters in the Gulf of Maine, on Georges Bank, in coastal and continental shelf waters north of Cape May, New Jersey, and in the high salinity zones of bays and estuaries north of Cape Cod. Essential fish habitat for adult ocean pout includes mud and sand, particularly in association with structure forming habitat types (i.e., shells, gravel, or boulders). In softer sediments, they burrow tail first and leave a depression on the sediment surface. Ocean pout congregate in rocky areas prior to spawning and frequently occupy nesting holes under rocks or in crevices in depths less than 100 meters.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Scup *Stenotomus chrysops*	--	--	●	●	**Juveniles:** 1) Offshore, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ, from the Gulf of Maine to Cape Hatteras, North Carolina. 2) Inshore, EFH is the estuaries where scup were identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. In general, juvenile scup are found during the summer and spring in estuaries and bays between Virginia and Massachusetts, in association with various sands, mud, mussel and eelgrass bed type substrates and in water temperatures greater than 45 °F and salinities greater than 15 ppt. **Adults:** 1) Offshore, EFH is the demersal waters over the continental shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina. 2) Inshore, EFH is the estuaries where scup were identified as being common, abundant, or highly abundant in the ELMR database for the "mixing and "seawater" salinity zones. Generally, wintering adults (November through April) are usually offshore, south of New York to North Carolina, in waters above 45 °F.
Highly Migratory Species					
Albacore tuna *Thunnus alalunga*	--	--	●	●	**Juveniles**: Offshore, pelagic habitats of the Atlantic Ocean from the outer edge of the U.S. EEZ through Georges Bank to pelagic habitats south of Cape Cod, and from Cape Cod to Cape Hatteras, North Carolina. EFH also includes offshore pelagic habitats near the outer U.S. EEZ between North Carolina and Florida, and offshore pelagic habitats associated with the Blake Plateau. **Adults:** Offshore, pelagic habitats of the Atlantic Ocean from the outer edge of the U.S. EEZ through Georges Bank to pelagic habitats south of Cape Cod, and from Cape Cod to Cape Hatteras, North Carolina. EFH also includes offshore pelagic habitats near the outer U.S. EEZ between North Carolina and Florida, and offshore pelagic habitats associated with the Blake Plateau. EFH also includes offshore pelagic habitats in the western and central Gulf of Mexico.
Bluefin tuna *Thunnus thynnus*	--	--	●	●	**Juveniles:** Coastal and pelagic habitats of the Mid-Atlantic Bight and the Gulf of Maine, between southern Maine and Cape Lookout, from shore (excluding Long Island Sound, Delaware Bay, Chesapeake Bay, and Pamlico Sound) to the continental shelf break. EFH in coastal areas of Cape Cod are located between the Great South Passage and shore. EFH follows the continental shelf from the outer extent of the U.S. EEZ on Georges Bank to Cape Lookout. EFH is associated with certain environmental conditions in the Gulf of Maine (16 to 19°C; 0 to 40 meters deep). EFH in other locations associated with temperatures ranging from 4 to 26 °C, often in depths of less than 20 meters (but can be found in waters that are 40-100 meters in depth in winter). **Adults:** EFH is offshore and coastal regions of the Gulf of Maine the mid-coast of Maine to Massachusetts; on Georges Bank; offshore pelagic habitats of southern New England; from southern New England to coastal areas between the mouth of Chesapeake Bay and Onslow Bay, North Carolina; from coastal North Carolina south to the outer extent of the U.S. EEZ, inclusive of pelagic habitats of the Blake Plateau, Charleston Bump, and Blake Ridge.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Skipjack tuna *Katsuwonus pelamis*	--	--	●	●	**Juveniles:** Offshore pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank (off Massachusetts); coastal and offshore habitats between Massachusetts and South Carolina; localized in areas off Georgia and South Carolina; and from the Blake Plateau through the Florida Straits. In all areas juveniles are found if waters greater than 20 meters. **Adults:** Coastal and offshore habitats between Massachusetts and Cape Lookout, North Carolina and localized areas in the Atlantic off South Carolina and Georgia, and the northern east coast of Florida. EFH in the Atlantic Ocean also located on the Blake Plateau and in the Florida Straits through the Florida Keys.
Yellowfin tuna *Thunnus albacares*	--	--	●	●	**Juveniles**: Offshore pelagic habitats are seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank and Cape Cod, Massachusetts, and offshore and coastal habitats from Cape Cod to the mid-east coast of Florida and the Blake Plateau. Juveniles are locally distributed in the Florida Straits and off the southwestern edge of the West Florida Shelf. Yellowfin tuna juveniles are also found in the central Gulf of Mexico from the Florida Panhandle to southern Texas. Localized EFH is southeast of Puerto Rico. **Adults:** Offshore pelagic habitats seaward of the continental shelf break between the seaward extent of the U.S. EEZ boundary on Georges Bank and Cape Cod, Massachusetts. Offshore and coastal habitats from Cape Cod to North Carolina, and offshore pelagic habitats of the Blake Plateau.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Invertebrates					
Atlantic sea scallop *Placopecten magellanicus*	●	●	●	●	**Eggs:** Benthic habitats in inshore areas and on the continental shelf, near adult scallops. Eggs are heavier than seawater and remain on the seafloor. **Larvae:** Benthic and water column habitats in inshore and offshore areas throughout the region. Any hard surface can provide an essential habitat for settling pelagic larvae (“spat”), including shells, pebbles, and gravel. They also attach to macroalgae and other benthic organisms such as hydroids. Spat attached to sedentary branching organisms or any hard surface have greater survival rates. **Juveniles:** Benthic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic, in depths of 18 to 110 meters. Juveniles leave the original substrate on which they settle and attach themselves by byssal threads to shells, gravel, and small rocks, preferring gravel. As they grow older, they lose their byssal attachment. Juvenile scallops are relatively active and swim to escape predation. While swimming, they can be carried long distances by currents. Bottom currents stronger than 10 centimeters/second retard feeding and growth. In laboratory studies, maximum survival of juvenile scallops occurred between 1.2 and 15°C and above salinities of 25 ppt. On Georges Bank, age-1 juveniles are less dispersed than older juveniles and adults and are mainly associated with gravel-pebble deposits. Essential habitats for older juvenile scallops are the same as for the adults (gravel and sand). **Adults:** Benthic habitats in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic. Essential habitats for adult sea scallops are found on sand and gravel substrates in depths of 18 to 110 meters, but they are also found in shallower water and as deep as 180 meters in the Gulf of Maine. In the Mid-Atlantic they are found primarily between 45 and 75 meters and on Georges Bank they are more abundant between 60 and 90 meters. They often occur in aggregations called beds which may be sporadic or essentially permanent, depending on how suitable the habitat conditions are and whether oceanographic features keep larval stages near the spawning population. Bottom currents stronger than 25 centimeters/second inhibit feeding. Growth of adult scallops is optimal between 10 and 15°C and they prefer full strength seawater.
Ocean quahog *Arctica islandica*	--	--	●	●	**Juveniles and adults:** Throughout the substrate, to a depth of three feet below the water/sediment interface, within federal waters from the eastern edge of Georges Bank and the Gulf of Maine throughout the Atlantic EEZ. Distribution in the western Atlantic ranges in depths from 30 feet to about 800 feet. Ocean quahogs are rarely found where bottom water temperatures exceed 60 °F and occur progressively further offshore between Cape Cod and Cape Hatteras.

EFH Species	Life Stage				EFH Description
	Eggs	Larvae	Juvenile	Adult	
Longfin inshore squid *Doryteuthis pealeii*	●	--	●	●	**Eggs:** Inshore and offshore bottom habitats from Georges Bank to Cape Hatteras, generally where bottom water temperatures are between 10°C and 23°C, salinities are between 30 and 32 ppt, and depth is less than 50 meters. Eggs have also been collected in bottom trawls in deeper water at various places on the continental shelf. Egg masses are demersal and anchored to the substrates on which they are laid. Substrates include a variety of hard bottom types (e.g., shells, boulders), submerged aquatic vegetation, sand, and mud. **Juveniles: P**elagic habitats in inshore and offshore continental shelf waters from Georges Bank to South Carolina, in the southwestern Gulf of Maine, and in embayments such as Narragansett Bay, Long Island Sound, and Raritan Bay. Pre-recruits are generally found over bottom depths of 6-160 meters, bottom water temperatures of 8.5-24.5°C, and salinities of 28.5-36.5 ppt. Pre-recruits migrate offshore in the fall where they overwinter in deeper waters along the edge of the shelf. Small individuals feed on planktonic organisms while larger individuals feed on crustaceans and fish. **Adults:** Pelagic habitats in inshore and offshore continental shelf waters from Georges Bank to South Carolina, inshore waters of the Gulf of Maine, and in embayments such as Narragansett Bay, Long Island Sound, Raritan Bay, and Delaware Bay. Recruits are generally found over bottom depths of 6-200 meters, bottom water temperatures of 8.5-14°C, and salinities of 24-36.5 ppt. Recruits inhabit the continental shelf and upper continental slope to depths of 400 meters. They migrate offshore in the fall and overwinter in warmer waters along the edge of the shelf. Females deposit eggs in gelatinous capsules which are attached in clusters to rocks, boulders, and aquatic vegetation and on sand or mud bottom, generally in depths less than 50 meters.

Notes:
• = present
-- = not present
EEZ = Exclusive Economic Zone
EFH = Essential Fish Habitat
m = meters
OCS = Outer Continental Shelf
ppt = parts per thousand
SAV = submerged aquatic vegetation

Table 4-2. EFH-designated elasmobranchs within the Lease Area

EFH Species	Life Stage			EFH Description
	Neonate	Juvenile	Adult	
Skates				
Barndoor skate *Dipturus laevis*	--	●	●	**Juveniles and Adults:** Benthic habitats on the continental shelf, primarily on Georges Bank and in southern New England, in depths of 40 – 400 meters, and on the continental slope to a maximum depth of 750 meters. Essential fish habitat for juvenile and adult barndoor skates occurs on mud, sand, and gravel substrates. Both life stages are usually found on the continental shelf in depths less than 160 meters, but the adults also occupy benthic habitats between 300 and 400 meters on the outer shelf.
Little skate *Leucoraja erinacea*	--	●	●	**Juveniles:** Intertidal and sub-tidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 80 meters, and including high salinity zones in certain bays and estuaries. Essential fish habitat for juvenile little skates occurs on sand and gravel substrates, but they are also found on mud. **Adults**: Intertidal and sub-tidal benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 100 meters, and including high salinity zones in certain bays and estuaries. Essential fish habitat for adult little skates occurs on sand and gravel substrates, but they are also found on mud.
Winter skate *Leucoraja ocellata*	--	●	●	**Juveniles and Adults**: Benthic habitats with mud and sand substrates on the outer continental shelf in depths of 80 – 400 meters from approximately 40˚N latitude to Cape Hatteras, North Carolina.
Sharks				
Basking shark *Cetorhinus maximus*	●	●	●	**Neonate, Juveniles, and Adults:** At this time, insufficient data is available to differentiate EFH between size classes; therefore, EFH designations for all life stages have been combined and are considered the same. Atlantic east coast from the Gulf of Maine to the northern Outer Banks of North Carolina, and from mid-South Carolina to coastal areas of northeast Florida. Aggregations of basking sharks were observed from the south and southeast of Long Island, east of Cape Cod, and along the coast of Maine, in the Gulf of Maine and near the Great South Channel, approximately 95 km southeast of Cape Cod, Massachusetts as well as approximately 75 km south of Martha’s Vineyard and 90 km south of Moriche’s Inlet, Long Island. These aggregations tend to be associated with persistent thermal fronts within areas of high prey density.
Blue shark *Prionace glauca*	●	●	●	**Neonate:** In the Atlantic in areas offshore of Cape Cod through New Jersey, seaward of the 30-meter bathymetric line (and excluding inshore waters such as Long Island Sound). EFH follows the continental shelf south of Georges Bank to the outer extent of the U.S. EEZ in the Gulf of Maine. **Juveniles and Adults**: EFH is localized areas in the Atlantic Ocean in the Gulf of Maine, from Georges Bank to North Carolina, South Carolina, Georgia, and off Florida.

EFH Species	Life Stage			EFH Description
	Neonate	Juvenile	Adult	
Common thresher *Alopias vulpinus*	●	●	●	**Neonates, Juveniles, and Adults**: Insufficient data are available to differentiate EFH between the juvenile and adult size classes; therefore, EFH is the same for those life stages. EFH is in the Atlantic Ocean, from Georges Bank (at the offshore extent of the U.S. EEZ boundary) to Cape Lookout, North Carolina, and from Maine to locations offshore of Cape Ann, Massachusetts. EFH occurs with certain habitat associations in nearshore waters of North Carolina, especially in areas with temperatures of 18.2-20.9°C and at depths of 4.6-13.7 meters.
Dusky shark *Carcharhinus obscurus*	●	●	●	**Neonate:** EFH in the Atlantic Ocean includes offshore areas of southern New England to Cape Lookout, North Carolina. Specifically, EFH is associated with habitat conditions including temperatures from 18.1 to 22.2 °C, salinities of 25 to 35 ppt and depths at 4.3 to 15.5 meters. Seaward extent of EFH for this life stage in the Atlantic is 60 meters in depth. **Juveniles and Adults:** Coastal and pelagic waters inshore of the continental shelf break (< 200 meters in depth) along the Atlantic east coast from habitats offshore of southern Cape Cod to Georgia, including the Charleston Bump and adjacent pelagic habitats. Inshore extent for these life stages is the 20-meter bathymetric line, except in habitats of southern New England, where EFH is extended seaward of Martha's Vineyard, Block Island, and Long Island. Pelagic habitats of southern Georges Bank and the adjacent continental shelf break from Nantucket Shoals and the Great South Channel to the eastern boundary of the United States EEZ. Adults are generally found deeper (to 2000 meters) than juveniles, however there is overlap in the habitats utilized by both life stages. Offshore waters of the western and north Gulf of Mexico, at and seaward of the continental shelf break (a buffer is included ~10 nautical miles north of the 200-meter bathymetric line), and in proximity to numerous banks along the continental shelf edge (e.g., Ewing and Sackett Bank). The continental shelf edge habitat from Desoto Canyon west to the Mexican border is important habitat for adult dusky sharks.
Porbeagle shark *Lamna nasus*	●	●	●	**Neonate, Juveniles, and Adults:** At this time, available information is insufficient for the identification of EFH by life stage, therefore all life stages are combined in the EFH designation. EFH in the Atlantic Ocean includes offshore and coastal waters of the Gulf of Maine (not including Cape Cod Bay and Massachusetts Bay) and offshore waters of the Mid-Atlantic Bight from Georges Bank to New Jersey.
Sandbar shark *Carcharhinus plumbeus*	--	--	●	**Adults:** EFH in the Atlantic Ocean includes coastal areas from southern New England to the Florida Keys, ranging from inland waters of Delaware Bay and the mouth of Chesapeake Bay to the continental shelf break. EFH in the Gulf of Mexico includes coastal areas between the Florida Keys and Anclote Key, Florida; areas offshore of the Big Bend region; coastal areas of the Florida panhandle and Gulf coast between Apalachicola and the Mississippi River; and habitats surrounding the continental shelf between Louisiana and south Texas.
Shortfin mako shark *Isurus oxyrinchus*	●	●	●	**General habitat description**: The shortfin mako shark is a pelagic, oceanic species that inhabits warm and warm-temperate waters throughout all oceans. **Neonates, Juveniles, and Adults**: Pelagic waters in the Atlantic from southern New England through Cape Lookout, and specific areas off Maine, South Carolina, and Florida.

EFH Species	Life Stage			EFH Description
	Neonate	Juvenile	Adult	
Tiger shark *Galeocerdo cuvieri*	--	●	●	**Juveniles and adults:** EFH in the Atlantic Ocean extends from offshore pelagic habitats associated with the continental shelf break at the seaward extent of the U.S. EEZ boundary (south of Georges Bank, off Massachusetts) to the Florida Keys, inclusive of offshore portions of the Blake Plateau. EFH in the Gulf of Mexico includes pelagic and coastal habitats between Tampa Bay, Florida Bay and Florida Keys, and the edge of the West Florida Shelf; and an area extending from off eastern Louisiana, Mississippi, and Alabama to offshore pelagic habitats in the central Gulf of Mexico. Grass flats in the Gulf of Mexico are considered feeding areas and are included as EFH. EFH also includes coastal and pelagic habitats surrounding Puerto Rico (except on the northwest side of the island) and the U.S. Virgin Islands.
White shark *Carcharadon carcharias*	●	●	●	**Neonate:** EFH includes inshore waters out to 105 kilometers from Cape Cod, Massachusetts, to an area offshore of Ocean City, New Jersey. **Juveniles and adults:** Known EFH includes inshore waters to habitats 105 kilometers from shore, in water temperatures ranging from 9 to 28 °C, but more commonly found in water temperatures from 14 to 23 °C from Cape Ann, Massachusetts, including parts of the Gulf of Maine, to Long Island, New York, and from Jacksonville to Cape Canaveral, Florida.
Spiny dogfish *Squalus acanthias*	--	sf	f/m	**Female Sub-Adults:** Pelagic and epibenthic habitats throughout the region. Sub-adult females occur over a wide depth range in full salinity seawater (32-35 ppt) where bottom temperatures range from 7-15°C. Sub-adult females are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C. **Female Adults:** Pelagic and epibenthic habitats throughout the region. Adult females occur over a wide depth range in full salinity seawater (32-35 ppt) where bottom temperatures range from 7-15°C. They are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C. **Male Adults:** Pelagic and epibenthic habitats throughout the region. Adult males are found over a wide depth range in full salinity seawater (32-35 ppt) where bottom temperatures range from 7 to 15°C. They are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C.
Smoothhound shark complex *Mustelus spp.*	●	●	●	**Neonate, Juvenile, and Adult:** Available information is insufficient for the identification of EFH for this life stage, therefore, all life stages are combined in the EFH designation. EFH identified in the Atlantic is exclusively for smooth dogfish. EFH in Atlantic coastal areas ranges from Cape Cod Bay, Massachusetts to South Carolina, inclusive of inshore bays and estuaries (e.g., Pamlico Sound, Core Sound, Delaware Bay, Long Island Sound, Narragansett Bay, etc.). EFH also includes continental shelf habitats between southern New Jersey and Cape Hatteras.

Notes:

• = present
-- = not present
sf = sub-females
f = female
m = male
YOY = young-of-year

EEZ = Exclusive Economic Zone
EFH = Essential Fish Habitat
OCS = Outer Continental Shelf
ppt = parts per thousand

4.1. Vulnerable Species, Life Stages, and Habitat

Many mobile species are less susceptible to potential project impacts because they can leave or avoid areas of impacts. However, certain EFH species are more susceptible because they are immobile or have limited mobility. Certain habitats are also considered sensitive. The following list summarizes vulnerable species and habitat:

- Sessile or slow-moving benthic/epibenthic invertebrates (e.g., bivalve juveniles and adults, squid egg mops)
- Skate egg cases
- Ocean pout eggs and larvae

4.2. Habitat Areas of Particular Concern

In order to conserve fish habitat in geographical locations particularly critical to the survival of a species, NMFS and the Fisheries Management Councils have designated some locations to be Habitat Areas of Particular Concern (HAPC). According to the NMFS EFH Mapper, no HAPCs have been designated within the Lease Area (NMFS 2023). However, the New England Fisheries Management Council proposes to designate a HAPC within and around wind lease areas in Southern New England, which would overlap the entirety of the Lease Area. This action would focus conservation recommendations on cod spawning habitats and complex benthic habitats using the best scientific information available. Atlantic cod eggs and larvae are most abundant during the spring (NMFS 2017b). Eggs are buoyant and therefore are restricted to the surface, whereas larvae occur from near-surface to depths of 246 feet (75 meters). Juvenile and adult cod inhabit structurally complex habitats, including eelgrass, mixed sand and gravel, and rocky habitats (gravel pavements, cobble, and boulder) with and without attached macroalgae and emergent epifauna (NMFS 2017b). Adult cod also occur on sandy substrates and frequent deeper slopes of ledges along shore. South of Cape Cod, Atlantic cod spawning occurs in nearshore areas and on the continental shelf, usually in depths less than 230 feet (70 meters).

4.3. Prey Species

Prey species are those consumed by fish and invertebrates with designated EFH and are thus considered in some cases to be a component of EFH. Prey species that inhabit the Lease Area include epibenthic and infaunal fishes and invertebrates, which provide important trophic linkages to upper trophic levels. Among the taxa that provide prey for EFH-designated species are oligochaetes, polychaetes, flatworms, and nematodes, burrowing amphipods, mysids, copepods, crabs, sand dollars, starfish, sea urchins, bivalves, snails, and burrowing anemones. Impacts to prey species may cause indirect impacts to EFH, and species and life stages with designated EFH, because of lost foraging opportunities or reduced foraging efficiency resulting from adverse impacts to this vital component of the habitat.

4.4. Species Groups

Species groups, defined as groups of EFH species and/or life history stages that predominantly share the same habitat type, are used throughout this assessment. Benthic/epibenthic species groups are sorted into two NMFS habitat classification groups (soft bottom or complex) based on the benthic habitat with which the species is typically associated, with the potential for any species occur in heterogenous complex habitat. Prey species are included as species groups because they are consumed by managed fish and invertebrate species and thus are therefore a component of EFH. A list of the species groups used in this assessment is provided below.

Sessile Benthic/Epibenthic – Soft Bottom

- Atlantic sea scallop (eggs, adults)
- Longfin inshore squid (eggs)
- Ocean quahog (juveniles, adults)
- Winter flounder (larvae)

Mobile Benthic/Epibenthic – Soft Bottom

- Barndoor skates (juveniles, adults)
- Monkfish (juveniles, adults)
- Ocean pout (juveniles, adults)
- Red hake (juveniles, adults)
- Scup (juveniles, adults)
- Sharks (neonates)
- Little skate (juveniles, adults)
- Silver hake (juveniles, adults)
- Summer flounder (juveniles, adults)
- White hake (juveniles)
- Windowpane flounder (juveniles, adults)
- Winter flounder (juveniles, adults)
- Witch flounder (adults)
- Winter skate (juveniles, adults)

Sessile Benthic/Epibenthic – Complex Habitat

- Atlantic sea scallop (eggs, larvae, juveniles, adults)
- Longfin inshore squid (eggs)
- Ocean pout (eggs)

Mobile Benthic/Epibenthic – Complex Habitat

- Atlantic cod (juveniles, adults)
- Atlantic sea herring (eggs)
- Barndoor skates (juveniles, adults)
- Black sea bass (juveniles)
- Haddock (juveniles, adults)
- Little skate (juveniles, adults)
- Monkfish (juveniles, adults)
- Ocean pout (juveniles, adults)
- Pollock (juveniles)
- Red hake (juveniles, adults)

- Scup (juveniles, adults)
- Sharks (neonates)
- Silver hake (juveniles, adults)
- Summer flounder (juveniles, adults)
- White hake (juveniles)
- Winter flounder (juveniles, adults)

Pelagic

- Atlantic butterfish (eggs, larvae, juveniles, adults)
- Atlantic cod (eggs, larvae)
- Atlantic herring (larvae, juveniles, adults)
- Atlantic mackerel (eggs, larvae, juveniles, adults)
- Bluefish (larvae, juveniles, adults)
- Flatfish (eggs, larvae)
- Haddock (larvae)
- Highly Migratory Species (juveniles, adults)
- Longfin inshore squid (juveniles, adults)
- Monkfish (eggs, larvae)
- Offshore hake (larvae)
- Pollock (eggs, larvae,)
- Red hake (eggs, larvae)
- Silver hake (eggs, larvae)
- Sharks (juveniles, adults)
- White hake (eggs, juveniles)

Prey Species – Benthic/Epibenthic

- Annelid worms
- Crustaceans (e.g., amphipods, shrimps, crabs)

5. Adverse Effects

This section provides an analysis of the potential effects of the Proposed Action on designated EFH for managed species and life stages that have documented to occur within the Lease Area, as defined in Section 2.1. As stated, potential impacts on EFH are defined by the geographic extent of measurable effects from foundation testing. Potential impacts on EFH are evaluated in this section by 1) determining if designated EFH occurs in the Lease Area, and 2) determining if impact mechanisms are likely to impair the suitability of the affected habitat for the species and life stage being evaluated. Adverse effects on EFH may include direct or indirect physical, chemical, or biological alterations of waters or substrates used by EFH species during their life cycle, impacts to pelagic and benthic prey organisms and their habitats, and other ecosystem components. Adverse effects may be short-term (less than 2 years) or permanent, site-specific, or habitat-wide, and can result from the individual, cumulative, or synergistic consequences of actions (50 CFR § 600.910). If a project activity is likely to result in a short-term or long-term impairment of designated EFH for a managed species and life stage, this would constitute an adverse effect on EFH.

The Proposed Action would generate short-term to permanent, direct and indirect effects on EFH associated with foundation testing and vessel traffic. Effects would include disturbance of benthic habitat leading to potential crushing and burial, sediment resuspension and deposition, entrainment of ichthyoplankton during use of the suction pump, vessel noise, and potential introduction of non-native species. These effects would occur intermittently and at varying locations within the Lease Area over the testing period. Therefore, the suitability of EFH for managed species may be reduced depending on the nature, duration, and magnitude of each effect. Impacts of the Proposed Action on EFH and EFH species are discussed below.

5.1. Habitat Disturbance

Potential impacts resulting from foundation testing include disturbance of the seabed from placement of the reference frame lowered from the vessel, contact and penetration of the suction bucket during installation, removal, and contact of the baseplate moorings used to secure the acoustic monitoring device. Disturbance of benthic sediments and habitats directly within the footprint of the suction bucket, reference frame, and acoustic monitoring moorings would result in a reduction of habitat suitability for benthic infauna and epifauna. Disturbance may also result in localized mortality of benthic and demersal fish and invertebrates within the footprint of the frame, suction bucket, and monitoring moorings; surrounding seafloor habitat would be undisturbed.

Non-complex soft-bottom habitat, including small sand waves, ripples, and depressions in the seabed, comprises the entire 128,881 acres of the Lease Area and provides EFH for eighteen species (e.g., hakes, flounders). Deployment of the suction bucket would remove these habitat features if they occur within the footprint of the suction bucket. Tidal and wind-forced bottom currents are expected to reform most sand ripples and waves within days to weeks following disturbance. Although some sand ripples and waves may not immediately recover to the same height and width as pre-disturbance, the habitat function is expected to fully recover post-disturbance. Foundation testing would be limited to soft-bottom habitat, thereby avoiding impacts on complex habitat that would require longer to recover. Impacts of foundation testing on EFH and EFH species are expected to be localized and short term, dissipating over time as local oceanographic processes restore the altered seabed profile.

Sessile infaunal and epifaunal organisms (e.g., eggs, larvae, bivalves) within the footprints of the suction bucket and acoustic monitoring moorings are expected to experience direct, permanent (lethal), localized impacts as contact with the suction bucket and acoustic monitoring moorings or pressure from embedding would cause crushing or other fatal injuries. Benthic and demersal fish and invertebrates inhabiting the foundation testing locations could also potentially become crushed under the suction bucket or reference frame or become trapped inside the bucket once it reaches the seafloor, which could result in mortality. However, mobile fish and invertebrates are generally expected to leave the area as the suction bucket approaches the seafloor at a controlled rate of less than 13 inches (30 centimeters) per second, such that direct contact or trapping of those mobile fauna is unlikely. Mortality of organisms within the footprint of the suction bucket would result in a loss in foraging opportunity for benthic and epibenthic EFH species, but the overall impact on the forage base would be negligible given the small size of the impacted area and the ubiquity of similar soft-bottom habitat in the area.

Adverse impacts of foundation testing activities on EFH and EFH species are generally expected to occur within the footprint of the suction bucket, which will directly affect 0.028 acres (114 m^2) of soft-bottom habitat per test and up to 0.986 acres (3,990 m^2) collectively during the Proposed Action. The deployment of the baseplate moorings during acoustic monitoring will directly affect another 0.012 acres (52 m^2) of soft-bottom habitat during the Proposed Action. This total area of impact constitutes a small portion of the surrounding soft-bottom habitat, which is homogenous throughout the Lease Area, except for the area of sand ripple habitat along the west-central side of the Lease Area. Habitat disturbance associated with the Proposed Action is expected to have a short-term, localized, adverse effect on EFH.

Direct Effects on EFH and EFH species

- Short-term, localized loss/conversion of EFH:
  - Sessile Benthic/Epibenthic – Soft Bottom
  - Mobile Benthic/Epibenthic – Soft Bottom
  - Prey Species – Benthic/Epibenthic
- Permanent, localized mortality of EFH species from crushing and burial:
  - Sessile Benthic/Epibenthic – Soft Bottom
  - Prey Species – Benthic/Epibenthic
- Short-term, localized avoidance of foundation testing activities by EFH species:
  - Mobile Epibenthic/Benthic – Soft Bottom
  - Prey Species – Benthic/Epibenthic

Indirect Effects on EFH and EFH species

- Short-term, localized loss of benthic prey items:
  - Sessile Benthic/Epibenthic – Soft Bottom

5.2. Sediment Suspension/Redeposition

Deployment of the suction bucket during foundation testing would result in sediment suspension, a concomitant increase in turbidity in the water column, and sedimentation as a result of redeposition. Because the suction bucket will be lowered to the seabed in a controlled manner and at less than 13 inches [30 centimeters] per second, sediment plumes resulting from contact with the seafloor are expected to occur in the immediate area of the suction bucket and at minimal heights from the seabed. There is minimal information available on turbidity and sediment deposition levels that are associated with deployment, installation, and removal of suction bucket foundations. As suction bucket foundations require less benthic disturbance compared to other offshore wind foundation types (Horwath et al. 2021), it was assumed that suspended sediment plumes produced during installation and removal of the suction bucket and reference frame during foundation testing would be similar to, or less than, those associated with site preparation activities for other foundation types (e.g., dredging for sand bedform clearing). Modeling of cutterhead dredging demonstrates that suspended sediment concentrations above background levels are expected to be present within a 984 to 1,640 feet (300 to 500 meters) radius of the cutterhead dredge (NMFS 2020 citing Hayes et al. 2000; NMFS 2020 citing LaSalle 1990; NMFS 2020 citing USACE 1983). Suspended sediment concentrations associated with cutterhead dredge sediment plumes typically range from 11.5 to 282.0 milligrams per liter (mg/L) with the highest levels (550.0 mg/L) detected adjacent to the cutterhead dredge and concentrations decreasing with greater distance from the dredge (NMFS 2020 citing Nightingale and Simenstad 2001; NMFS 2020 citing USACE 2005, 2010, 2015). Based on this information, the localized sediment plume generated by the proposed foundation testing may extend up to 500 meters along the seabed with suspended sediment concentrations of 282 mg/L or less, with higher concentrations possible immediately adjacent to suction bucket upon removal. The plume is expected to dissipate rapidly, such that sediment disturbance is not expected to cause cumulative or long-lasting impacts on water quality.

Sessile benthic/epibenthic EFH species have a range of susceptibility to sediment suspension, turbidity, and sedimentation based on life stage, mobility, and feeding mechanisms. Increases in sediment suspension and deposition may cause short-term adverse impacts to EFH resulting from a decrease in habitat quality for benthic species and life stages, with small sessile or slow-moving benthic EFH species and life stages experiencing greater impacts from deposition than larger, mobile species or life stages that are able to avoid areas of reduced water quality.

Egg and larval life stages are sensitive to suspended sediment and can experience sublethal or lethal effects from as little as 0.4 inches (10 mm) of sediment deposition (Kjelland et al. 2015; Michel et al. 2013; Wilber and Clarke 2001). Egg and larval stages of certain fish species (e.g., winter flounder) are particularly sensitive to sediment deposition and can experience mortality at burial depths less than 0.1 inch (3 mm) (Michel et al. 2013). Further, sediment deposition depths between 0.4 and 1.2 inches (10 and 30 mm) could result in sublethal to lethal effects on benthic life stages of sessile bivalves. Benthic habitats exposed to measurable burial depths during foundation testing would be rendered temporarily unsuitable for EFH species with sessile, benthic or epibenthic eggs and larvae in the Lease Area. Deployment of the suction bucket during foundation testing would generate measurable sediment deposition levels only in the immediate area of seabed contact and only until suspended sediment has redeposited on the seafloor, such that impacts of sediment deposition on EFH and EFH species would be short-term and localized.

Adult and juvenile fishes exposed to elevated suspended sediment levels may temporarily experience sublethal effects (e.g., ceased feeding, abandoning cover, short-term physiological stress) and behavioral avoidance effects. Short-term exposure to total suspended sediment (TSS) concentrations exceeding 1,000 milligrams per liter (mg/L) has been associated with sublethal and behavioral avoidance effects on adult marine and estuarine fishes, while concentrations of less than 500 mg/L are more commonly associated with behavioral avoidance (Michel et al. 2013; Wilber and Clarke 2001). Adult bivalves may experience sublethal effects of suspended sediments at TSS concentrations of 1,000 mg/L or higher (Wilber and Clarke 2001). As described above, modeling of turbidity associated with site preparation activities for other foundation types suggest that turbidity levels associated with deployment of a suction bucket foundation are unlikely to cause sublethal effects but may cause behavioral avoidance within the sediment plume, which may extend out to 1,640 feet (500 meters) from the suction bucket. Elevated turbidity levels would occur for a short duration, such that impacts of suspended sediment on juvenile and adult fishes with EFH in the vicinity of the Proposed Action would be short-term and localized.

Direct Effects on EFH and EFH species

- Short-term, localized decrease in quality of EFH resulting from increased turbidity from suspended sediment:
  - Sessile Benthic/Epibenthic – Soft Bottom
  - Mobile Benthic/Epibenthic – Soft Bottom
  - Pelagic
- Short-term, localized impacts resulting from redeposition of suspended sediment:
  - Sessile Benthic/Epibenthic – Soft Bottom
  - Prey Species – Benthic/Epibenthic

Indirect Effects on EFH and EFH species

- Short-term, localized loss of foraging opportunities resulting from turbidity and redeposition of suspended sediment:
  - Mobile Benthic/Epibenthic – Soft Bottom

5.3. Entrainment

Benthic and pelagic eggs and larvae of EFH species inhabiting the immediate area of the suction pump may become entrained in the intake flow of the suction pump with assumed 100-percent entrainment mortality. During suction bucket penetration, all water would be withdrawn from within the 36- to 39-foot- (11- to 12-meter) tall suction bucket and would pass through the pump, assuming full penetration depth of the foundation is achieved. Consequently, both pelagic organisms and benthic epifaunal organisms within the footprint and overlying water column are expected to be susceptible to entrainment during installation of the suction bucket. During removal of the bucket, water would be withdrawn from the water column outside of the suction bucket. The hydraulic zone of influence during operation of the suction pump is expected to have a radial distance of 2.5 feet and encompass an area of up to 20 square feet. Because the suction pump would be top-mounted, only pelagic organisms within the hydraulic zone of influence are expected to be susceptible to entrainment during removal of the suction bucket. Several EFH species have surface-oriented egg and larval stages (e.g., gadids, some flounders), which are not expected to be vulnerable to entrainment at the intake. During each test, the suction pump would operate for up to nine hours at a typical intake flow of approximately 1,320 gallons (5 m^3) per minute, with a maximum intake volume of 716,963 gallons (2,714 m^3) per test (including installation into the seabed and reverse suction to remove the foundation). If the maximum of 35 tests were conducted, the total intake volume would be 25.1 million gallons (94,990 m^3) over 315 hours.

An analysis of entrainment associated with foundation testing in the Lease Area was conducted in support of the Proposed Action (Beacon Wind 2023b). The analysis relied on publicly available ichthyoplankton data from the NOAA Fisheries EcoMon Survey Program, which spanned from 1977–2019. EcoMon surveys were conducted at 120 randomly selected stations and 35 fixed stations throughout the continental shelf and slope of the northeastern U.S. The surveys routinely collect phytoplankton and zooplankton, including fish larvae and eggs throughout the water column to a maximum depth of 200 meters (about 650 feet) using long, funnel-shaped nets with very fine mesh known as bongo nets. Ichthyoplankton data collected from the EcoMon surveys were queried to include larval fish densities from 129 samples collected at the 98 unique EcoMon Survey stations within a 10-nautical mile (18.5-kilometer) radius of the center of the Lease Area. Survey stations from within this area were selected because that area encompasses all of the suction bucket testing locations and therefore should be representative of the larval densities present in areas where entrainment may occur. The raw data returned from the query are included as an attachment to this EFH assessment. To estimate entrainment densities for the analysis (Appendix 10.3), average monthly densities (number of larvae per 100 m^3) for each species were calculated. Monthly mean densities of larval fish were then multiplied by the maximum volume of water withdrawn by the suction pump during a test (i.e., the full volume of the bucket multiplied by two) to estimate numbers of fish entrained, by species, per test (Table 5-1).

Results of the entrainment analysis suggest that water withdrawals during foundation testing would have a minor impact on EFH species. The analysis estimated that entrainment of larvae per suction bucket test would range from 459 larvae in May to 9,289 larvae in August. Assuming the maximum of 35 foundation tests were conducted, it would result in an estimated entrainment of 16,065 larvae if the tests were conducted in May and 325,115 larvae if the tests were conducted in August. Ichthyoplankton abundances during other months between February and August are up to an order of magnitude less than that documented in August and lower entrainment would be expected during those months. Atlantic cod larvae, which occur from near-surface to depths of 246 feet (75 meters), are likely to be vulnerable to entrainment. If the maximum of 35 foundation tests were conducted during March, it could result in an estimated entrainment of 2,240 larval cod, whereas foundation testing in the summer would likely result in negligible entrainment of cod (Table 5-1). Many fish species in the region exhibit broadcast spawning or other high fecundity reproductive strategies that produce thousands to millions of eggs per fish (e.g., Kelly and Stevenson 1985; Kjesbu et al. 1998; Morse 1980; Papaconstantinou and Vassilopoulou 1986; Pitt et al. 1971). Given these high fecundity rates, the suction pump entrainment mortality at the scale estimated here is not expected to result in population-level effects on EFH species. It is important to note that the entrainment analysis excluded fish eggs, such that the estimates presented are less than the potential entrainment of all life stages. However, given the high natural mortality of the egg stage for most fish species and the relatively small volume of water being withdrawn, entrainment mortality of eggs is expected to be small relative to natural egg mortality.

Entrainment mortality would remove some small organisms that are consumed by planktivorous species, potentially resulting in a loss in foraging opportunity for sessile EFH species (e.g., filter-feeding invertebrates) within the 0.028-acre (114-m^2) footprint of the suction bucket and within the 20-ft^2 hydraulic zone of influence of the pump. However, mobile and pelagic species are not expected to experience losses in foraging opportunities because they can move to feed in areas just outside the small area of the suction bucket footprint and zone of influence.

Entrainment during foundation testing is expected to result in direct, permanent (lethal), localized impacts on some EFH species.

Direct Effects on EFH and EFH species

- Permanent, localized mortality of eggs and larvae of EFH species from entrainment:
  - Sessile Benthic/Epibenthic – Soft Bottom
  - Pelagic
  - Prey Species – Benthic/Epibenthic
  - Prey Species – Pelagic

Indirect Effects on EFH and EFH species

- Short-term loss of food sources for planktivorous species, including filter-feeding invertebrates:
  - Sessile Benthic/Epibenthic – Soft Bottom

- **Table 5-1. Monthly larval entrainment estimates per suction bucket test**

Taxon	Feb	Mar	Apr	May	Jun	Jul	Aug
American plaice	0	5	0	11	13	0	0
Atlantic cod	41	64	54	7	0	0	0
Atlantic croaker	0	0	0	8	0	0	0
Atlantic herring	128	98	0	0	0	0	0
Atlantic mackerel	0	0	0	18	34	10	0
Atlantic menhaden	0	0	0	0	0	0	0
Bluefish	0	0	0	0	4	0	20
Bristlemouths	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	29	467
Cunner	0	0	0	0	0	19	15
Fourbeard rockling	0	0	0	6	75	39	0
Fourspot flounder	0	0	0	0	0	39	941
Frigate tunas	0	0	0	0	0	0	129
Grubby	0	2	0	0	0	0	0
Gulf stream flounder	0	0	0	0	0	9	3,957
Haddock	2	11	0	25	23	0	0
Hakes	0	0	0	0	8	390	3,096
Lanternfishes	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0
Lefteye flounders	0	0	0	0	0	0	0
Longhorn sculpin	12	29	5	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0
Monkfish	0	0	0	0	4	0	4
Offshore hake	0	0	0	0	0	0	0
Pollock	19	32	0	0	0	0	0
Rock gunnel	4	2	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0
Sand lances	6,430	2,447	804	3	4	0	0
Sea robins	0	3	0	0	0	0	23
Silver hake	0	0	0	0	8	144	576
Summer flounder	3	2	0	0	0	0	0
Windowpane	0	0	0	23	72	0	53
Winter flounder	2	44	0	249	68	0	0
Witch flounder	0	0	0	25	12	10	4
Wolffishes	0	0	0	0	0	0	0
Yellowtail flounder	0	2	0	84	704	29	4
Total	**6,641**	**2,741**	**863**	**459**	**1,029**	**718**	**9,289**

Notes:
Based on larval densities provided in Appendix 10.3 and maximum volume of displaced seawater of 716,963 gallons (2,714 m^3) per test

5.4. Vessel Traffic

The Proposed Action would be conducted with a single large vessel that would use a dynamic positioning system, thereby avoiding impacts associated with anchoring (e.g., crushing, seabed disturbance, turbidity, sedimentation) (Table 6-1). The operation of this vessel would impact EFH and EFH species primarily through the underwater noise from the engines and dynamic positioning systems and the potential introduction of non-native species through the discharge of ballast water.

Vessel Noise

Vessel noise may have several effects on fish and invertebrates through changes to the ambient acoustic environment, including interfering with feeding and breeding, altering schooling behaviors and migration patterns (Buerkle 1973; Schwarz and Greer 1984; Soria et al. 1996; Vabø et al. 2002; Mitson and Knudsen 2003; Ona et al. 2007), masking important environmental auditory cues (Codarin et al. 2009; Radford et al. 2014), and inducing endocrine stress response (Wysocki et al. 2006). Fish communication is mainly in the low-frequency (<1000 hertz [Hz]) range (Ladich and Myrberg 2006; Myrberg and Lugli 2006), so masking is a particular concern because many fish species have unique vocalizations that allow for inter- and intra-species identification and because fish vocalizations are generally not loud, usually ~120 decibels (dB) sound pressure level (SPL) with the loudest sounds reaching 160 dB SPL (Normandeau Associates 2012). Behavioral responses in fishes differ depending on species and life stage, with younger, less mobile age classes being the most vulnerable to vessel noise impacts (Popper and Hastings 2009).

Underwater sound generated by vessels has been observed to cause avoidance behavior in hearing specialist fish species (e.g., Atlantic herring [*Clupea harengus*] and Atlantic cod [*Gadus morhua*]) and is likely to cause similar behavior in other hearing specialist species (Vabø et al. 2002; Handegard et al. 2003). For example, analysis of vessel noise related to the Cape Wind Energy Project observed that underwater noise generated by construction vessels at 10 feet (3 meters) was loud enough to cause an avoidance response in fish, but not loud enough to do physical harm (MMS 2008). Vessel noise has been observed to cause avoidance behavior of herring at distances of 100 meters or greater (e.g., Mitson and Knudsen 2003; Vabø et al. 2002), suggesting that vessel noise associated with the Proposed Action may cause impacts extending to the deepest parts of the Lease Area (206 feet [63 meters]). However, pelagic species and life stages and prey species that inhabit the upper water column (e.g., Atlantic butterfish, Atlantic herring, Atlantic mackerel, bluefish, and some highly migratory pelagic species) are the most likely to be impacted by vessel noise.

Noise thresholds for adult invertebrates have not been developed because of a lack of available data. Current research suggests that some invertebrate species groups, such as cephalopods (e.g., octopus, squid), crustaceans (e.g., crabs, shrimp), and some bivalves (e.g., scallops, ocean quahog) are capable of sensing sound through particle motion (Carroll et al. 2016; Edmonds et al. 2016; Hawkins and Popper 2014). However, particle motion effects dissipate rapidly and are highly localized around the noise source, suggesting that only pelagic invertebrates inhabiting waters near the surface would experience impacts from vessel-related noise.

Vessel noise associated with the Proposed Action would be intermittent and short-term and would dissipate as the vessel leaves the area.

Direct Effects on EFH and EFH species

- Short-term, localized behavioral responses to vessel noise:
  - Sessile Benthic/Epibenthic – Soft Bottom

- Mobile Benthic/Epibenthic – Soft Bottom
- Pelagic
- Prey Species – Benthic/Epibenthic
- Prey Species – Pelagic

Potential Introduction of Non-native Species

The Proposed Action would result in a small risk of invasive species being introduced through releases of ballast water and bilge water from the survey vessel into the aquatic environment. Introductions of non-native species do not always result in the establishment of viable populations of those species. Establishment of non-native introduced species depends on species characteristics that are favorable for survival, such as variability in life-history traits, high production, and wide-ranging tolerances to environmental conditions. The establishment of non-native species resulting from offshore wind activity has been documented, as the colonial tunicate, *Didemnum vexillum*, was one of the first such examples of invasive introductions from offshore wind activities (HDR 2020). However, the risk of an invasive species being introduced in the Lease Area from the Proposed Action is extremely low given than it will involve only a single trip to the area from foreign waters. Vessels are required to adhere to existing state and federal regulations related to ballast and bilge water discharge, including U.S. Coast Guard ballast discharge regulations (33 CFR 151.2025) and U.S. Environmental Protection Agency National Pollutant Discharge Elimination System Vessel General Permit standards, both of which aim in part to prevent the release and movement of invasive species. Adherence to these regulations would reduce the likelihood of discharge of ballast or bilge water contaminated with invasive species (Table 6-1). Although the likelihood of invasive species becoming established because of project-related activities is low, the impacts of invasive species could be adverse, widespread, and permanent if the species were to become established and out-compete native fauna. Indirect impacts could result from competition with invasive species for food or habitat, and/or loss of foraging opportunities if preferred prey is no longer available due to competition with invasive species.

Direct Effects on EFH and EFH species

- Extremely low likelihood, but potentially permanent, wide-spread impacts to any or all EFH and EFH species:
  - Sessile Benthic/Epibenthic – Soft Bottom
  - Mobile Benthic/Epibenthic – Soft Bottom
  - Sessile Benthic/Epibenthic – Complex
  - Mobile Benthic/Epibenthic – Complex
  - Pelagic
  - Prey Species – Benthic/Epibenthic
  - Prey Species – Pelagic

Indirect Effects on EFH and EFH species

- Extremely low likelihood of competition with invasive species, loss of foraging opportunities:
  - Sessile Benthic/Epibenthic – Soft Bottom
  - Mobile Benthic/Epibenthic – Soft Bottom
  - Sessile Benthic/Epibenthic – Complex
  - Mobile Benthic/Epibenthic – Complex
  - Pelagic

- Prey Species – Benthic/Epibenthic
- Prey Species – Pelagic

5.5. Cumulative and Synergistic Effects to EFH

Cumulative impacts are the incremental effects of the Proposed Action on the environment when added to other past, present, or reasonably foreseeable future actions taking place within the region. The spatial boundary of this cumulative impacts assessment focuses primarily on the Southern New England region where existing and planned projects/activities have the most potential for resulting in incremental impacts on resources described in this EFH Assessment. There is one existing offshore wind facility in the Southern New England region, Block Island Wind Farm, and two offshore wind projects that are under construction in the region, South Fork Wind and Vineyard Wind 1, which will likely be operating by the time the foundation tests begin in 2024. Additionally, there are two planned offshore wind projects in the Southern New England region that are scheduled to begin offshore construction in 2024, Sunrise Wind and Revolution Wind (Revolution Wind 2023, Sunrise Wind 2023). Collectively, the construction and operation of these facilities would impact EFH and EFH species primarily through seafloor disturbance during cable emplacement, pile driving noise, and habitat conversion. The cumulative and synergistic effects of each of these IPFs are discussed in the following paragraphs.

Construction of the Sunrise Wind and Revolution Wind projects would include placement of 540 miles of buried and armored cable along transmission corridors and interarray connections, disturbing 2,091 acres (8.5 km^2) of benthic habitat. Cable emplacement for each of these two projects is scheduled to begin in early 2024 and would potentially overlap the Proposed Action. Cable emplacement and would disturb, displace, and injure or kill finfish and invertebrates, release sediment into the water column, and cause habitat alterations. Mobile finfish and invertebrates are likely to move away from cable-laying equipment, but immobile or slow-moving demersal species and life stages (e.g., eggs, larvae) may be injured or killed by the equipment. Some types of equipment that are used to prepare the seabed prior to cable emplacement (e.g., hydraulic dredges) use water withdrawals, which can entrain planktonic eggs and larvae with assumed 100-percent mortality of entrained individuals. Suspended sediment and sediment deposition associated with cable emplacement may cause impacts on EFH and EFH species out to several hundred meters, including behavioral changes in fish and invertebrates and burial of sessile species and life stages. Seabed preparation prior to cable emplacement would cause short-term disturbances of soft-bottom habitat and long-term disturbances of complex habitat, which may require several years to recover.

Construction of the Sunrise Wind and Revolution Wind projects would generate pile driving noise during the installation of up to 194 WTG and 3 OSS foundations. Installation of foundations is schedule to begin in mid-2024 for each of these projects and would potentially overlap the Proposed Action. Pile driving noise generated by these projects would cause instantaneous behavioral effects and cumulative injurious effects over distances of up to several kilometers from each foundation. However, because the lease areas for these two projects are not adjacent to the Beacon Wind Lease Area, the area ensonified by pile driving noise sufficient to produce behavioral or injurious impacts is not expected to overlap any of the foundation testing locations. Pile driving noise generated by these projects would temporarily make the surrounding habitat less suitable and cause individuals to vacate the area of project activities. Pile driving is anticipated to cause adverse impacts to EFH for both pelagic and demersal life stages; however, this impact will be short-term, as EFH is expected to return to pre-pile driving conditions at the completion of foundation installation.

Planned and ongoing offshore wind activities in the Southern New England region would install or continue to operate up to 273 WTG and 6 OSS foundations, 209 acres (0.8 km^2) of foundation scour protection, and 274 acres (1.1 km^2) of cable protection. BOEM anticipates that structures would be added intermittently over a three-year period and that they would remain until decommissioning of each facility is complete. These structures would be constructed in mostly sandy seafloor and would therefore convert soft-bottom habitat to hard-bottom habitat. The installation of these structure would result in a permanent loss of EFH for epibenthic and benthic finfish and invertebrates that associate with soft-bottom habitat (e.g., clams, flounders, skates). New structures could affect migration through the area of species that prefer complex habitat by providing unique, complex features (relative to the primarily sandy seafloor). This could lead to retention of those species and possibly impact spawning opportunities. Complex habitat and its associated faunal communities are limited in the Mid-Atlantic, and it is possible that additional habitat will facilitate the expansion of these communities. The structures would create an "artificial reef effect," whereby more sessile and benthic organisms would likely colonize over time (e.g., sponges, algae, mussels, shellfish, sea anemones). Higher densities of invertebrate colonizers would provide a food source and habitat to other invertebrates, such as mobile crustaceans, and some finfish species. With new foundations being added from additional offshore wind farms, EFH for fishes and invertebrates adapted to complex habitat would increase, but at the expense of EFH for species that are typically associated with soft-bottom habitat. Potential benefits of added complex habitat may be offset if the colonizable habitat provides steppingstones for non-native species. Given the duration over which the monopiles from these projects will remain in the water column (~30 years) and that non-native species have been observed to tolerate higher water temperatures than native species, the presence of these structures may interact synergistically with warming ocean temperatures to promote the establishment of invasive species.

6. Avoidance, Minimization, and Mitigation

6.1. Applicant-Proposed Mitigation Measures

This section outlines Applicant Proposed Mitigations (APMs) proposed by Beacon Wind and additional mitigation and monitoring measures that are intended to avoid and/or minimize potential impacts to EFH-designated species and EFH. Relevant APMs and mitigation measures, contributions to avoiding and/or minimizing adverse effects on EFH, and supporting rationale are summarized by project component in Table 6-1.

Table 6-1. APMs for construction and operation of the Proposed Action

Proposed APM	Expected Effects
Use dynamic positioning, thereby eliminating the use of anchors and jack-up features.	This measure would eliminate anchoring impacts on EFH and EFH species.
Adhere to existing state and federal regulations related to ballast and bilge water discharge.	This measure would reduce the likelihood of non-native species being introduced.

6.2. Environmental Protection Measures that BOEM Could Impose

The APMs described in Section 6.1 are expected to avoid or minimize impacts of the Proposed Action to EFH-designated species and EFH to the maximum extent practicable. Therefore, BOEM is not proposing additional Environmental Protection Measures for foundation testing activities.

7. NOAA Trust Resources

Twelve species of NOAA Trust Resources have been identified within the vicinity of the Lease Area. Table 7-1 summarizes these species and life stages and provides an impact determination for each.

The following NOAA Trust Resource species or species groups may occur within the Lease Area:

- Alewife (*Alosa pseudoharengus*)
- American eel (*Anguilla rostrata*)
- American lobster (*Homarus americanus*)
- Atlantic croaker (*Micropogonias undulatus*)
- Atlantic menhaden (*Brevoortia tyrannus*)
- Blueback herring (*Alosa aestivalis*)
- Horseshoe crab (*Limulus polyphemus*)
- Jonah crab (*Cancer borealis*)
- Northern sea robin (*Prionotus carolinus*)
- Spot (*Leiostomus xanthurus*)
- Spotted hake (*Urophycis regia*)
- Striped bass (*Morone saxatilis*)

Table 7-1. Determination for NOAA trust resources by species

Species	Life Stages	Impact Determination	Rationale for Determination
Alewife	Adult	Short-term and permanent, localized and widespread impacts	The Proposed Action would result in short-term, localized effects on EFH and EFH species, including crushing and burial, disturbance to soft bottom habitat, sediment suspension and deposition, entrainment, and noise. Up to 0.986 acres (3,990 m^2) of soft-bottom benthic habitat would be disturbed by suction bucket deployment. Mortality of benthic invertebrates in the footprint of the suction bucket would result in a loss in foraging opportunity for some benthic and demersal species. Benthic community structure of disturbed soft-bottom habitat would recovery rapidly, within a few months of the activity. Up to 325,115 larval fish would be entrained with assumed 100-percent mortality during water intake withdrawals by the suction pump. Additional mortality would occur for eggs and small juveniles. Non-native species may be accidentally released in the discharge of ballast water and bilge water during vessel activities, potentially resulting in permanent, widespread impacts.
American eel	Larvae, Adult		
American lobster	All		
Atlantic croaker	Egg, Larvae, Adult		
Atlantic menhaden	Egg, Larvae, Adult		
Blueback herring	Adult		
Horseshoe crab	Adult		
Jonah crab	Juvenile, Adult		
Northern sea robin	All		
Spot	Egg, Larvae, Adult		
Spotted hake	All		
Striped bass	Adult		

8. Conclusions/Determinations

The Proposed Action includes suction bucket deployment and retrieval and vessel operations for up to 15 days of foundation testing at 26 locations within the Lease Area. These activities have the potential to cause adverse effects on EFH and EFH-designated species in the Lease Area. There are 42 species of finfish, elasmobranchs, and invertebrates with designated EFH within the Lease Area. EFH-designated species with one or more demersal life stage are more likely to experience adverse effects than species with only pelagic life stages, primarily resulting from the temporary disturbance of benthic habitat during deployment of the suction bucket.

Adverse effects from the Proposed Action would occur intermittently at varying locations in the Lease Area during the 10- to 15-day foundation testing period and may include short-term (less than 2 years) effects and permanent effects on EFH and permanent (lethal) effects on individual fish and invertebrates. Short-term adverse effects on EFH would include those from disturbance of soft-bottom habitat, increased turbidity and sedimentation, and vessel noise. Permanent adverse effects on EFH are not likely to occur because of the low probability that a non-native species would be introduced in vessel ballast water and become established. Permanent adverse effects on individual fish and invertebrates include mortality from crushing or burial and from entrainment by the suction pump.

Table 8-1 details short-term and permanent adverse effects on habitat suitability by impact producing factor described in Section 5 for managed species and life stage. The Proposed Action is expected to adversely affect EFH for a species and life stage if: 1) EFH for the designated species and life stage occurs in the Lease Area, and 2) one or more of the impact-producing factors described in Section 5 has an adverse effect on the species and life stage.

Table 8-1. Summary of adverse effects of the Proposed Action on EFH for managed species and life stages

EFH Species Group	EFH Species	Life Stage	Habitat Association	Short-Term Effects on EFH			Permanent Effects on EFH	Permanent (Lethal) Effects on Individuals	
				Habitat Disturbance	Turbidity and Sedimentation	Vessel Noise	Establishment of Non-Native Species	Crushing or Burial	Entrainment
Gadids	Atlantic cod	Eggs	Surface	--	--	No	No	--	--
		Larvae	Pelagic	--	No	No	No	--	Yes
		Juvenile	Benthic complex	--	--	Yes	No	--	--
		Adult	Benthic complex	--	--	Yes	No	--	--
	Haddock	Larvae	Pelagic	--	--	No	No	--	--
		Juvenile	Benthic complex	--	--	Yes	No	--	--
		Adult	Benthic complex	--	--	Yes	No	--	--
	Pollock	Eggs	Surface	--	--	No	No	--	--
		Larvae	Pelagic	--	No	No	No	--	Yes
		Juvenile	Benthic complex	--	--	Yes	No	--	--
	Red hake	Eggs	Surface	--	--	No	No	--	--
		Larvae	Surface	--	--	No	No	--	--
		Juvenile	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
	Silver hake	Eggs	Surface	--	--	No	No	--	--
		Larvae	Surface	--	--	No	No	--	--
		Juvenile	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
	White hake	Eggs	Surface	--	--	No	No	--	--
		Juvenile	Pelagic/benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
Flatfish	American plaice	Eggs	Pelagic	--	No	No	No	--	Yes
		Larvae	Pelagic	--	No	No	No	--	Yes
	Summer flounder	Eggs	Pelagic	--	No	No	No	--	Yes
		Larvae	Pelagic	--	No	No	No	--	Yes
		Juvenile	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No

EFH Species Group	EFH Species	Life Stage	Habitat Association	Short-Term Effects on EFH			Permanent Effects on EFH	Permanent (Lethal) Effects on Individuals	
				Habitat Disturbance	Turbidity and Sedimentation	Vessel Noise	Establishment of Non-Native Species	Crushing or Burial	Entrainment
Flatfish (cont.)	Windowpane flounder	Eggs	Surface	--	--	No	No	--	--
		Larvae	Pelagic	--	No	No	No	--	Yes
		Juvenile	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
	Winter flounder	Larvae	Pelagic/benthic non-complex	Yes	Yes	No	No	Yes	Yes
		Juvenile	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
	Witch flounder	Eggs	Surface	--	--	No	No	--	--
		Larvae	Surface	--	--	No	No	--	--
		Adult	Benthic non-complex	Yes	Yes	Yes	No	Yes	No
	Yellowtail flounder	Eggs	Surface	--	--	No	No	--	--
		Larvae	Surface	--	--	No	No	--	--
		Juvenile	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
Other finfish	Atlantic butterfish	Eggs	Pelagic	--	No	No	No	--	Yes
		Larvae	Pelagic	--	No	No	No	--	Yes
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Atlantic mackerel	Eggs	Pelagic	--	No	No	No	--	Yes
		Larvae	Pelagic	--	No	No	No	--	Yes
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Atlantic sea herring	Eggs	Benthic complex/non-complex	Yes	Yes	No	No	Yes	Yes
		Larvae	Pelagic	--	No	No	No	--	Yes
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No

EFH Species Group	EFH Species	Life Stage	Habitat Association	Short-Term Effects on EFH			Permanent Effects on EFH	Permanent (Lethal) Effects on Individuals	
				Habitat Disturbance	Turbidity and Sedimentation	Vessel Noise	Establishment of Non-Native Species	Crushing or Burial	Entrainment
Other finfish (cont.)	Black sea bass	Juvenile	Benthic complex	--	--	Yes	No	--	--
	Bluefish	Larvae	Pelagic	--	No	No	No	--	Yes
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Monkfish	Eggs	Surface	--	--	No	No	--	--
		Larvae	Pelagic	--	No	No	No	--	Yes
		Juvenile	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
	Ocean pout	Eggs	Benthic complex	--	--	No	No	--	--
		Juvenile	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
	Scup	Juvenile	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic complex/non-complex	Yes	Yes	Yes	No	Yes	No
Tunas	Albacore tuna	Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Atlantic bluefin	Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Atlantic skipjack	Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Atlantic yellowfin	Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
Sharks	Basking shark	Neonate	Pelagic	--	No	Yes	No	--	No
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Blue shark	Neonate	Pelagic	--	No	Yes	No	--	No
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No

EFH Species Group	EFH Species	Life Stage	Habitat Association	Short-Term Effects on EFH			Permanent Effects on EFH	Permanent (Lethal) Effects on Individuals	
				Habitat Disturbance	Turbidity and Sedimentation	Vessel Noise	Establishment of Non-Native Species	Crushing or Burial	Entrainment
Sharks (cont.)	Common thresher	Neonate	Pelagic	--	No	Yes	No	--	No
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Dusky shark	Neonate	Pelagic	--	No	Yes	No	--	No
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Porbeagle shark	Neonate	Pelagic	--	No	Yes	No	--	No
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Sandbar shark	Adult	Benthic non-complex	Yes	Yes	Yes	No	Yes	No
	Shortfin mako	Neonate	Pelagic	--	No	Yes	No	--	No
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Tiger shark	Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	White shark	Neonate	Pelagic	--	No	Yes	No	--	No
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Smooth dogfish	Neonate	Pelagic	--	No	Yes	No	--	No
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No
	Spiny dogfish	Juvenile	Pelagic/benthic non-complex	--	Yes	Yes	No	Yes	No
		Adult	Pelagic/benthic non-complex	--	Yes	Yes	No	Yes	No
Skates	Barndoor skate	Juvenile	Benthic non-complex/complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic non-complex/complex	Yes	Yes	Yes	No	Yes	No
	Little Skate	Juvenile	Benthic non-complex/complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic non-complex/complex	Yes	Yes	Yes	No	Yes	No

EFH Species Group	EFH Species	Life Stage	Habitat Association	Short-Term Effects on EFH			Permanent Effects on EFH	Permanent (Lethal) Effects on Individuals	
				Habitat Disturbance	Turbidity and Sedimentation	Vessel Noise	Establishment of Non-Native Species	Crushing or Burial	Entrainment
Skates (cont.)	Winter skate	Juvenile	Benthic non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic non-complex	Yes	Yes	Yes	No	Yes	No
Invertebrates	Atlantic sea scallop	Eggs	Benthic non-complex/complex	Yes	Yes	No	No	Yes	Yes
		Larvae	Pelagic/benthic complex	--	No	No	No	--	Yes
		Juvenile	Benthic complex	--	--	Yes	No	--	--
		Adult	Benthic non-complex/complex	Yes	Yes	Yes	No	Yes	No
	Ocean quahog	Juvenile	Benthic non-complex	Yes	Yes	Yes	No	Yes	No
		Adult	Benthic non-complex	Yes	Yes	Yes	No	Yes	No
	Longfin squid	Eggs	Benthic non-complex/complex	Yes	Yes	No	No	Yes	Yes
		Juvenile	Pelagic	--	No	Yes	No	--	No
		Adult	Pelagic	--	No	Yes	No	--	No

Notes:
'Yes' = adverse effect on habitat suitability
'No' = insignificant effect on habitat suitability
'--' = no life stage EFH exposure to this impact mechanism

9. References

Atlantic States Marine Fisheries Commission (ASMFC). 2015. Interstate Fishery Management Plan for Jonah Crab: 73 pages.

Atlantic States Marine Fisheries Commission (ASMFC). 2018a. Interstate Fisheries Management Program Overview: American Lobster: 7 pages.

Atlantic States Marine Fisheries Commission (ASMFC). 2018b. Addendum XXVI to Amendment 3 to the American Lobster Fishery Management Plan; Addendum III to the Jonah Crab Fishery Management Plan: Harvester Reporting and Biological Data Collection: 32 pages.

Beacon Wind, LLC (Beacon Wind). 2023a. Beacon Wind Project: Beacon Wind 1 and Beacon Wind 2, Construction and Operations Plan. June. Available: https://www.boem.gov/renewable-energy/state-activities/beacon-wind-farm-construction-and-operations-plan.

Beacon Wind, LLC (Beacon Wind). 2023b. Applicant-Prepared Supplemental Materials in Support of Foundation Testing Concise Environmental Assessment – Beacon Wind, Massachusetts Wind Energy Lease Area OCS-A 0520.

Buerkle, U. 1973. Detection of trawling noise by Atlantic cod (*Gadus morhua*). PhD Thesis. McGill University, Quebec, Canada.

Carroll, A.G., R. Przeslawski, A. Duncan, M. Ganning, and B. Bruce. 2016. A critical review of the potential impacts of marine seismic surveys on fish & invertebrates. Marine Pollution Bulletin 114:9-24.

Codarin, A., L.E. Wysocki, L. Friedrich, and M. Picciulin. 2009. Effects of ambient and boat noise on hearing and communication in three fish species living in a marine protected area (Miramare, Italy). Marine Pollution Bulletin 58(12):1880-1887.

Edmonds, N.J., C.J. Firmin, D. Goldsmith, R.C. Faulkner, and D.T. Wood. 2016. A review of crustacean sensitivity to high amplitude underwater noise: Data needs for effective risk assessment in relation to UK commercial species. Marine Pollution Bulletin 108:5-11.

Guida, V., A. Drohan, H. Welch, J. McHenry, D. Johnson, V. Kentner, J. Brink, D. Timmons, and E. Estela- Gomez. 2017. Habitat Mapping and Assessment of Northeast Wind Energy Areas. Sterling, VA: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088. 312 p.

Handegard, N.O., K. Michalsen, and D. Tjøstheim. 2003. Avoidance behaviour in cod (*Gadus morhua*) to a bottom-trawling vessel. Aquatic Living Resources 16(3):265-270.

Hare, J.A., W.E. Morrison, M.W. Nelson, M.M. Stachura, E.J. Teeters, R.B. Griffis, and C.A. Griswold. 2016. A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf. PLoS ONE 11(2):30. doi:10.1371/journal.pone.0146756.

Hawkins, A.D., and A.N. Popper. 2014. Assessing the impact of underwater sounds on fishes and other forms of marine life. Acoustics Today Spring 2014:30-41. Available at: https://acousticstoday.org/wp-content/uploads/2015/05/Assessing-the-Impact-of-Underwater-Sounds-on-Fishes-and-Other-Forms-of-Marine-Life-Anthony-D.-Hawkins-and-Arthur-N.-Popper.pdf

HDR. 2020. Benthic and epifaunal monitoring during wind turbine installation and operation at the Block Island Wind Farm, Rhode Island – Project Report. OCS Study BOEM 2020-044. Available at: https://espis.boem.gove/final%20reports/BOEM_2020-044.pdf

Horwath, S., J. Hassrick, R. Grismalda, E. Diller, J. Krebs, and R. Manhard. 2021. Comparison of Environmental Effects from Different Offshore Wind Turbine Foundations. OCS Study BOEM 2021-053. 48 pp.

Karleskint, G., R. Turner, and J.W. Small. 2006. Introduction to Marine Biology, Second Edition. Southbank, Victoria, Belmont, CA.

Kelly, K.H., and D.K. Stevenson. 1985. Fecundity of Atlantic herring (*Clupea harengus*) from three spawning areas in the western Gulf of Maine, 1969 and 1982. Journal of Northwest Atlantic Fishery Science 6(2).

Kjelland, M.E., C.M. Woodley, T.M. Swannack, and D.L. Smith. 2015. A review of the potential effects of suspended sediment on fishes: potential dredging-related physiological, behavioral, and transgenerational implications. Environmental Systems and Decisions 35:334-350.

Kjesbu, O.S. 1989. The spawning activity of cod, *Gadus morhua* L. Journal of Fish Biology 34:195-206.

Koschinski, S., and K. Lüdemann. 2020. Noise mitigation for the construction of increasingly large offshore wind turbines: Technical options for complying with noise limits. Federal Agency for Nature Conservation.

Ladich, F., and A.A. Myrberg. 2006. Agonistic behaviour and acoustic communication. *In* F. Ladich, S. P. Collin, P. Moller, and B.G. Kapoor (eds.), Communication in Fishes (pp. 122–148). Science Publishers, Enfield, NH.

LaFrance, M., E. Shumchenia, J. King, R. Pockalny, B. Oakley, S. Pratt, and J. Boothroyd. 2010. Benthic Habitat Distribution and Subsurface Geology Selected Sites from the Rhode Island Ocean Special Area Management Study Area. Rhode Island Ocean Special Management Area Technical Report #4, University of Rhode Island, Kingston, RI, 98 pp.

Malek, A.J., J.S. Collie, and J. Gartland. 2014. Fine-scale spatial patterns in the demersal fish and invertebrate community in a northwest Atlantic ecosystem. Estuarine Coastal and Shelf Science 147:1-10.

Michel, J., A.C. Bejarano, C.H. Peterson, and C. Voss 2013. Review of Biological and Biophysical Impacts from Dredging and Handling of Offshore Sand. U.S. Department of the Interior, Bureau of Ocean Energy Management, Herndon, Virginia. OCS Study BOEM 2013-0119. 258 pp.

Mid-Atlantic Fishery Management Council (MAFMC). 2017. Unmanaged Forage Omnibus Amendment: Amendment 20 to the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan, Amendment 18 to the Mackerel, Squid, and Butterfish Fishery Management Plan, Amendment 19 to the Surf Clam and Ocean Quahog Fishery Management Plan, Amendment 6 to the Bluefish Fishery Management Plan, Amendment 5 to the Tilefish Fishery Management Plan, Amendment 5 to the Spiny Dogfish Fishery Management Plan, Including an Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis.

Mid-Atlantic Fishery Management Council (MAFMC). 2019. Ecosystem Approach to Fisheries Management Guidance Document. 68 pages. Available online at: https://static1.squarespace.com/static/511cdc7fe4b00307a2628ac6/t/5c87d446fa0d606c22e7e845/1552405575156/EAFM+Doc+Revised+2019-02-08.pdf.

Minerals Management Service (MMS). 2008. Cape Wind Energy Project Nantucket Sound Biological Assessment (Appendix G). In Cape Wind Energy Project Final EIS. p. 296.

Mitson, R.B., and H.P. Knudsen. 2003. Causes and effects of underwater noise on fish abundance estimation. Aquatic Living Resources 16(3):255-263.

Morse, W.W. 1980. Spawning and fecundity of Atlantic mackerel, *Scomber scombrus*, in the Middle Atlantic Bight. Fishery Bulletin 78(1):103-108.

Myrberg, A.A., and M. Lugli. 2006. Reproductive behavior and acoustical interactions. *In* F. Ladich, S. P. Collin, P. Moller, and B.G. Kapoor (eds.), Communication in Fishes (pp. 149–176). Science Publishers, Enfield, NH.

National Academies of Sciences (NAS). 2018. Atlantic Offshore Renewable Energy Development and Fisheries: Proceedings of a Workshop--in Brief. Retrieved from Washington, DC.

National Marine Fisheries Service (NMFS). 2017a. Amendment 10 to the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan to Update Essential Fish Habitat Delineations and Life History Descriptions for Atlantic Highly Migratory Species.

National Marine Fisheries Service (NMFS). 2017b. Omnibus Essential Fish Habitat Amendment 2. Volume: EFH and HAPC Designation Alternatives and Environmental Impacts. Available: https://www.habitat.noaa.gov/application/efhmapper/oa2_efh_hapc.pdf

National Marine Fisheries Service (NMFS). 2020. Section 7 Effect Analysis: Turbidity in the Greater Atlantic Region. Available: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-effect-analysis-turbidity-greater-atlantic-region.

National Marine Fisheries Service (NMFS). 2023. Essential Fish Habitat Mapper. Available at: https://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper.

New England Fishery Management Council (NEFMC). 2017. Final Omnibus Essential Fish Habitat Amendment 2. Volume 2: EFH and HAPC Designation Alternatives and Environmental Impacts.

New York State Energy Research and Development Authority (NYSERDA). 2017. New York State Offshore Wind Master Plan: Fish and Fisheries Study Final Report: 202 pages.

Normandeau Associates, Inc. (Normandeau). 2012. Effects of Noise on Fish, Fisheries, and Invertebrates in the U.S. Atlantic and Arctic from Energy Industry Sound-Generating Activities. A Workshop Report for the U.S. Department of the Interior, Bureau of Ocean Energy Management. Contract # M11PC00031. 72 pp. plus Appendices.

Northeast Fisheries Science Center (NEFSC). 2021. Resource Survey Report Catch Summary Spring Multispecies Bottom Trawl Survey Virginia – Gulf of Maine. 35 pp.

Ona, E., O.R. Godø, N.O. Handegard, V. Hjellvik, R. Patel, and G. Pedersen. 2007. Silent research vessels are not quiet. Journal of the Acoustical Society of America 121, EL145 (2007). doi:10.1121/1.2710741.

Papaconstantinou, C., and V. Vassilopoulou. 1986. The fecundity of hake (*Merluccius merluccius* L.) and red pandora (*Pagellus erythrinus* L.) in the Greek seas. Acta Adriatica 27(1,2):85-95.

Petruny-Parker, M., A. Malek, M. Long, D. Spencer, F. Mattera, E. Hasbrouck, and J. Wilson. 2015. Identifying Information Needs and Approaches for Assessing Potential Impacts of Offshore Wind Farm Development on Fisheries Resources in the Northeast Region. Sterling, VA.

Pitt, T.K. 1971. Fecundity of the Yellowtail Flounder (*Limanda ferruginea*) from the Grand Bank, Newfoundland. Journal of the Fisheries Board of Canada 28(3).

Popper, A.N., and M.C. Hastings. 2009. The effects of anthropogenic sources of sound on fishes. Journal of Fish Biology 75(3):455-489.

Radford, A.N., E. Kerridge, and S.D. Simpson. 2014. Acoustic communication in a noisy world: can fish compete with anthropogenic noise? Behavioral Ecology 25(5):1022-1030.

Revolution Wind, LLC (Revolution Wind). 2023. Construction & Operations Plan, Revolution Wind Farm. March 2023. Available: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Revolution%20Wind%20COP%20Volume%201%20March%202023_v2_508c.pdf

Selden, R.L., R.D. Batt, V.S. Saba, and M.L. Pinsky. 2018. Diversity in thermal affinity among key piscivores buffers impacts of ocean warming on predator-prey interactions. Global Change Biology. 24(1):117-131.

Schwarz, A.L., and G.L. Greer. 1984. Responses of Pacific Herring, *Clupea harengus pallasi*, to some underwater sounds. Canadian Journal of Fisheries and Aquatic Sciences 41(8). doi:10.1139/f84-140.

Soria, M., P. Fréon, and F. Gerlotto. 1996. Analysis of vessel influence on spatial behaviour of fish schools using a multi-beam sonar and consequences for biomass estimates by echo-sounder. ICES Journal of Marine Science 53(2):453-458.

Stokesbury, K. D. E. 2012. SMAST video survey of Western portion of the offshore Windfarm area. Massachusetts Clean Energy Center.

Stokesbury, K. D. E. 2014. SMAST video survey of Western portion of the offshore Windfarm area, 2nd Survey. Massachusetts Clean Energy Center.

Sunrise Wind, LLC (Sunrise Wind). 2023. Construction & Operations Plan, Sunrise Wind Farm Project. September 2023. Available: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/SRW01_COP.pdf

Tougaard, J. 2015. Underwater Noise from a Wave Energy Converter Is Unlikely to Affect Marine Mammals. PLoS ONE 10(7): e0132391. Available online at: https://doi.org/10.1371/journal.pone.0132391.

Vabø, R., K. Olsen, and I. Husea. 2002. The effect of vessel avoidance of wintering Norwegian spring spawning herring. Fisheries Research 58(1):59-77.

Van den Akker, S., and L. van der Veen. 2013. Together for a healthy North Sea. North Sea Foundation.

Walker, J.H., A.C. Trembanis, and D.C. Miller. 2016. Assessing the use of a camera system within an autonomous underwater vehicle for monitoring the distribution and density of sea scallops (*Placopecten magellanicus*) in the Mid-Atlantic Bight. Fishery Bulletin 114(3):261-273.

Walsh, H.J., D.E. Richardson, K.E. Marancik, and J.A. Hare 2015. Long-Term Changes in the Distributions of Larval and Adult Fish in the Northeast U.S. Shelf Ecosystem. PLoS ONE 10(9):e0137382.

Walsh, H.J., and V.G. Guida. 2017. Spring occurrence of fish and macro-invertebrate assemblages near designated wind energy areas on the northeast US continental shelf. Fishery Bulletin 115(4):437-450.

Ward C.H. 2017. Habitats and Biota of the Gulf of Mexico: Before the Deepwater Horizon Oil Spill Springer-Verlag New York. doi: 10.1007/978-1-4939-3456-0

Wilber, D.H., and D.G. Clarke. 2001. Biological Effects of Suspended Sediments: A Review of Suspended Sediment Impacts on Fish and Shellfish with Relation to Dredging Activities in Estuaries. North American Journal of Fisheries Management 21: 855-875.

Williams, S.J., M.A. Arsenault, B. J. Buczkowski, J. A. Reid, J. Flocks, M. A. Kulp, S. Penland, and C. J. Jenkins. 2006. Surficial sediment character of the Louisiana offshore Continental Shelf region: a GIS Compilation. U.S. Geological Survey Open-File Report 2006-1195. Available: http://pubs.usgs.gov/of/2006/1195/index.htm.

Wysocki, L.E., J.P. Dittami, and F. Ladich. 2006. Ship noise and cortisol secretion in European freshwater fishes. Biological Conservation 128(4):501-508.

10. Appendices

10.1. List of Supporting Documents

The following documents support this EFH assessment.

- Applicant-Prepared Supplemental Materials in Supports of a Foundation Testing Concise Environmental Assessment – Beacon Wind Massachusetts Wind Energy Lease Area OCS-A 0520, October 2023
- Beacon Wind Construction and Operations Plan, June 2023
- COP Appendix G, Marine Site Investigation Report, June 2023
- COP Appendix S, Benthic Resources Characterization Report, June 2023
- COP Appendix S, Benthic Resources Mapbooks, June 2023

10.2. Data Collection and Mapping Methodologies

Beacon Wind conducted site-specific geophysical, geotechnical, and benthic surveys across the Lease Area in Summer 2021 (see Figure 3-1, above). The surveys were designed to identify the dominant substrates in the Lease Area and to establish a pre-construction baseline and characterizes potentially sensitive or important seafloor areas that may serve as EFH. The benthic survey methods (e.g., recommended equipment, procedures, lab analyses, etc.) were selected to meet federal guidance including BOEM benthic survey guidance and NMFS recommendations for mapping essential fish habitat. A total of 157 benthic stations located at the proposed foundation location stations were sampled spanning the entire Lease Area (Table 10-1). These 157 stations were sampled with the full suite of instruments – the HD drop/two camera system, the SPI/PV system, and the Smith-McIntyre grab sampler with mounted benthic camera. An additional 218 interarray cable stations were sampled using only SPI/PV (Table 10-1). At each foundation station, samples were collected via benthic grab for benthic infauna taxonomy and biomass, particle size distribution/grain size analysis, and total organic carbon (TOC). Replicate samples were also collected at every 10th station throughout the survey for quality assurance/quality control of particle size distribution and TOC. The resulting sample density in the Lease Area was 0.7 samples per km^2.

Prior to the benthic survey, a high resolution geophysical (HRG) survey of the Lease Area was performed starting in 2020 and continued into 2021. Using those results, 218 interarray cable station locations and 44 priority foundation sample sites (of the proposed 157 foundation locations) were identified based on review of the HRG survey's side scan sonar and sub-bottom profiling data to obtain information across the Lease Area. Characteristics derived from the HRG data that were used to determine priority foundation site selection included observations of potential homogeneity and heterogeneity of seafloor conditions. The 44 priority foundation stations were identified for immediate benthic infaunal analysis, while the remaining benthic infaunal samples from foundation sites were archived for possible future analysis. Analysis of the remaining parameters (particle size distribution, TOC, SPI/PV imagery and benthic video imagery) occurred for all 157 foundation stations.

Beacon Wind contracted MMT and their subcontractors (Continental Shelf Associates, Inc., Tombo Environmental, LLC, and NewFields, Inc.) to perform site specific benthic surveys with the survey vessel M/V Deep Helder. The survey equipment and scope included the following:

- Gridded survey lines at a spacing of approximately 98 feet (ft) by 1,640 ft (30 meters [m] by 500 m);
- Depth sounding (multibeam echosounder [MBES]) to determine site bathymetry and elevations;
- Seafloor imaging (sidescan sonar survey [SSS]) for seabed sediment classification purposes, to identify natural and man-made acoustic targets on the seabed, as well as any anomalous features;
- Sediment profile images (SPI)/plan view (PV) images; and
- Sediment grab samples and drop-down video transects to support the interpretation of geophysical data to characterize surficial sediment conditions and benthic habitat, including macrofaunal analysis with samples sieved at 0.5-millimeter (mm) mesh size.

Geophysical survey data (multibeam echo sounder and side-scan sonar) were used to support the characterization of seabed conditions within the Lease Area. Sediment grab samples were analyzed for grain size distribution, total organic carbon (TOC), and benthic infauna (identified and classified according to the Coastal and Marine Ecological Classification Standard [CMECS] [FGDC 2012]). Digital imagery was reviewed to aid in identification of key habitat types, macroinvertebrates, and fish. Beacon Wind's surveys in the Lease Area are listed in Table 10-1.

Table 10-1. Beacon Wind's benthic survey in the Lease Area

Project Subarea	MBES Percent Coverage	SSS Percent Coverage	Benthic Imagery			
			Sediment Grab	Video Transect	Benthic Grab Camera	SPI/PV
Foundation Locations	100	100	157	157	157	157
Interarray Cable Locations	100	100	--	--	--	218

10.3. Monthly Entrainment Densities for Entrainment Analysis

Table 10-2. Mean monthly ichthyoplankton densities (larvae/100 m^3) in the Lease Area[1]

Taxon	Feb	Mar	Apr	May	Jun	Jul	Aug
American plaice	0	0.2	0	0.4	0.5	0	0
Atlantic cod	1.5	2.3	2	0.2	0	0	0
Atlantic croaker	0	0	0	0.3	0	0	0
Atlantic herring	4.7	3.6	0	0	0	0	0
Atlantic mackerel	0	0	0	0.6	1.2	0.3	0
Atlantic menhaden	0	0	0	0	0	0	0
Bluefish	0	0	0	0	0.1	0	0.7
Bristlemouths	0	0	0	0	0	0	0
Butterfish	0	0	0	0	0	1.1	17.2
Cunner	0	0	0	0	0	0.7	0.5
Fourbeard rockling	0	0	0	0.2	2.8	1.4	0
Fourspot flounder	0	0	0	0	0	1.4	34.6

Taxon	Feb	Mar	Apr	May	Jun	Jul	Aug
Frigate tunas	0	0	0	0	0	0	4.7
Grubby	0	<0.1	0	0	0	0	0
Gulf stream flounder	0	0	0	0	0	0.3	145.8
Haddock	<0.1	0.4	0	0.9	0.8	0	0
Hakes	0	0	0	0	0.3	14.4	114
Lanternfishes	0	0	0	0	0	0	0
Large-tooth flounder	0	0	0	0	0	0	0
Lefteye flounders	0	0	0	0	0	0	0
Longhorn sculpin	0.4	1.1	0.2	0	0	0	0
Madeira lantern fish	0	0	0	0	0	0	0
Monkfish	0	0	0	0	0.1	0	0.1
Offshore hake	0	0	0	0	0	0	0
Pollock	0.7	1.2	0	0	0	0	0
Rock gunnel	0.1	<0.1	0	0	0	0	0
Rockfishes	0	0	0	0	0	0	0
Sand lances	236.9	90.1	29.6	0.1	0.1	0	0
Sea robins	0	<0.1	0	0	0	0	0.8
Silver hake	0	0	0	0	0.3	5.3	21.2
Summer flounder	<0.1	<0.1	0	0	0	0	0
Windowpane	0	0	0	0.8	2.6	0	1.9
Winter flounder	<0.1	1.6	0	9.2	2.5	0	0
Witch flounder	0	0	0	0.9	0.4	0.4	0.1
Wolffishes	0	0	0	0	0	0	0
Yellowtail flounder	0	<0.1	0	3.1	25.9	1.1	0.1
Total	**244.6**	**100.8**	**31.7**	**16.7**	**37.6**	**26.3**	**342**

Source: National Centers for Environmental Information. 2023. Zooplankton and Ichthyoplankton Abundance and Distribution in the North Atlantic Collected by the Ecosystem Monitoring (EcoMon) Project from 1977-02-13 to 2021-11-15. NCEI Accession 0187513. Available: https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.nodc:0187513.

[1] Based on EcoMon survey stations located within a 10-nautical mile radius of the center point of the Lease Area

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930

February 27, 2024

Ms. Jessica Stromberg
Chief, Environmental Branch for Renewable Energy
Bureau of Ocean Energy Management
45600 Woodland Road, VAM-OREP
Sterling, Virginia 20166-4281

Re: Beacon Wind Foundation Testing, Lease Area OCS-A 0520

Dear Ms. Stromberg:

We have reviewed the Essential Fish Habitat (EFH) Assessment dated January 18, 2024, and the Technical Addendum dated February 21, 2024, prepared for the additional site assessment activities proposed in the Site Assessment Plan (SAP) amendment submitted by Beacon Wind. The proposed action includes a series of 35 deployments and removals of a single suction bucket foundation at 26 locations to gather information to support the engineering design of wind turbine and offshore wind substation foundations that would potentially be installed within the lease area located 20 statute miles (mi) (17 nautical miles [nm], 32 kilometers [km]) south of Nantucket, Massachusetts and 60 mi (52 nm, 97 km) east of Montauk, New York. To assess whether the geological and geotechnical conditions of areas within the lease area are suitable for, and could support wind turbine generators that use suction bucket foundations, imaging equipment (e.g., sonar, echo sounder, sub-bottom profiler) would be mounted inside the lid of the bucket while measurement equipment would be deployed inside the bucket during testing to monitor soil plugs. Beacon Wind may also use up to two ROVs to assist in positioning the precise location of the bucket during deployment, as well as to observe and gather data on the process of penetration and recovery and deploy and retrieve the acoustic monitoring moorings. Acoustic monitoring would also be conducted to document sound levels produced during suction bucket installation. If BOEM approves the SAP amendment, Beacon Wind would be authorized to carry out foundation testing in the lease area as part of Beacon Wind's site assessment activities in July 2024 but no later than July 2026.

Consultation Responsibilities

In the Magnuson-Stevens Fishery Conservation and Management Act (MSA), Congress recognized that one of the greatest long-term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats. Congress also determined that habitat considerations should receive increased attention for the conservation and management of fishery resources of the United States. As a result, one of the purposes of the MSA is to promote the conservation of EFH in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. The MSA requires federal agencies to consult with the Secretary of Commerce, through NOAA Fisheries, with respect to "any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act," 16 U.S.C. § 1855(b)(2). Because the activities proposed will affect EFH adversely, this process is guided by the requirements of our EFH regulation at 50 CFR 600.905, which mandates the preparation of EFH assessments, lists the required contents of EFH assessments, and generally outlines each agency's obligations in this consultation procedure.

The proposed activities will take place in areas designated as EFH for various life stages of nearly every species managed by the New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council (MAFMC), and NOAA Fisheries including Atlantic cod (*Gadus morhua*), summer flounder (*Paralichthys dentatus*), winter flounder (*Pseudopleuronectes americanus*), inshore longfin squid (*Doryteuthis pealeii*), yellowtail flounder (*Limanda ferruginea*), windowpane flounder (*Scophthalmus aquosus*), ocean pout (*Zoarces americanus*), red hake (*Urophycis chuss*), monkfish (*Lophius americanus*), black sea bass (*Centropristis striata*), little skate (*Leucoraja erinacea*), winter skate (*Leucoraja ocellata*), witch flounder (*Glyptocephalus cynoglossus*), Atlantic sea scallop (*Placopecten magellanicus*), Atlantic mackerel (*Scomber scombrus*), Atlantic surfclams (*Spisula solidissima*), albacore (*Thunnus alalunga*), bluefin tuna (*Thunnus thynnus*), skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*). In addition, the coastal tiger shark species (*Galeocerdo cuvier*) and sandbar shark (*Carcharhinus plumbeus*) have EFH designated within the project area, as do ten additional shark species including dusky shark (*Carcharhinus obscurus*), blue shark (*Prionace glauca*), porbeagle (*Lamna nasus*), shortfin mako (*Isurus oxyrinchus*), common thresher shark (*Alopias vulpinus*), sand tiger shark (*Carcharias taurus*), basking shark (*Cetorhinus maximus*) spiny dogfish (*Squalus acanthias*), tiger shark (*Galeocerdo cuvier*), smoothhound shark complex Atlantic stock (*Mustelus spp.*), and white shark (*Carcharodon carcharias*).

General Comments

There are a number of deficiencies in the EFH assessment including the lack of a narrowed project schedule for the proposed action and a discussion of how EFH and federally managed species would be affected based on the time of year activities are planned to occur. Rather, the technical addendum states testing could take place July 2024 but no later than July 2026. Additionally, the entrainment analysis developed for the EFH assessment does not accurately assess entrainment impacts as it entirely relies upon larval data and excludes eggs. Because eggs typically occur at higher densities than larvae, not including eggs in the estimation of entrainment would underestimate the overall impact of the proposed action. In addition, the EFH assessment does not adequately evaluate the adverse effects on Atlantic cod reproduction and early life stages. Available information shows that cod leks begin to form in November, with peak grunt detections occurring between November and January. Ichthyoplankton data indicates spawning success occurs later in the spawning season, with peak success occurring between January and March (Van Hoeck et al. 2023; McBride and Smedbol 2022). If suction bucket testing is planned to be conducted during the cod spawning season (November 1 through March 31), the proposed action could have significant impacts that have not been adequately evaluated due to the lack of consideration of egg densities in the entrainment analysis. Lastly, it is not clear from the EFH assessment if the suction bucket design used for testing is representative of the suction bucket parameters that could be considered for larger scale commercial installation. However, while the parameters may differ, as much in situ data that can be collected to inform larger scale commercial installation will be critical for the Beacon Wind offshore wind energy project.

The EFH assessment concludes that sediment disturbance is not expected to cause cumulative or long-lasting impacts on water quality and that elevated turbidity levels would occur for a short duration, such that suspended sediment impacts on species with EFH in the vicinity of the proposed action would be short-term and localized. However, these conclusions are unsupported by the text and the lack of a quantitative analysis done to understand impacts from the proposed action. As stated in the EFH assessment, there is minimal information available on turbidity and sediment deposition levels that are associated with deployment, installation, and removal of suction bucket foundations. However, the EFH assessment further suggests that the suspended sediment plumes produced during the proposed action would be similar, to, or less than, those associated with site preparation activities for other foundation types (e.g., dredging for sand bedform clearing) and cites modeling results of cutterhead dredging. This study, however, did not evaluate activities or conditions analogous to those proposed for the Beacon Wind suction bucket testing and these values should not be used in lieu of in situ turbidity monitoring. In situ turbidity monitoring is critical to inform and quantify impacts from turbidity produced and the degree of sediment resuspension in the water column from the proposed action. This data could then be used to inform turbidity impacts from larger commercial scale installation of proposed suction buckets which may be installed in the lease area for the Beacon Wind offshore wind energy project

Suspended sediments can cover fish spawning areas and food supply, alter foraging patterns and success (Breitburg 1988), interfere with filtering capacity of filter feeders, clog and harm the gills of fish (U.S. EPA 2003), or lead to death (Wilber and Clarke 2001). The severity of suspended sediments effects on aquatic organisms often increases as a function of sediment concentration and duration of exposure (Newcombe and Jensen 1996), and the sensitivity of species to suspended sediments depends on the nature of the sediment and the life history stage of the species. Recently, the New England Fisheries Management Council finalized the designation of the Southern New England Habitat Area of Particular Concern (HAPC) on February 2, 2024, within and around offshore wind lease areas in southern New England due to concerns about potential adverse impacts on EFH from offshore wind energy development (50 CFR 648). This HAPC designation overlaps the entirety of the Beacon Wind Lease Area and is focused on known and potential cod spawning grounds and areas of complex habitat that are known to serve important habitat functions to Council-managed fishery species. Due to the lack of information on turbidity and sediment resuspension levels associated with installation and removal of suction buckets, in situ turbidity monitoring is necessary to inform sedimentation impacts to EFH and HAPCs in the project area.

The installation and removal of suction buckets is also expected to result in entrainment of ichthyoplankton within the intake flow during the use of the suction pump. The EFH assessment assumes 100-percent entrainment mortality from any EFH species which inhabit the immediate area of the suction pump. It is assumed that during each test, the suction pump would operate for up to nine hours at a typical intake flow of approximately 1,320 gallons (5 m^3) per minute, with a maximum intake volume of 716,963 gallons (2,714 m^3) per test (including installation into the seabed and reverse suction to remove the foundation). The need for in situ flow rate monitoring of the suction pumps is critical to ground truth the modeled/assumed intake flow to ensure a more accurate entrainment analysis is conducted on ichthyoplankton during larger commercial scale installation of suction buckets for the lease area.

EFH Conservation Recommendations
In order to avoid, minimize, and offset significant impacts to EFH and Southern New England HAPC as result of the proposed project, pursuant to Section 305(b)(4)(A) of the MSA, we recommend that you adopt the following EFH conservation recommendations (CRs) as Terms and Conditions of the Record of Decision.

1. Due to the lack of existing information on turbidity effects from suction bucket installation in the lease area, in situ turbidity monitoring should be conducted to quantify turbidity and sediment resuspension produced during testing and used to inform larger scale commercial installation of suction buckets in the project area. A sampling design should be developed with our Northeast Fisheries Science Center (NEFSC) to be effectively implemented.

2. Flow rate of the suction bucket pumps should be monitored in situ to ground truth the intake volume assumed in the EFH assessment to better inform entrainment impacts for larger scale commercial installation of suction buckets in the lease area.

3. Provide the results of in situ turbidity and flow rate monitoring to NMFS HESD at NMFS.GAR.HESDoffshorewind@noaa.gov upon completion of the foundation testing.

4. Avoid placing the reference frame in sensitive benthic habitats[1], benthic features with pronounced vertical relief (e.g., sand waves, slopes of ridge and trough complexes), areas with dense aggregations of biota (e.g., cerianthid beds, shellfish beds), or areas with particularly sensitive species (e.g., corals).

Please note that Section 305(b)(4)(B) of the MSA requires you to provide a written response to us within 30 days after receiving our EFH conservation recommendations. The response must also be provided to us at least 10 days before the signing of the Finding of No Significant Impact (FONSI) or a Record of Decision to allow time for dispute resolution if necessary. The response must include a description of measures proposed for avoiding, mitigating, or offsetting the impact of the activity on EFH, as required by section 305(b)(4)(B) of the MSA and 50 CFR 600.920(j). In the case of a response that is inconsistent with our conservation recommendations you must explain your reasons for not following the recommendations, including the scientific justification for any disagreements with us over the anticipated effects of the action or the measures needed to avoid, minimize, mitigate, or offset such effects.

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[1] the term "**sensitive benthic habitats**" will be used to encompass: complex habitats and benthic features (defined as coarse unconsolidated mineral substrates [i.e. substrates containing 5% or greater gravels], rock substrates [e.g. bedrock], and shell substrates [e.g. mussel reef] consistent with CMECS definitions as well as vegetated habitats [e.g. SAV] and as defined described in our 2021 Recommendations for Mapping Fish Habitat), bathymetric features (such as lumps, banks, and scarps) and other areas of high habitat heterogeneity (diversity of structural elements including bathymetric features) and complexity.

Please also note that a distinct and further EFH consultation must be initiated pursuant to 50 CFR 600.920(j) if new information becomes available or if the project is revised in such a manner that affects the basis of our determination above.

Conclusion

We look forward to the opportunity to review and comment on applicable future related actions to ensure our concerns and information needs are addressed early in the process. Our staff is committed to full coordination on surveys, monitoring plans, and other material associated with this and other offshore wind projects moving forward. Should you have any questions about this matter, please contact Gabriella DiPreta at gabriella.dipreta@noaa.gov. If you have any questions regarding this ESA coordination, please contact Julie Crocker at julie.crocker@noaa.gov.

Sincerely,

Louis A. Chiarella
Assistant Regional Administrator
for Habitat and Ecosystem Services

cc: Genevieve Brune, BOEM
Brian Hooker, BOEM
Cheri Hunter, BSEE
Timothy Timmermann, EPA
Danielle Gaito, EPA
Stephanie Vail-Muse, FWS
David Simmons, FWS
Jon Hare, NOAA
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Karen Gaidasz, NYDEC

Literature Cited

Breitburg DL. 1988. Effects of turbidity on prey consumption by striped bass larvae. Transactions of the American Fisheries Society 117: 72-77.

McBride R. S., R. K. Smedbol, (Editors). 2022. An Interdisciplinary Review of Atlantic Cod (*Gadus morhua*) Stock Structure in the Western North Atlantic Ocean. NOAA Technical Memorandum NMFS-NE-273. Woods Hole, Massachusetts: US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Science Center. i-x, 264 pp.https://repository.library.noaa.gov/view/noaa/48082

Newcomb CP and Jenson JO. 1996. Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact. North American Journal of Fisheries Management. 16: 693-727.

[U.S. EPA] U.S. Environmental Protection Agency. 2003. National management measures for the control of non-point pollution from agriculture. Washington (DC): U.S. EPA Office of Water. EPA-841-B03-004.

Van Hoeck, R. V., Rowell, T. J., Dean, M. J., Rice, A. N., and Van Parijs, S. M. 2023.Comparing Atlantic cod temporal spawning dynamics across a biogeographic boundary: insights from passive acoustic monitoring. Marine and Coastal Fisheries, 15(2), e10226.

Wilber DH and Clarke DG. 2001. Biological Effects of Suspended Sediments: A Review of Suspended Sediment Impacts on Fish and Shellfish with Relation to Dredging Activities in Estuaries. North American Journal of Fisheries Management 21: 855-875.

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

Mr. Louis A. Chiarella
Assistant Regional Administrator
for Habitat and Ecosystem Services
55 Great Republic Drive
Gloucester, Massachusetts 01930

Dear Mr. Chiarella:

This letter is in response to the Essential Fish Habitat (EFH) conservation recommendations (CR) received from the National Marine Fisheries Service (NMFS) dated February 27, 2024, regarding the proposed Beacon Wind Foundation Testing Activities, Lease Area OCS-A-0520 Project (Project). The Bureau of Ocean Energy Management (BOEM) is the lead Federal agency for the EFH consultation for the Project, in coordination with the Bureau of Safety and Environmental Enforcement and the U.S. Army Corps of Engineers (USACE), who has permitting authority over some of the proposed site assessment and site characterization activities in the Site Assessment Plan (SAP) under Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 U.S.C.§ 403).

BOEM appreciates the opportunity to collaborate with the Greater Atlantic Regional Fisheries Office on the CRs and the BOEM's responses. Thank you for your staff's ongoing collaboration and communication throughout this process on the proposed additional site assessment activities of the Project and for these recommendations. BOEM's response to each CR recommended by NMFS in the February 27, 2024, letter for activities within the Outer Continental Shelf (OCS) are provided in Enclosure 1.

Pursuant to Section 304(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), BOEM is required to provide a detailed written response to each EFH CR within 30 days of receipt unless NMFS and BOEM have agreed to use alternative time frames for your response. BOEM indicated to NMFS on March 25, 2024, that due to the complex nature of the Project and additional time needed to evaluate NMFS' CRs, more than 30 days would be needed to respond. The interim response notified you of BOEM's intent to provide a response no later than 10 days prior to the Final Environmental Assessment (FEA) issuance and the Finding of No Significance (FONSI) anticipated for April 22, 2024. We appreciate your flexibility, and the subsequent communications to clarify some of these complexities and gain a better understanding of NMFS's concerns.

BOEM understands and shares NMFS's commitment to avoiding and minimizing potential effects to EFH. The Outer Continental Shelf Lands Act (OCSLA) establishes a policy to make the OCS available for expeditious and orderly development, subject to environmental safeguards. 43 U.S.C. §1332(3). BOEM's response to the CRs is consistent with its duties under subsection.
8(p)(4) (43 U.S.C. § 1337(p)(4)) of OCSLA to ensure that the approved activity is carried out in a manner that provides for Congress's 12 enumerated goals. BOEM's response reflects a balance of considerations, including impacts to EFH, benthic habitats, cultural and Tribal resources, and the responsible development of offshore wind. BOEM considered all CRs carefully, and endeavored to adopt the CRs it believes are implementable. BOEM believes that the EFH assessment is sufficient and meets all the requirements of the MSA and applicable regulations, and it represents a thorough assessment of the best available science on the Project's impacts on EFH.

EFH Conservation Recommendations

Please see Enclosure 1 for BOEM's detailed responses to NMFS's EFH conservation recommendations under the MSA. A table with a brief overview of BOEM's responses and a summary of the anticipated terms and conditions of SAP approval that are a result of the EFH consultation are also included in Enclosure 1.

Coordination with USACE

Under Section 10 of the RHA, the USACE regulates construction of any structures and work that are in or that affect "navigable waters of the U.S." In tidal waters, the shoreward limit of navigable waters extends to the mean high-water line while the seaward limit coincides with the 3 nautical mile limit of the territorial seas. The USACE's authority to prevent obstructions to navigation in navigable waters of the United States was extended to artificial islands, installations, and other devices located on the seabed, to the seaward limit of the outer continental shelf, by section 4(f) of the Outer Continental Shelf Lands Act of 1953 as amended (43 U.S.C. 1333(e) and 33 CFR 320.2). As all the EFH CRs pertain to work on the OCS as well as within the territorial seas, BOEM has accepted responsibility for providing responses for the CRs. BOEM has coordinated with USACE regarding the EFH CRs for this project. On March 25, 2024, the USACE notified BOEM that "Given the extremely temporary nature of the bucket and acoustic device deployment (magnitude of hours per test), we determined that USACE would not have jurisdiction on the suction bucket testing activities proposed by Beacon Wind, as currently proposed."

Conclusion

The terms and conditions of the SAP will not be finalized until after the decision is reached following the conclusion of BOEM's environmental assessment under the National Environmental Policy Act; however, the draft conditions developed in response to NMFS's EFH CRs are provided in Enclosure 1 of this letter.

Thank you for your continued collaboration on Atlantic offshore wind project environmental reviews. If you have any questions, please feel free to contact Mr. Brandon Jensen (brandon.jensen@boem.gov).

Sincerely,

BRIAN HOOKER

Digitally signed by BRIAN HOOKER
Date: 2024.04.12 12:26:52 -04'00'

Brian Hooker
Section Chief
Biology Section
Office of Renewable Energy Programs

Enclosures:

BOEM Beacon Wind EFH CR Responses Enclosure 1

Enclosure 1 - Beacon Wind Suction Bucket Testing
BOEM Response to NMFS EFH Conservations Recommendations
April 12, 2024

NMFS EFH CRs that apply to BOEM/BSEE	CR Adopted/Not Adopted	Explanation if Not Fully Adopted	Conditions of to be included in the SAP
1. Due to the lack of existing information on turbidity effects from suction bucket installation in the lease area, in situ turbidity monitoring should be conducted to quantify turbidity and sediment resuspension produced during testing and used to inform larger scale commercial installation of suction buckets in the project area. A sampling design should be developed with our Northeast Fisheries Science Center (NEFSC) to be effectively implemented.	Adopted		Turbidity Monitoring Plan: Provide the results of in situ turbidity monitoring to BOEM, BSEE, and NMFS HESD at NMFS.GAR.HESDoffshorewind@noaa.gov upon completion of the foundation testing.

NMFS EFH CRs that apply to BOEM/BSEE	CR Adopted/Not Adopted	Explanation if Not Fully Adopted	Conditions of to be included in the SAP
2. Flow rate of the suction bucket pumps should be monitored in situ to ground truth the intake volume assumed in the EFH assessment to better inform entrainment impacts for larger scale commercial installation of suction buckets in the lease area.	Adopted		Suction Bucket Flow Rate Monitoring Plan: Provide the results of flow rate monitoring to BOEM, BSEE, and NMFS HESD at NMFS.GAR.HESDoffshorewind@noaa.gov upon completion of the foundation testing.

NMFS EFH CRs that apply to BOEM/BSEE	CR Adopted/Not Adopted	Explanation if Not Fully Adopted	Conditions of to be included in the SAP
3. Provide the results of in situ turbidity and flow rate monitoring to NMFS HESD at NMFS.GAR.HESDoffshorewind@noaa.gov upon completion of the foundation testing.	Adopted		See response to CR #1 and CR #2 above.

NMFS EFH CRs that apply to BOEM/BSEE	CR Adopted/Not Adopted	Explanation if Not Fully Adopted	Conditions of to be included in the SAP
4. Avoid placing the reference frame in sensitive benthic habitats[1], benthic features with pronounced vertical relief (e.g., sand waves, slopes of ridge and trough complexes), areas with dense aggregations of biota (e.g., cerianthid beds, shellfish beds), or areas with particularly sensitive species (e.g., corals). [1] the term "**sensitive benthic habitats**" will be used to encompass: complex habitats and benthic features (defined as coarse unconsolidated mineral substrates [i.e. substrates containing 5% or greater gravels], rock substrates [e.g. bedrock], and shell substrates [e.g. mussel reef] consistent with CMECS definitions as well as vegetated habitats [e.g. SAV] and as defined described in our 2021 Recommendations for Mapping Fish Habitat), bathymetric features (such as lumps, banks, and scarps) and other areas of high habitat heterogeneity (diversity of structural elements including bathymetric features) and complexity.	Partially adopted	BOEM has concerns with the ability of the lessee to comply with the recommendation as originally posed. BOEM is adopting in a manner consistent with previous authorizations.	Avoid placing the reference frame in areas of known sensitive benthic habitat. The term "sensitive benthic habitats" will be used to encompass: complex habitats and benthic features (defined as coarse unconsolidated mineral substrates [i.e. substrates containing 5% or greater gravels], rock substrates [e.g. bedrock], and shell substrates [e.g. mussel reef] consistent with CMECS definitions as well as vegetated habitats [e.g. SAV], bathymetric features (such as lumps, banks, and scarps) and other areas of high habitat heterogeneity (diversity of structural elements including bathymetric features) and complexity)).

G.3 Coastal Zone Management Act

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

Ms. Kisha Santiago-Martinez
Deputy Secretary of State
Office of Planning, Development & Community Infrastructure
New York Department of State
One Commerce Plaza
99 Washington Avenue, Suite 1010
Albany, New York 12231

Dear Ms. Kisha Santiago-Martinez:

This document provides New York with the Bureau of Ocean Energy Management's (BOEM) Consistency Determination (CD) for Site Assessment Plan (SAP) Amendment activities within the Beacon Wind Lease Area (OCS-A-0520) on the Outer Continental Shelf offshore Massachusetts under the Coastal Zone Management Act (CZMA) Section 307 (c)(1) and 15 CFR Part 930 Subpart C. The information in this CD is provided pursuant to 15 CFR 930.36(a) and 930.39.

In 2014, BOEM consulted with Massachusetts and Rhode Island regarding the original SAP for the Wind Energy Area Offshore the State of Rhode Island and the Commonwealth of Massachusetts. New York was not consulted at that time because the Beacon Wind Lease Area was not located in the New York coastal zone. A new Renewable Energy Geographic Location Description (GLD) for New York was approved in April 2023 and includes the Beacon Wind Lease Area. Therefore, BOEM is submitting this CD to New York for consistency review.

In 2023 BOEM received the SAP Amendment for OCS-A-520 and has conducted an environmental assessment to identify potential impacts from the Proposed Action- approval of an amended SAP in support of site assessment activities that are different from the original SAP activities (i.e., suction bucket foundation testing). Information gathered from site assessment activities would be used to determine if areas within the Beacon Wind Lease Area are suitable for suction bucket foundations.

BOEM's analysis of the reasonably foreseeable environmental consequences of the Proposed Action can be found in the enclosed *Draft Beacon Wind Foundation Testing Concise Environmental Assessment*. The CD takes into consideration the reasonably foreseeable coastal effects of the Proposed Action and its consistency with the enforceable policies identified by the New York State Coastal Management Program. The New York Coastal Management Program's Federal Consistency Policy and Procedure's applicable enforceable policies and reasonably foreseeable coastal effects are included in Table 1 (enclosed) for your review.

Based upon the above-referenced information, data, and analysis, BOEM finds that the Proposed Action is consistent to the maximum extent practicable with the enforceable policies of the New York Coastal Management Program.

Pursuant to 15 CFR 930.41, the New York Coastal Management Program has 60 days from the receipt of this letter in which to concur with or object to this CD, or to request an extension under 15 CFR 930.41(b). New York's concurrence will be presumed if its response is not received by BOEM within 60 days of receipt of this determination.

New York's response should be sent to:

Bureau of Ocean Energy Management
Office of Renewable Energy Programs
Attn: Ms. Jessica Stromberg
45600 Woodland Road
Sterling, VA 20166

We appreciate having a cooperative working relationship with New York as we move forward with our review of potential offshore renewable energy activities.

Sincerely,

Jessica Stromberg
Chief, Environmental Branch for Renewable Energy
Office of Renewable Energy Programs

Enclosures

Jeffrey Willis
Executive Director
Rhode Island Coastal Resources Management Council
Stedman Government Center, Suite 3
4808 Tower Hill Road
Wakefield, Rhode Island 02879

Dear Mr. Jeffrey Willis:

This document provides Rhode Island with the Bureau of Ocean Energy Management's (BOEM) Consistency Determination (CD) for Site Assessment Plan (SAP) Amendment activities within the Beacon Wind Lease Area (OCS-A-0520) on the Outer Continental Shelf offshore Massachusetts under the Coastal Zone Management Act (CZMA) Section 307 (c)(1) and 15 CFR Part 930 Subpart C. The information in this CD is provided pursuant to 15 CFR 930.36(a) and 930.39.

In 2014, BOEM consulted with Rhode Island regarding the original SAP for the Wind Energy Area Offshore the State of Rhode Island and the Commonwealth of Massachusetts. Rhode Island concurred with BOEM's 2014 consistency determination. In 2023 BOEM received an amendment to the original SAP for OCS-A-520 and has conducted an environmental assessment to identify potential impacts from the Proposed Action- approval of an amended SAP in support of site assessment activities that are different from the original SAP activities (i.e., suction bucket foundation testing). Information gathered from site assessment activities would be used to determine if areas within the Beacon Wind Lease Area are suitable for suction bucket foundations.

BOEM's analysis of the reasonably foreseeable environmental consequences of the Proposed Action can be found in the enclosed *Draft Beacon Wind Foundation Testing Concise Environmental Assessment*. The CD takes into consideration the reasonably foreseeable coastal effects of the Proposed Action and its consistency with the enforceable policies identified by the Rhode Island Coastal Resources Management Council. The Rhode Island Coastal Resources Management Council's Federal Consistency Policy and Procedure's applicable enforceable policies and reasonably foreseeable coastal effects are included in Table 1 (enclosed) for your review.

Based upon the above-referenced information, data, and analysis, BOEM finds that the Proposed Action is consistent to the maximum extent practicable with the enforceable policies of the Rhode Island Coastal Resources Management Council.

Pursuant to 15 CFR 930.41, the Rhode Island Coastal Resources Management Council has 60 days from the receipt of this letter in which to concur with or object to this CD, or to request an extension under 15 CFR 930.41(b). Rhode Island's concurrence will be presumed if its response is not received by BOEM within 60 days of receipt of this determination.

Rhode Island's response should be sent to:

Bureau of Ocean Energy Management
Office of Renewable Energy Programs
Attn: Ms. Jessica Stromberg
45600 Woodland Road
Sterling, VA 20166

We appreciate having a cooperative working relationship with Rhode Island as we move forward with our review of potential offshore renewable energy activities.

Sincerely,

Jessica Stromberg
Chief, Environmental Branch for Renewable Energy
Office of Renewable Energy Programs

Enclosures

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

Ms. Lisa Berry Engler
CZM Director
Massachusetts Office of Coastal Zone Management
251 Causeway Street, Suite 800
Boston, MA 02114

Dear Ms. Lisa Berry Engler:

This document provides the Commonwealth of Massachusetts with the Bureau of Ocean Energy Management's (BOEM) Consistency Determination (CD) for Site Assessment Plan (SAP) Amendment activities within the Beacon wind Lease Area (OCS-A-0520) on the Outer Continental Shelf offshore Massachusetts under the Coastal Zone Management Act (CZMA) Section 307 (c)(1) and 15 CFR Part 930 Subpart C. The information in this CD is provided pursuant to 15 CFR 930.36(a) and 930.39.

In 2014, BOEM consulted with Massachusetts regarding the original SAP for the Wind Energy Area Offshore the State of Rhode Island and the Commonwealth of Massachusetts. Massachusetts concurred with BOEM's 2014 consistency determination. In 2023 BOEM received an amendment to the original SAP for OCS-A-520 and has conducted an environmental assessment to identify potential impacts from the Proposed Action- approval of an amended SAP in support of site assessment activities that are different from the original SAP activities (i.e., suction bucket foundation testing). Information gathered from site assessment activities would be used to determine if areas within the Lease Area are suitable for suction bucket foundations.

BOEM's analysis of the reasonably foreseeable environmental consequences of the Proposed Action can be found in the enclosed *Draft Beacon Wind Foundation Testing Concise Environmental Assessment*. The CD takes into consideration the reasonably foreseeable coastal effects of the Proposed Action and its consistency with the enforceable policies identified by Massachusetts's Coastal Zone Management Program. The Commonwealth of Massachusetts's Coastal Zone Management Program's applicable enforceable policies and reasonably foreseeable coastal effects are included in Table 1 (enclosed) for your review.

Based upon the above-referenced information, data, and analysis, BOEM finds that the Proposed Action is consistent to the maximum extent practicable with the enforceable policies of the Massachusetts Coastal Zone Management Program.

Pursuant to 15 CFR 930.41, the Massachusetts Office of Coastal Zone Management has 60 days from the receipt of this letter in which to concur with or object to this CD, or to request an extension under 15 CFR 930.41(b). Massachusetts's concurrence will be presumed if its response is not received by BOEM within 60 days of receipt of this determination.

The Commonwealth's response should be sent to:

Bureau of Ocean Energy Management
Office of Renewable Energy Programs
Attn: Ms. Jessica Stromberg
45600 Woodland Road
Sterling, VA 20166

We appreciate having a cooperative working relationship with the Commonwealth of Massachusetts as we move forward with our review of potential offshore renewable energy activities.

Sincerely,

Jessica Stromberg
Chief, Environmental Branch for Renewable Energy
Office of Renewable Energy Programs

Enclosures

Coastal Zone Management Act, Consistency Determination
(15 CFR 930.36(a))

Supplemental Foundation Testing Activities
for Offshore Site Characterization

Beacon Wind
Massachusetts Wind Energy Lease Area OCS-A 0520

equinor

Beacon Wind LLC
1600 Washington Blvd, Ste 800
Stamford, CT 06901

Prepared by

TETRA TECH

Tetra Tech, Inc.
10 Post Office Square, Suite 1100
Boston, MA 02109

November 10, 2023

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Attachments

Attachment 1 Table 1: Applicable Enforceable Policies for the Coastal Management Programs for Massachusetts, Rhode Island, and New York
Attachment 2 2014 Coastal Zone Consistency Determination for Massachusetts Wind Energy Area

Acronyms and Abbreviations

AIS	Automatic Identification System
Beacon Wind	Beacon Wind LLC
BMPs	best management practices
BOEM	Bureau of Ocean Energy Management
CD	Consistency Determination
CFR	Code of Federal Regulations
CMPs	Coastal Management Programs
COP	Construction and Operations Plan
CZMA	Coastal Zone Management Act
DOI	U.S. Department of Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPAct	Energy Policy Act of 2005
FONSI	Finding of No Significant Impact
Foundation Test	Short-term deployment and subsequent removal of representative wind turbine/offshore substation foundation components
ft	feet
Lease Area	Lease Area OCS-A 0520
m	meter
MMS	Minerals Management Service
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OCS	Outer Continental Shelf
PDC	project design criteria
ROV	remotely operated vehicle
SAP	Site Assessment Plan
U.S.	United States
USCG	United States Coast Guard
2014 EA	Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts

1. Introduction

Beacon Wind LLC (Beacon Wind) has prepared this Consistency Determination (CD) to assist the U.S. Department of the Interior (DOI), Bureau of Ocean Energy Management (BOEM) in its review to determine whether approval of additional site assessment activity (Foundation Testing) as proposed by Beacon Wind within Lease Area OCS-A 0520 (Lease Area) offshore Massachusetts (Figure 1) is consistent to the maximum extent practicable with the provisions identified as enforceable by the Coastal Management Programs (CMPs) of the Commonwealth of Massachusetts and states of Rhode Island and New York. This document is provided pursuant to the requirements of 15 CFR 930.39(a) of the Coastal Zone Management Act (CZMA) Federal Consistency regulations.

Section 307(c) (1) of the CZMA, as amended, requires that each Federal agency activity within or outside the coastal zone affecting any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of federally approved state management programs.

The Lease Area is within the Outer Continental Shelf (OCS) but also within the NYS Renewable Energy Geographic Location which is considered within the New York State coastal area for the purpose of evaluating consistency with the New York State CMP (Figure 1). At the closest location the Lease Area is 13.6, 40.6, and 51.9 nautical miles (nm) from the nearest submerged land area boundary of Massachusetts, Rhode Island, and New York, respectively (Figure 1). The Lease Area and proposed Foundation Testing is not within the defined coastal area boundaries or review areas of Massachusetts and Rhode Island (including under the Rhode Island Coastal Resource Management Council (CRMC) Review Authority Geographic Location Descriptions for offshore renewable energy listed activities pursuant to 15 CFR § 930.34(b)). The three states do, however, generally share some common coastal management issues and have similar enforceable policies as identified by their respective CMPs. For these reasons a single CD addressing the three states has been prepared for the proposed Foundation Testing.

BOEM is evaluating whether to approve Beacon Wind's proposed Foundation Testing activities as a supplement to previously reviewed and approved site assessment activities within the Lease Area. Foundation Testing will consist of trials of a suction bucket which would be similar to the suction buckets that could be used as a component of future wind turbine and/or offshore substation foundations. The Foundation Testing will collect site-specific data to assist Beacon Wind in refining future suction bucket design.

The necessary data and information required pursuant to § 930.58 is included within this CD and also within the Site Assessment Plan (SAP) Amendment filed by Beacon Wind with BOEM on March 2, 2023 (Beacon Wind, 2023a). This CD also documents state enforceable policies identified by the Commonwealth of Massachusetts and states of Rhode Island and New York, applicable offshore and coastal resources or uses, and CZMA "reasonably foreseeable coastal effects" that might be expected for activities conducted under the proposed action (see Table 1 included in Attachment 1).

BOEM's previous review and approval of site assessment activities within the Lease Area was documented in an Environmental Assessment (EA) for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts (2014 EA) (BOEM 2014), and included a statement that the activities would be consistent to the maximum extent practicable with the enforceable policies of the Massachusetts and Rhode Island CMPs. BOEM received concurrence from Massachusetts on July 29, 2013, and from Rhode Island on August 6, 2014 (copies included in Attachment 2). Because the proposed Foundation Testing is a supplement to the previously authorized site assessment activities and the associated consistency determinations, for consistency this CD is prepared following the general format of the previous consistency determination.

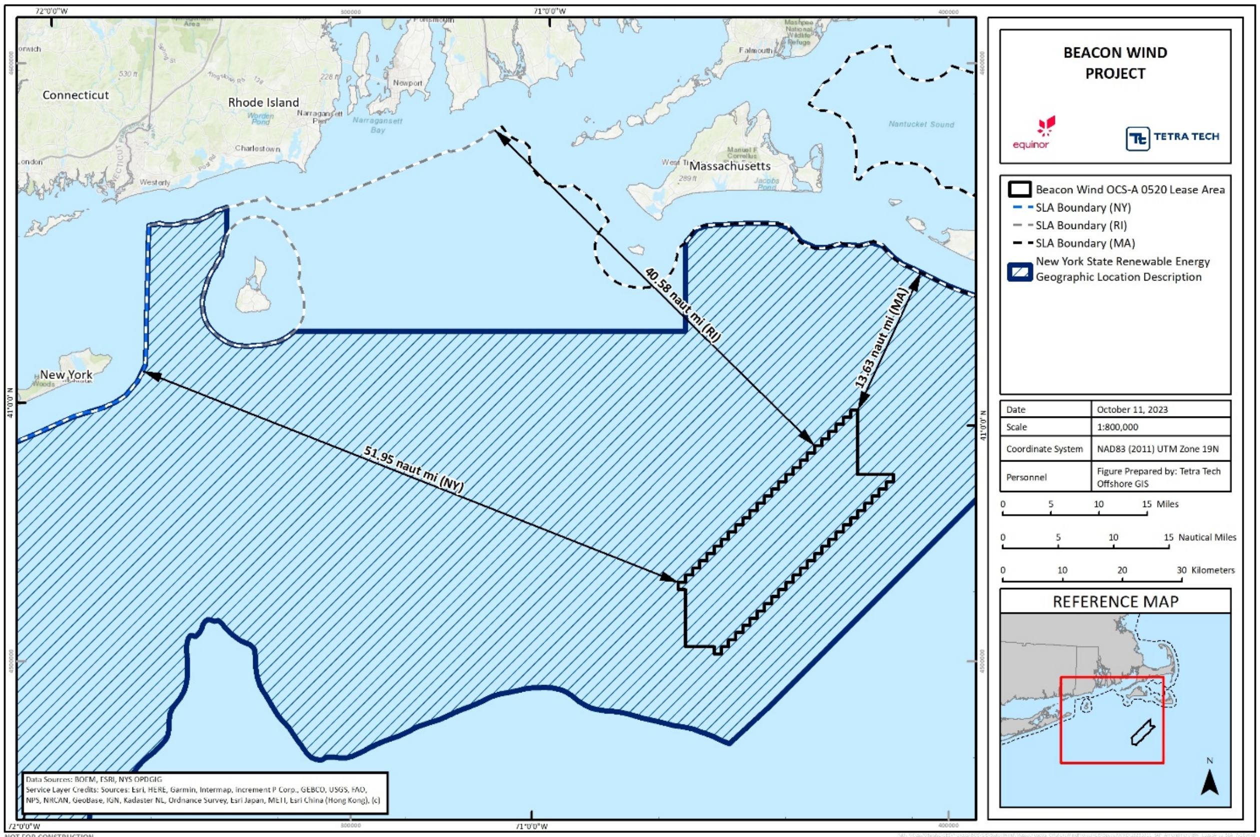

Figure 1: Beacon Wind Lease Area OCS-A 0520

2. Background

BOEM is authorized to issue leases on the Outer Continental Shelf (OCS) for the purposes of wind energy development pursuant to Section 388 of the Energy Policy Act of 2005 (EPAct). On April 22, 2009, BOEM promulgated regulations implementing this authority at 30 CFR Part 585. The regulations establish a program to grant leases, easements, and rights-of-way for orderly, safe, and environmentally responsible renewable energy development activities, such as the siting and construction of offshore wind facilities on the OCS as well as other forms of renewable energy such as marine hydrokinetic (i.e., wave and current). The Minerals Management Service (MMS) prepared a programmatic Environmental Impact Statement (EIS) to evaluate the impact of establishing a comprehensive, nationwide MMS Alternative Energy Program on the OCS (MMS 2007).

In June 2014, BOEM released the Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic OCS Offshore Massachusetts Revised Environmental Assessment (EA) (2014 EA) (BOEM 2014). The EA analyzed the reasonably foreseeable consequences associated with two distinct BOEM actions within the Wind Energy Area Offshore Massachusetts:

(1) Lease issuance (including reasonably foreseeable consequences associated with shallow hazards, geological, geotechnical, archaeological resources, and biological surveys); and

(2) Site Assessment Plan (SAP) approval (including reasonably foreseeable consequences associated with the installation of a meteorological tower[s] and meteorological buoys).

As part of its review for the 2014 EA, BOEM prepared a statement that the activities would be consistent to the maximum extent practicable with the enforceable policies of the Massachusetts CMP. BOEM received concurrence from Massachusetts on July 29, 2013.

On December 8, 2020, Beacon Wind submitted a SAP in support of site assessment activities consisting of installation and operation of metocean equipment, with updated versions submitted April 27, 2021, and June 28, 2021. The activities included in the SAP were covered by the scope of the 2014 BOEM EA and associated Finding of No Significant Impact (FONSI), and the SAP was approved by BOEM on September 24, 2021. The metocean equipment was deployed in the Lease Area on November 10, 2021.

On March 2, 2023, Beacon Wind submitted a SAP Amendment in support of additional site assessment activities in the Lease Area not included in the 2020 SAP, to consist of short-term deployment and subsequent removal of representative wind turbine/offshore substation foundation components (Foundation Testing) (Beacon Wind 2023a). The proposed Foundation Testing includes repeated tests of a single suction bucket within the Lease Area, at areas planned for eventual installation of wind turbines. The suction bucket will be similar to those considered within the Beacon Wind Construction and Operations Plan (COP) (Beacon Wind 2023b) for the suction bucket jacket foundation, which may support wind turbines and/or offshore substations. The Foundation Testing will be conducted to further assess the site conditions and to gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area.

The SAP Amendment was submitted to add the Foundation Testing to the approved activities under the previously submitted SAP, to be conducted during the site assessment term of the Commercial Lease of Submerged Lands for Renewable Energy Development on the OCS and prior to approval of the COP for the Lease Area by BOEM. The SAP Amendment does not negate the information contained in the previously approved SAP and is not intended to affect the operations or eventual decommissioning of the metocean equipment. The SAP Amendment solely concerns the Foundation Testing.

BOEM does not issue permits for site assessment surveys or the proposed Foundation Testing, however, BOEM regulations require that it review and approve the proposed Foundation Testing identified in Beacon Wind's SAP Amendment. Therefore, this CD is required as a result of environmental consequences that may occur as a result of BOEM's approval of the proposed Foundation Testing.

BOEM intends to prepare a concise EA to inform its decision to approve Beacon Wind's SAP Amendment for Foundation Testing. Because the Foundation Testing locations will be within the same geographic areas analyzed in the 2014 EA, and some activities (e.g., vessel movements within the Lease Area) will be identical to the activities analyzed in the 2014 EA, much of the analysis conducted in the 2014 EA is also applicable to the Foundation Testing activities.

3. Proposed Action Description

3.1 Foundation Testing Activities

The location of the proposed Foundation Testing sites will fall within the Beacon Wind Lease Area within the OCS, and Beacon Wind estimates it may conduct testing at up to 26 sites (**Error! Reference source not found.**2). At each site, activities will occur within a 984 x 984 ft (300 x 300 m) square, which is centered on the location for eventual installation of the proposed wind turbines under the COP (Beacon Wind 2023b). This area is conservative and would cover all Foundation Testing activities at each location, including the possibility of multiple tests at a single location, such that up to 35 total trials may be conducted.

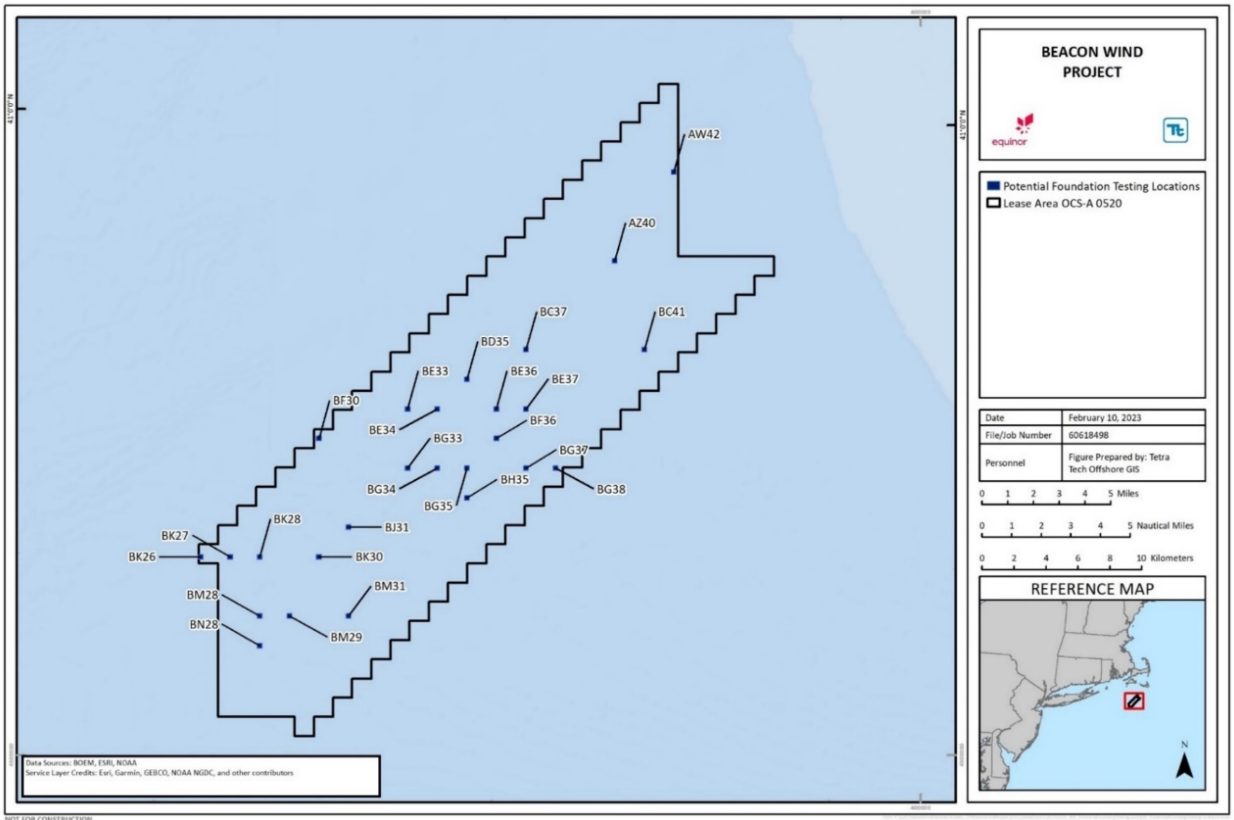

Figure 2: Beacon Wind Potential Foundation Testing Locations

Foundation Testing will consist of trials of deployment and removal of a suction bucket. The suction bucket will be similar to those considered within the COP for the suction bucket jacket foundation, which may support wind turbines and/or offshore substations. The Foundation Testing will be conducted to gather information to support the engineering design of wind turbine and offshore substation foundations that would potentially be installed within the Lease Area. Suction bucket foundations are an alternative foundation design to traditional pile-driven foundations. This technology secures a steel bucket-shaped foundation by penetrating the sediment and pumping water from within the bucket to create an area of reduced pressure against the seafloor. Due to reduced noise and depth disturbance of these foundation types relative to pile-driven foundations, suction bucket designs can have advantages over pile-driven designs.

The Foundation Testing will be conducted at-sea during a single approximately 10 to 15-day effort in the Lease Area. No foundation materials or other survey equipment will be detached from the vessel or remain in-water for a period exceeding the suction bucket trial periods at each site. The vessel will utilize dynamic positioning; therefore, no anchors or jack-up legs will be used. No equipment will be left in-water at the conclusion of the Foundation Testing activities.

The suction bucket used in the test will have a diameter of 30 to 39 ft (9 to 12 m), and a height of 36 to 39 ft (11 to 12 m), and total weight of approximately 200 tons. The suction bucket will be designed to penetrate into the seafloor a maximum of between 33 and 39 ft (10 and 12 m) which is significantly less than the depth assessed in the 2014 EA, which assumed that metocean tower foundations would be pile-driven up to 100 ft (30 m) below the seafloor. Each suction bucket test will affect 0.028 acre of seafloor/benthic habitat, and when all testing is complete, up to a total of 0.986 acre may be affected within the Lease Area.

A low-flow suction pump will be mounted to the top of the suction bucket lid. After the suction bucket has settled into the seafloor, the suction pump will slowly remove water from within the bucket to create an area of reduced pressure which will assist the suction bucket in completing penetration to the target depth. The suction pump is not expected to generate noise that would disturb marine mammals or other protected species. The suction pump will operate at a typical rate of approximately 392 yd^3/hour (300 m^3/hour) and the removed water will be released immediately outside the suction bucket. The volume of seawater removed will be limited to the volume inside the suction bucket, with a maximum of 1,775 yd^3 (1,357 m^3) per test. At the completion of each test, the pump will reverse this process and slowly return water to within the suction bucket to return the pressure inside the bucket and remove the bucket.

To monitor the soil plug on the inside of the suction bucket and gather data to assist in refining future foundation engineering, measurement equipment will be deployed inside the suction bucket during testing. Imaging equipment will be mounted on the inside of the lid. This imaging equipment may consist of sonar, echo sounder, and/or sub-bottom profiler equipment. The acoustic outputs of this equipment will be contained entirely within the suction bucket and are not expected to propagate outside the steel walls of the bucket. The measurement equipment is therefore not expected to be a source of disturbance for marine mammals or other protected species.

Prior to lowering the suction bucket, a reference frame will be lowered to the seafloor to assist the vessel lowering the suction bucket onto the targeted location and ensure accurate suction bucket positioning. The reference frame is made of steel with a maximum weight of approximately 1,100 pounds. The footprint of the reference frame is approximately 11 ft^2 (1 m^2). The reference frame will be directly lowered from the vessel onto the seabed and will rest atop the seabed without moving for the duration of the suction bucket trial. The edge studs of the reference frame may penetrate the top approximately 2 inches of the seabed. Upon completion of each trial, the reference frame will be raised vertically back onto the vessel.

The Foundation Testing may also use up to two remotely operated vehicles (ROVs) to assist in positioning the precise location of the suction bucket tests, as well as to observe and gather data on the process of penetration and recovery. The ROVs will be suspended in the water column and will not touch or rest on the seafloor. The ROVs will be controlled from on board the vessel and will navigate via hydraulic propellers or thrusters that do not generate significant underwater noise.

Beacon Wind plans to proceed with Foundation Testing following BOEM approval of the Foundation Testing, no later than August 2024. Testing activities in the Lease Area will be conducted over a period of approximately 10-15 days, plus additional days for poor weather or other potential delays. Each foundation trial is expected to take an estimated six to nine hours, including three to five hours for deployment (lowering and seabed penetration) and three to four hours for removal (reverse penetration, lifting, potential cleaning, and lifting onboard).

3.2 Coastal Activity

Coastal Activity associated with the proposed Foundation Testing would be less than, and indistinguishable from, the activity evaluated in the 2014 EA and addressed by the previous CZMA CD. Support crews and vessels, as needed, would be from existing ports or industrial areas. Existing port facilities are adequate to support the proposed short-term activities and no expansion of existing port facilities or industrial areas is expected to occur.

No direct impacts on wetlands or other coastal habitats would occur from the proposed Foundation Testing activities.

3.3 Vessel Traffic

Foundation Testing equipment will be fabricated and transported from Europe, and the testing vessel will transit crew and equipment from Europe over approximately 12 days to a port in eastern Canada, then transit to the Lease Area over 1-4 days. Support crew or others as needed will be mobilized from U.S. ports and will meet the testing vessel in the Lease Area prior to beginning activities. Once on site, Foundation Testing activities are expected to occur over approximately 10-15 days, barring weather delays. Once complete, crew and materials will transit back to their respective ports and demobilize.

The Foundation Testing will use a single large vessel, equipped with a crane rated to a minimum of 300-ton capacity. Once the vessel arrives at each Foundation Testing location, it will be positioned for the testing using dynamic positioning technology, without the use of anchors or jack-up legs. The vessel will move from site to site within the Lease Area until all testing is complete, at which point crew and materials will transit back to their respective ports and demobilize.

Beacon Wind will notify BOEM, United States Fleet Forces N46, the United States Army Corps of Engineers, and the United States Coast Guard (USCG) prior to mobilization. Written notice via email will be provided to the appropriate contact at Fleet Forces Command prior to mobilization to avoid potential conflicts with military operations. Beacon Wind will update Fleet Forces Command on the testing schedule following BOEM approval of the SAP Amendment and detailed planning.

Additionally, Beacon Wind will notify mariners, fishermen, and other users of the area by submitting a request to the USCG for publication of a Local Notice to Mariners at least two weeks prior to the start of the in-water work. This notice will include the contact names for the vessel, local fisheries liaison officer, channels of communication, and the duration of the work. Copies of all USCG communications will be provided to BOEM as required. Additionally, in accordance with standard maritime practices, the vessel captain(s) will broadcast via VHF radio on Marine Channel 16 notification to mariners of their position and limited mobility during Foundation Testing activities. Beacon Wind also provides a continual live Automatic Identification System (AIS) feed of vessel activity within and around the Lease Area, which can be accessed at https://www.beaconwind.com/environment-sustainability/mariners-fisheries/ along with additional information on Beacon Wind's ongoing coordination with mariners and fisheries. Within 30 days of completing Foundation Testing, Beacon Wind will notify BOEM in writing.

3.4 Mitigation Measures

The Beacon Wind Lease contains specific stipulations to minimize risk to marine species that must be followed. Foundation Testing will not require pile driving; accordingly, mitigations to reduce adverse impacts on protected species from pile driving do not apply to the proposed Foundation Testing. All activities associated with the Foundation Testing will comply with the applicable Lease stipulations.

Beacon Wind will employ best management practices (BMPs) identified in the *Project Design Criteria (PDCs) and BMPs for Protected Species Associated with Offshore Wind Data Collection* (National Marine Fisheries Service [NMFS] 2021), *Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan* (BOEM 2019), and *Establishment of an OCS Alternative Energy and Alternate Use Program, Record of Decision, December 2007* (BOEM 2007). Additionally, Beacon Wind will adhere to the BOEM programmatic consultation with NMFS, most recently revised as of November 22, 2021, detailing *PDCs and BMPs for Protected Species Associated with Offshore Wind Data Collection* (NMFS 2021). Beacon Wind will also consult with NMFS regarding Essential Fish Habitat and will implement any additional measures that may be required as a result of that consultation.

All vessels, regardless of length, will observe a 10-knot speed restriction in specific areas designated by NMFS for the protection of North Atlantic right whales, the Block Island Sound Seasonal Management Area (in effect from November 1 through April 30); and any Dynamic Management Areas when in effect.

4. State Enforceable Policies

As part of this CD, Beacon Wind has evaluated and documented in the enclosed table (Table 1 included in Attachment 1), policies identified by the Commonwealth of Massachusetts and states of Rhode Island and New York as enforceable, applicable offshore and coastal resources or uses, and CZMA "reasonably foreseeable coastal effects" that might be expected for activities conducted under the proposed action.

5. Consistency Determination

Beacon Wind has evaluated applicable enforceable policies of the CMPs of Massachusetts, Rhode Island, and New York and the potential activities resulting from the proposed action as described in Section 2. This CD has examined whether the proposed action is consistent to the maximum extent practicable with the applicable enforceable polices (see Table 1 in Attachment 1). Based on the preceding information and analyses, and the incorporated-by-reference Programmatic EIS and the 2014 EA, Beacon Wind has determined the proposed action will be consistent to the maximum extent practicable with the policies that Massachusetts, Rhode Island, and New York have identified as enforceable.

6. References

Beacon Wind. 2023a. Site Assessment Plan Amendment. Submitted March 2, 2023, to the Bureau of Ocean Energy Management.

Beacon Wind. 2023b. Beacon Wind Farm Construction and Operations Plan. Updated June 2023. Available at: https://www.boem.gov/renewable-energy/state-activities/beacon-wind-farm-construction-and-operations-plan.

BOEM (Bureau of Ocean Energy Management) Office of Renewable Energy Programs. 2007. Establishment of an OCS Alternative Energy and Alternate Use Program, Record of Decision December 2007. Available online at https://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/Regulatory_Information_OCS_PEIS_ROD.pdf.

BOEM. 2014. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts – Revised Environmental Assessment. Available online at: https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/MA/Revised-MA-EA-2014.pdf.

BOEM. 2019. Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan. Available online at https://www.boem.gov/sites/default/files/renewable-energy-program/BOEM-Renewable-SAP-Guidelines.pdf/.

MMS (Minerals Management Service). 2007. Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Programmatic Environmental Impact Statement, October, 2007. Available online at: http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Guide-To-EIS.aspx

NMFS (National Marine Fisheries Service). 2021. Project Design Criteria and Best Management Practices for Protected Species Associated with Offshore Wind Data Collection. Available online at: https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%2011222021.pdf.

Attachment 1

Table 1: Applicable Enforceable Policies for the Coastal Management Programs for Massachusetts, Rhode Island, and New York

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Table 1. Applicable Enforceable Policies for the Coastal Management Programs for Massachusetts, Rhode Island, and New York

Category	Enforceable Policies: Applicable Coastal Zone Management Rules 1/	Reasonable Foreseeable Coastal Effects (CZMA Coastal Effects)
General	NYS Coastal Policy 18 (NY)	The proposed Foundation Testing will be a short-term effort taking approximately 10-15 days and the action will be undertaken with full consideration of potential impacts on economic, social, and environmental interests of the state of New York. The proposed action will have negligible, if any, impacts on these interests. Further, BOEM intends to prepare an Environmental Assessment (EA) to address in detail the potential impacts, including potential impacts on resources discussed in NYS Coastal Policy 18.
Coastal Hazards, Flooding and Erosion Hazards	MA CMP Policies #1-4 (MA) Massachusetts Wetland Protection Act (M.G.L.c.131, §40) (MA) Massachusetts General Law Chapter 91 (MA) RI SAMP Section 1160.2.3 Areas of Particular Concern (RI) RI SAMP Section 1160.3 – 4 Prohibitions and Areas Designated for Preservation (RI) NYS Coastal Policies 12, 14 and 15 (NY)	The proposed Foundation Testing will use a single large vessel, expected to operate for approximately 10-15 days to complete testing at up to 26 sites within the Lease Area. The vessel will be positioned at each test site using dynamic positioning technology, without the use of anchors or jack-up legs. The vessel will move from site to site within the Lease Area until all testing is complete. Foundation Testing equipment will be fabricated and transported from Europe, and the crew will be mobilized from Europe, Canada, and/or the U.S. In addition to the 10-15 days of testing, transit to and from the Lease Area is expected to take approximately 13-16 days in either direction. No dunes, beaches, coastal banks, barrier islands, bluffs, marshes, or wetlands will be altered as a result of the proposed action. No proposed activities will remove, fill, dredge, excavate, or otherwise alter any barrier beach or wetland resource area, including as defined under Massachusetts Wetlands Protection Act (M.G.L.c.131, §40) and Massachusetts Coastal Management Program's (CMP) Coastal Hazards Policy #1, and per NYS Coastal Policy 12. No installation or expansion of existing coastal infrastructure or coastal engineering structure, or a non water dependent project, as defined under MA Coastal Hazards Policy #1, is anticipated to occur as a result of the proposed action. The proposed activities will have no impact on erosion or flooding per NYS Coastal Policy 14, and will not interfere with the natural coastal processes which supply beach materials to land adjacent to coastal waters per NYS Coastal Policy 15. If short-term support of the single Foundation Testing vessel is required it would be from existing ports in Massachusetts, Rhode Island, and Connecticut. No expansion of existing ports or dredging of channels or waterways is anticipated in support of the proposed action. Impacts on coastal habitats could occur from an accidental diesel fuel spill within the Lease Area in the OCS and if this does occur, it is expected to be local, offshore, and temporary, and therefore negligible. The proposed action will not interfere with water circulation or sediment transport processes, alter bottom topography, increase erosion, or impact littoral drift volumes, as defined in the MA CMP Coastal Hazards Policy #2. No state or federally-funded public works projects, as defined in the MA CMP Coastal Hazards Policy #3, will occur as a result of the proposed action.
Energy	MA CMP Energy Policy #1 (MA)	The purpose of the proposed action is to assess a potential construction technique so that Beacon Wind can determine whether the technique is suitable for the Lease Area. The proposed action does not include the consideration or approval of any commercial wind energy facility or other major energy facility.

Category	Enforceable Policies: Applicable Coastal Zone Management Rules 1/	Reasonable Foreseeable Coastal Effects (CZMA Coastal Effects)
	NYS Coastal Policies 27 and 29 (NY)	Decisions on the siting and construction of the Beacon Wind power generation facilities will be part of a separate action by BOEM and other federal and state regulators. The proposed action will be a short-term effort taking approximately 10-15 days and effort will accommodate existing ocean industries such as commercial and recreational fishing, and the ecological functions of ocean habitats. BOEM intends to prepare an Environmental Assessment (EA) that will address in detail the potential impacts of the proposed Foundation Testing. The EA will address potential impacts on commercial and recreational fishing and marine habitats and other resources discussed in NYS Coastal Policy 29.
Habitat, including Wetlands	MA CMP Habitat Policy #1-2 (MA) RI SAMP Section 1160.3 Prohibitions and Areas Designated for Preservation (RI) NYS Coastal Policy 44 (NY)	The proposed action will not impact coastal or estuarine habitats, and will not adversely affect marine habitats, nor will the proposed action interrupt the ecosystem services provided-by these habitats, as defined in the MA CMP Habitat Policy #1. The proposed action is subject to oversight and regulation under the enforceable standards of the Massachusetts Ocean Management Plan as contained in Appendix 5 of the MA Office of Coastal Zone Management's October 2011 Policy Guide. No adverse impacts to coastal, estuarine, and marine habitats, including designated Special, Sensitive and Unique Resources Areas under the MA Ocean Management Plan, are anticipated as a result of the proposed action, and Beacon Wind will engage in all feasible measures to avoid, minimize, and mitigate damage to any coastal, estuarine, and marine habitat, as described in the MA CMP Habitat Policy #2. No impact to Areas Designated for Preservation within the RI Ocean Special Area Management Plan (SAMP), are anticipated as a result of the proposed action. The proposed action does not include underwater cables within Areas Designated for Preservation, or any mining and extraction of minerals. No impacts to Critical Habitat under the Endangered Species Act would occur, and the proposed action does not include the disposal of dredge material. The proposed action would affect the seafloor within the OCS but would have no direct impact on habitats within coastal waters. However, the proposed action would impact bottom habitat within the NYS Renewable Energy Geographic Location. Up to approximately 1 acre of seafloor would be affected by the Foundation Testing. No known sensitive habitat would be impacted. Additionally, Beacon Wind will adhere to the BOEM programmatic consultation with NOAA Fisheries, most recently revised as of November 22, 2021, detailing *Project Design Criteria (PDCs) and Best Management Practices (BMPs) for Protected Species Associated with Offshore Wind Data Collection*. This will include; • avoid locating facilities near known sensitive seafloor habitats; • use existing data to identify important, sensitive, and unique marine habitats in the vicinity of the project and design the deployment to avoid adverse impacts to these habitats; avoid hard-bottom habitats, including seagrass communities and kelp beds; and • all vessel anchoring and any seafloor-sampling activities are restricted from seafloor areas with

Category	Enforceable Policies: Applicable Coastal Zone Management Rules 1/	Reasonable Foreseeable Coastal Effects (CZMA Coastal Effects)
		consolidated seabed features including pavement, scarp walls, and deep/cold-water coral reefs and shallow/mesophotic reefs as defined in the Coastal and Marine Ecological Classification Standard for geologic substrate classifications. All vessel anchoring and seafloor sampling must also occur at least 150 m from any known locations of threatened or endangered coral species. All sensitive live bottom habitats (eelgrass, cold-water corals, etc.) should be avoided as practicable. All vessels in coastal waters will operate in a manner to minimize propeller wash and seafloor disturbance and transiting vessels should follow deep-water routes (e.g., marked channels), as practicable, to reduce disturbance to sturgeon and sawfish habitat. No impacts on wetlands or other coastal habitats would occur from the Foundation Testing due to the distance of over 16 nm between the Lease Area and the nearest shoreline.
Ocean Resources	Ocean Resources Policy #1-3 (MA)	The proposed Foundation Testing will not affect any state-regulated aquaculture, marine mineral resource extraction, or offshore sand and gravel extraction as described in the MA CMP Ocean Resources Policies #1, #2, and #3, respectively. No hazardous impacts to commercial navigation are anticipated as a result of the proposed Foundation Testing, including the MA designated Areas of Concentrated Existing Water Dependent Uses.
Fish and Wildlife	NYS Coastal Policies 7, 8, and 9 (NY)	The proposed Foundation Testing will impact up to approximately 1 acre of seafloor habitat but will not affect any significant coastal fish and wildlife habitats. See additional discussion under the Habitat category above. The proposed Foundation Testing will not result in the introduction of hazardous wastes and other pollutants which bio-accumulate in the food chain or which cause significant sublethal or lethal effect on those resources. The proposed Foundation Testing will have no impact, either positive or negative, on the recreational use of fish and wildlife resources in coastal areas, or on the access to these resources. The proposed action will not impede existing or future utilization of the New York State's recreational fish and wildlife resources.
Commercial and For-Hire Fishing	Affected Uses and Resources (§ 923.84(d) (1)) (NY) NYS Coastal Policy 9 (NY)	During the temporary positioning of the Foundation Testing vessel at each test site, other vessels will be excluded from the immediate area around the testing vessel. Other vessels that may be transiting the area could use local notices to mariners to avoid the areas where activities are being conducted. Commercial and recreational fishing will not be broadly excluded from the Lease Area but rather within the immediate vicinity of Foundation Testing itself. Overall, the vessel presence associated with the Foundation Testing will take place over a short time span of 10-15 days. Further, Beacon Wind will adhere to all Lease Stipulations which include stipulation 4.1.3 that requires that Beacon Wind develop a publicly available Fisheries Communications Plan that describes the strategies that Beacon Wind intends to use for communicating with fisheries stakeholders prior to and during lease activities. Given the small area and duration of the potential impact, and the mitigation measures that Beacon Wind will implement to further

Category	Enforceable Policies: Applicable Coastal Zone Management Rules 1/	Reasonable Foreseeable Coastal Effects (CZMA Coastal Effects)
		reduce potential impacts, effects on commercial and for-hire fishing would be negligible.
Recreational Uses and Resources	Affected Uses and Resources (§ 923.84(d) (1)) (NY) NYS Coastal Policy 21 (NY)	The proposed Foundation Testing will be within the OCS nearly 55 nm from the New York coast and will have no effect on coastal recreational users and resources. Potential impacts on offshore recreational fishing within OCS are described under the category of Commercial and For-Hire Fishing.
Ports and Harbors	MA CMP Ports and Harbors Policies #1-4 (MA) RI SAMP Section 1160.2 (1) and (2) Areas of Particular Concern (RI)	It is anticipated the Foundation Testing will be completed using a single vessel. Any support vessels, as needed, will use existing ports and facilities, including Designated Port Areas in Massachusetts. No new development, expansion, or dredging will be required. No modifications or expansions to existing ports are anticipated as a result of the proposed action. The minor, short-term activities within the OCS would have negligible, if any, impact on land or coastal infrastructure.
Protected Areas, including Wetlands	MA CMP Protected Areas Policies #1-3 (MA) RI SAMP 1160.3 Prohibitions and Areas Designated for Preservation (RI) NYS Coastal Policy 44 (NY)	The proposed action would affect the seafloor within the OCS but would have no direct impact on habitats within coastal waters. However, the proposed action would impact bottom habitat within the NYS Renewable Energy Geographic Location. Up to approximately 1 acre of seafloor would be affected by the Foundation Testing. No known sensitive habitat would be impacted. See additional discussion under the Habitat category. Impacts on marine fish and shellfish from noise from Foundation Testing is generally expected to be limited to avoidance around the short-term testing activities. Thus, potential population-level impacts on fish resulting from Foundation Testing are expected to be negligible. Fish could be exposed to discharges or accidental fuel releases or solid debris releases from the Foundation Testing vessel. The entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during the short duration of testing. Impacts on fish and their habitat, including EFH, from the discharge of waste materials or the accidental release of fuels are expected to be negligible because of the short duration of testing activity by a single vessel operating in the Lease Area. No impacts on wetlands or other coastal habitats would occur from the Foundation Testing due to the distance of over 16 nm between the Lease Area and the nearest shoreline.
Public Access	MA CMP Public Access Policy #1 (MA) RI SAMP 1160.2 Areas of Particular Concern NYS Coastal Policies 19 and 20 (NY)	No impacts to public recreation areas, or access to public water related recreation resources or the publicly-owned foreshore or water's edge, are anticipated as a result of the proposed Foundation Testing. The proposed action would have no impact on existing access points, and no new onshore coastal structures would be built if the proposed action is implemented. The Lease Area is not located within the RI Area of Particular Concern for recreational boating and sailboat racing.

Category	Enforceable Policies: Applicable Coastal Zone Management Rules 1/	Reasonable Foreseeable Coastal Effects (CZMA Coastal Effects)
Agricultural Lands	NYS Coastal Policy 26 (NY)	The proposed Foundation Testing will be within the OCS nearly 55 nm from the New York State coastline and will have no effect on agricultural lands in New York State's coastal area.
Water Quality	MA CMP Water Quality Policy #1 (MA) (Point Source) MA CMP Water Quality Policy #2 (MA) (Nonpoint Source) MA CMP Water Quality Policy #2 (MA) (Groundwater Discharges) Section 401 of the Clean Water Act (33 U.S.C. 1251 et seq.) (MA, RI) NYS Coastal Policies 30 and 34 (NY)	The routine activities associated with the proposed Foundation Testing which could impact water quality include vessel operational discharges such as bilge and ballast water and sanitary waste. Discharges of these materials are expected to be small, temporary in nature, consistent with discharges from other vessels operating in the area of the OCS. No such discharges would occur within state waters. Coastal and ocean circulation would disperse and biodegrade discharges quickly and water quality impact would be negligible to minor. No trash or debris discharge would be expected. Seabed contact, penetration, and removal by the suction bucket and reference frame would cause an increase in turbidity and create sediment plumes. Because the suction bucket will be lowered to the seabed in a very slow and controlled manner (less than 13 inches per second), sediment plumes resulting from contact with the seafloor are expected to be limited to the immediate surrounding circumference of the suction bucket and at minimal heights from the seabed. Suctioning to embed the suction bucket into the substrate is not expected to cause increased turbidity or other measurable impacts to water quality. The suction pump will operate at a typical rate of approximately 392 yd^3/hour (300 m^3/hour). Seawater from the suction pumps would be displacing water from within the suction bucket to directly outside; therefore, there would be no thermal impacts or other water quality impacts. Removal of the foundation by reversing pumps to flow into the suction bucket would also have no impact on water quality, as any potential disturbed sediment will be contained within the suction bucket. Upon lifting of the foundation, any residual disturbed sediments may cause increased turbidity directly below and in the immediate vicinity of the activity. While some disturbed sediments could be carried by currents at the seafloor, these plumes would be minimal and disperse rapidly. Therefore, sediment disturbance is not expected to cause cumulative or long-lasting impacts to water quality. The proposed action will not include groundwater discharges, dredging, or any municipal, industrial, or commercial discharge of pollutants. Overall impacts on coastal water quality as a result of the proposed Foundation Testing would be negligible to minor.
Air Resources	NYS Coastal Policies 41, 42, and 43 (NY)	The closest point of land to the proposed Foundation Testing is approximately 19 nautical miles (nm) (22 statute miles, 35 km) northeast of the Lease Area on Nantucket, Massachusetts. The closest point of land in New York State is Montauk Point, approximately 55 nm (63 statute miles, 102 km) northwest of the Lease Area. The geographic area included in a National Ambient Air Quality Standards (NAAQS) designation is limited to areas that are either within a state or territory's actual area, or that are within 3 nm of a state or territory's seaward boundary. The entire Lease Area is more than 3 nm from the seaward boundary of New York State.

Category	Enforceable Policies: Applicable Coastal Zone Management Rules 1/	Reasonable Foreseeable Coastal Effects (CZMA Coastal Effects)
		Air monitoring for NAAQS compliance and other relevant data, including ambient background concentrations of regulated air pollutants, occurs at continuous ambient monitoring stations at onshore locations near the Lease Area. However, data from ambient monitoring stations are generally only considered when conducting dispersion modeling of a project's air emissions, and since the proposed Foundation Testing is a short-term temporary activity, there is no need for air emissions modeling. Potential emission sources for the Foundation Testing activities would be from a single vessel. The vessel associated with these activities would emit criteria air pollutants (nitrogen oxide [NO_X], carbon monoxide [CO], sulfur dioxide [SO_2], particulate matter less than 10 microns in diameter [PM_{10}], particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]), and volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and greenhouse gases (GHGs). The vessel would emit pollutants in federal waters while traveling to and from the Lease Area and during the Foundation Testing activity. The vessel for Foundation Testing will transit from Europe across the Atlantic Ocean over approximately 12 days to a port in eastern Canada (Halifax or St. John's), then transit to the Lease Area. The vessel may briefly cross into Massachusetts state waters as it transits from Canada to the Lease Area, but is not expected to cross into New York State waters. Impacts from pollutant emissions associated with this vessel would likely be localized within the OCS in the immediate vicinity of the Foundation Testing activity. It is anticipated that the Foundation Testing would be completed over a period of approximately 10-15 days over a single vessel trip. The activities may be paused during the mobilization during unfavorable weather, in which case, the vessel would remain within the Lease Area under dynamic positioning. Therefore, the air emissions inventory conservatively assumes 25 vessel days within the Lease Area. Emissions associated with the site assessment activity would be minor based on the estimate of less than 50 tons per year of NO_X and VOCs, 100 tons per year of the other criteria air pollutants, and 25 tons per year of HAPs or 10 tons per year of any individual HAP. The majority of these emissions would occur within the Lease Area and therefore would not affect local onshore air quality in New York State. Additionally, since the emissions are associated with mobile sources, an OCS air permit for these activities will not be required.
Historical Properties, and Scenic Resources	MA CMP Protected Areas Policy #3 (MA) RI Historical Preservation Act and Antiquities Act (RI) RI SAMP Section 1160.1.12-17 Overall Regulatory Standards (RI)	The previous CD prepared in association with the 2014 BOEM EA is applicable to the proposed Foundation Testing activities and potential impacts on historic properties and scenic resources. In support of the Foundation Testing SAP Amendment, Beacon Wind also conducted a site-specific Archaeological Site Characterization Report that evaluated a Preliminary Area of Potential Effects (PAPE) consisting of an area 984 by 984 ft (300 by 300 m) with a depth of 66 ft (20 m) below the seafloor at each of 26 potential Foundation Testing sites. The report included analysis of high-resolution geophysical data including gradiometer, side-scan sonar, and sub-bottom profiler datasets that identified four magnetic anomalies and 23 acoustic contacts within the PAPE. None of the magnetic anomalies or acoustic contacts are indicative of submerged cultural resources or ancient submerged landforms (ASLFs). The PAPE for the Foundation

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Category	Enforceable Policies: Applicable Coastal Zone Management Rules 1/	Reasonable Foreseeable Coastal Effects (CZMA Coastal Effects)
	RI SAMP Section 1160.2.3{i) Areas of Particular Concern (RI) NYS Coastal Policies 23, 24, and 25 (NY)	Testing activities avoids identified potential archaeological resources by a minimum of 164 ft (50 m). Beacon Wind's Qualified Marine Archaeologist recommends no further archaeological work at the 26 test installation locations within the PAPE. In accordance with 30 CRF § 585.802 and Addendum C § 4.3.7 of the Lease, if an unanticipated archaeological resource is discovered during Foundation Testing, seafloor-disturbing activities will immediately halt within the area of discovery. Beacon Wind will comply with the notification requirements in its unanticipated archaeological resources discovery plan. The potential impacts on scenic resources from Foundation Testing would be negligible. The action includes temporary and short-term vessel activity located over 16, 43, and 55 nm from the nearest shoreline in Massachusetts, Rhode Island, and New York, respectively and does not include placement of permanent infrastructure. Given the distance of the proposed activities from shore, the fact that no new coastal infrastructure would be necessary, and the small amount of temporary vessel traffic associated with the proposed action, impacts on scenery and onshore cultural resources would be short-term and negligible. The proposed Foundation Testing activities have the potential to affect historic and post-contact historic properties. However, based on information generated in the Archaeological Site Characterization Report and implementation of the unanticipated discoveries requirement, the potential for Foundation Testing activities to have an adverse effect (i.e., cause significant impact or damage) on historic properties is negligible. Visual impacts on onshore cultural resources or scenery would be short-term and negligible.

1/ The following policies from the respective state CMPs are not applicable to the proposed temporary Foundation Testing activities within the OCS and are therefore not included in this table:

- MA CMP: Coastal Hazards Policy #4; Growth Management Policy #3; Ports and Harbors Policy #1, 2, 3, 4, and 5; Public Access Policy #2; and Water Quality Policy #3 (Massachusetts Office of Coastal Zone Management, Policy Guide. October 2011).
- NYS CMP Policies 1, 2, 3, 4, 5, 6, 10, 11, 13, 16, 17, 22, 28, 31, 32, 33, 35, 36, 37, 38, 39, and 40 (New York State Department of State Coastal Management Program, State Coastal Policies. June 2017).

Attachment 2

2014 BOEM CZMA Consistency Determination for MA Wind Energy Area

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

Coastal Zone Management Act, Consistency Determination
(15 CFR 930.36(a))

Wind Energy Area Offshore the Commonwealth of Massachusetts

The U.S. Department of the Interior (DOI), Bureau of Ocean Energy Management (BOEM) has prepared this Consistency Determination (CD) to determine whether issuing leases and approving site assessment activities (including the installation, operation and decommissioning of meteorological towers and buoys) within the Wind Energy Area (WEA) offshore Massachusetts (Figure 1) is consistent to the maximum extent practicable with the provisions identified as enforceable by the Coastal Management Programs (CMPs) of the Commonwealth of Massachusetts and State of Rhode Island. This document is provided pursuant to the requirements of 15 CFR 930.39(a) of the Coastal Zone Management Act (CZMA) Federal Consistency regulations.

Section 307(c) (1) of the CZMA, as amended, requires that each Federal agency activity within or outside the coastal zone affecting any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of federally-approved state management programs.

The Commonwealth of Massachusetts and State of Rhode Island share common coastal management issues and have similar enforceable policies as identified by their respective CMPs. Due to the proximity of the WEA to both states (Figure 1), and their shared impacts on environmental and socioeconomic resources and uses, BOEM has prepared a single CD for the Massachusetts WEA.

BOEM is proposing to issue commercial wind energy leases within the Massachusetts WEA (as illustrated in Figure 1 and described below) and approve site assessment activities that would be conducted to determine whether the leases are suitable for, and would support commercial-scale wind energy production. These leases would not authorize the lessee to construct or operate any wind energy project on the Outer Continental Shelf (OCS).

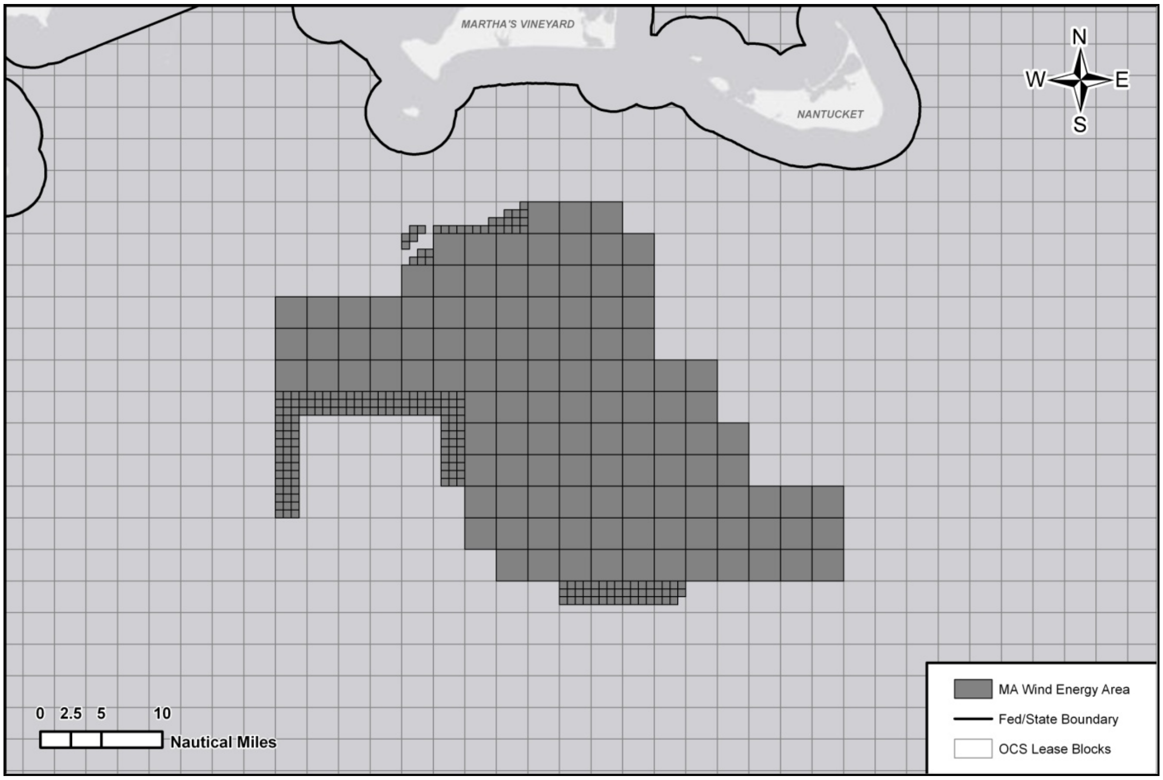

Figure 1: Massachusetts Wind Energy Area

In November 2009, BOEM established the Massachusetts Intergovernmental Renewable Energy Task Force and began working with the task force to develop an area offshore of Massachusetts to be considered for commercial wind leasing.

On December 29, 2010, BOEM published a Request for Interest (RFI) in the *Federal Register*. After considering public comments on the RFI and based on further consultation with the Task Force, the potential WEA was refined to avoid shipping lanes, traffic separation schemes, recommended routes, the Nantucket Lightship Habitat Closure Area and commercial fishing areas of interest (resulting in the removal of the eastern half of the RFI). On February 6, 2012, BOEM published the Call for Information and Nominations (77 FR 5820) and the Notice of Intent to prepare an Environmental Assessment (77 FR 5830) in the *Federal Register*.

On May 30, 2012, BOEM announced the Area Identification (Area ID) by designating the WEA offshore and Massachusetts as shown in Figure 1 and summarized in Table 1 (below).

Table 1: Massachusetts Wind Energy Area

Wind Energy Area (WEA)	Official Protraction Diagrams	Size (sq nautical miles (nm))	Distance to Shore (nm)	Minimum Water Depth (ft)	Maximum Water Depth (ft)
MA	Providence NK 19-07, Block Island Shelf NK 19-10, Hydrographer Canyon NK 19-11	877	12	108	207

Activities that would occur over the site assessment period of these leases (i.e. up to five years) include site characterization survey activities and site assessment activities involving the construction, operation, maintenance and decommissioning of meteorological towers and buoys. Site characterization surveys would inform a lessee about site specifics of a lease area in order to prepare for submission of either a Site Assessment Plan (SAP) or a Construction and Operations Plan (COP). The projected site characterization and site assessment activities which will occur within the WEA are discussed in detail in Section 2 and summarized in Table 2 (below).

Table 2: Projected Site Characterization & Assessment Activities in the WEA

Potential Leaseholds	Site Characterization Activities			Site Assessment Activities	
	High Resolution Geophysical (HRG) Surveys (Total Trips)	Sub-bottom Sampling (Total Trips)	Avian and Fish Surveys	Installation of Met Towers (max)	Installation of Met Buoys (max)
Up to 5	1,500	668-2,700	420-600	5	10

1. BACKGROUND

BOEM is authorized to issue leases on the OCS for the purposes of wind energy development pursuant to Section 388 of the Energy Policy Act of 2005 (EPAct). On April 22, 2009, BOEM promulgated regulations implementing this authority at 30 CFR Part 585. The regulations establish a program to grant leases, easements and rights-of-way (ROWs) for orderly, safe and environmentally responsible renewable energy development activities, such as the siting and construction of offshore wind facilities on the OCS as well as other forms of renewable energy such as marine hydrokinetic (i.e., wave and current). The Minerals Management Service (MMS) prepared a programmatic Environmental Impact Statement (EIS) to evaluate the impact of establishing of a comprehensive, nationwide MMS Alternative Energy Program on the OCS (*Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Programmatic Environmental Impact Statement*, October, 2007 (Programmatic EIS.) The final rule and the Programmatic EIS can be reviewed for reference on the BOEM website at: http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx and: http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Guide-To-EIS.aspx

On July 3, 2012, BOEM released the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf (OCS) Offshore Massachusetts Revised Environmental Assessment* (EA) (enclosed) and available online at: http://www.boem.gov/Commercial-Wind-Leasing-Offshore-Massachusetts. The EA analyzes the reasonably foreseeable consequences associated with two distinct BOEM actions in the WEA:

(1) Lease issuance (including reasonably foreseeable consequences associated with shallow hazards, geological, geotechnical, archaeological resources, and biological surveys); and

(2) SAP approval (including reasonably foreseeable consequences associated with the installation of a meteorological tower(s) and meteorological buoys).

BOEM does not issue permits for shallow hazards, geological, geotechnical or archaeological resource surveys. However, since BOEM regulations require that a lessee include the results of these surveys in its application for SAP and COP approval, the EA treats the environmental consequences of these surveys as reasonably foreseeable consequences of issuing a lease.

2. PROPOSED ACTION DESCRIPTION

Offshore Site Characterization Surveys

BOEM regulations require that a lessee provide the results of a number of surveys with both a SAP and a COP, including: a shallow hazards survey, a geological survey, biological surveys, a geotechnical survey, and an archaeological resource survey (30 CFR 585.626(a)(1) to (a)(5), respectively). BOEM refers to these surveys as “site characterization” activities.

Site characterization activities (e.g., locating shallow hazards, cultural resources and hard-bottom areas; evaluating installation feasibility; assisting in the selection of appropriate foundation system designs, and determining the variability of subsurface sediments) would necessitate using high-resolution geophysical (HRG) surveys and geotechnical exploration. The purpose of the HRG survey would be to acquire geophysical shallow hazards data and information pertaining to the presence or absence of archaeological resources and to conduct bathymetric charting. The purpose of geotechnical exploration would be to assess the suitability of shallow foundation soils for supporting a structure 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 structures and cables. The results of geotechnical exploration allow for a thorough investigation of the stratigraphic and geo-engineering properties of the sediment that may affect the foundations or anchoring systems of a meteorological tower or buoy, which would be necessary for BOEM to consider in a SAP, or later a COP, for a given lease.

Site characterization activities would also necessitate vessel and/or aerial surveys to characterize three primary biological resources categories: (1) benthic habitats; (2) avian resources; and (3) marine fauna. BOEM does not anticipate lessees needing to conduct separate surveys to characterize the benthic habitats which could be affected by their potential future leasehold activities because the geological and geotechnical surveys would provide enough detailed information for BOEM to adequately assess potential impacts on benthic habitats in the area. For lessees to describe the state of the avian and marine fauna resources, resource surveys would generally involve simple visual observation, either from a vessel or aircraft. For avian and marine fauna surveys, multi-year assessment periods may be necessary to capture natural seasonal and inter-annual variability of marine fauna within the WEA and immediate surroundings if current data available is not sufficient to determine spatial and temporal distribution of species. It is generally envisioned that the fish, marine mammal, sea turtle, and bird aerial and shipboard surveys could be conducted simultaneously.

It is assumed that the site of a meteorological tower or buoy would be surveyed first to meet the similar data requirements for a lessee’s SAP (30 CFR 585.610 and 585.611), and the site of a meteorological tower or buoy would not be resurveyed when the remainder of the leasehold is surveyed to meet the data requirements for a lessee’s COP (30 CFR 585.626(a)).

Meteorological Towers and Buoys

A typical meteorological tower consists of a mast mounted on a foundation anchored to the seafloor. The mast may be either a monopole or a lattice (similar to a radio tower). The mast and data collection devices would be mounted on a fixed or pile-supported platform (monopile, jackets, or gravity bases) or floating platform (spar, semi-submersible or tension-leg). Once installed, the top of a meteorological tower would be 90-115 meters (295-377 feet) above mean sea level. Total installation time for one meteorological tower would take eight days to ten weeks depending on the type of structure installed, and the weather and ocean conditions. The foundation pile(s) for a fixed platform could range from either a single 10-foot (3-meter)-diameter monopile or a steel jacket with three to four 36-inch-diameter (91 cm-diameter) piles. The monopile or piles would be driven anywhere from 25 to 100 feet (8 to 30 meters) into the seafloor. The area of ocean bottom affected by a meteorological tower would range from about 0.0046 acre (0.002 hectare), if supported by a monopile, to 0.046 acres (0.02 hectares) if supported by a jacket foundation. The final foundation selection would be included in a detailed SAP submitted to BOEM along with the results of SAP-related site characterization surveys prior to BOEM consideration for approval.

While a meteorological tower has been the traditional device for characterizing wind conditions, several companies have expressed their interest in installing one or two meteorological buoys per lease instead. Meteorological buoys can be used as an alternative to a meteorological tower in the offshore environment for collecting wind, wave, and current data. The EA assumes that, should a lessee choose to employ buoys instead of meteorological towers, it would install a maximum of two buoys per lease. These meteorological buoys would be anchored at fixed locations and regularly collect observations from many different atmospheric and oceanographic sensors. There are three primary types of buoys BOEM anticipates will be used for meteorological resource data collection: discus-shaped hull buoys; boat-shaped hull buoys; and spar-type buoys. Discus-shaped and boat-shaped buoys are typically towed or carried aboard a vessel to the installation location. A discus-type buoy would use a combination of chain, nylon and buoyant polypropylene materials, while a boat-shaped buoy would be moored using an all-chain mooring. 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. Then the mooring anchor is dropped. Transport and installation vessel anchoring would typically require one day for these types of buoys. A spar-type buoy would require two distinct phases for installation with typically a total of 2-3 days to install. The total area of bottom disturbance associated with a spar-type buoy and installation vessel anchors would be roughly 785 square feet (73 square meters).

To obtain meteorological data, scientific measurement devices consisting of anemometers, vanes, barometers and temperature transmitters would be mounted either directly on a tower, buoy, or on instrument support arms. A meteorological tower or buoy also could accommodate environmental monitoring equipment, such as avian monitoring equipment (e.g., radar units, thermal imaging cameras), acoustic monitoring for marine mammals, data-logging computers, power supplies, visibility sensors, water measurements (e.g., temperature, salinity), communications equipment, material hoist, and storage containers.

To measure the speed and direction of ocean currents, Acoustic Doppler Current Profilers (ADCPs) would likely be installed on or near a meteorological tower or buoy. The ADCP is a remote-sensing technology which transmits sound waves at a constant frequency and measures the ricochet of the sound wave off fine particles or zooplanktons suspended in the water column. The ADCPs may be mounted independently on the seafloor, or to the legs of the platform, or attached to a buoy. A typical ADCP is about 1 to 2 feet tall (approximately 0.3 to 0.6 meters) and 1 to 2 feet wide (approximately 0.3 to 0.6 meters).

A SAP describes the activities (e.g., installation of meteorological towers and/or buoys) a lessee plans to perform for the assessment of the wind resources and ocean conditions at its commercial lease (30 CFR 585.605). No site assessment activities could take place on a lease until BOEM has approved a lessee's SAP (30 CFR 585.600(a)). Once approved, the site assessment term for a commercial lease is five years from the date of SAP approval (30 CFR 585.235(a)(2)). It is assumed that each lessee would install some type of data-collection device (e.g., meteorological tower, buoy, or both) on its lease area to assess the wind resources and ocean conditions of the leasehold. This information would allow the lessee to determine whether the lease is suitable for wind energy development, where on the lease it would propose development, and what form of development to propose in a COP.

A lessee must submit a COP at least six months before the end of the site assessment term if the lessee intends to continue to the lease's operations term (30 CFR 585.601(c)). If the COP describes continued use of existing facilities, such as a meteorological tower or buoy approved in the SAP, a lessee may keep such facilities in place on their lease during BOEM review of the COP for approval (30 CFR 585.618(a)), which may take up to two years. If, after the technical and environmental review of a submitted COP, BOEM determines that such facilities may not remain in place throughout the operations term, a lessee must initiate the decommissioning process (30 CFR 585.618(c)). Depending on how long it takes to install a meteorological tower, whether a lessee submits a COP (or the lease expires) and/or how long subsequent COP approval would take, BOEM anticipates that a meteorological tower would be present for approximately five years before the agency decides whether to allow the tower to remain in place for the lease's operations term or whether the tower should be decommissioned immediately.

Coastal Activity

Specific ports used by lessees would be determined in the future and primarily by proximity to the lease blocks, capacity to handle the proposed activities, and/or established business relationships between port facilities and lessees. Existing ports or industrial areas which are likely to be used by lessees in support of the proposed action to occur in Massachusetts, Rhode Island, and Connecticut. Because these port facilities are adequate to support proposed action activities, expansion of port facilities to meet lessee needs is not anticipated, and, therefore, only existing facilities which can currently accommodate proposed site characterization and site assessment activities are considered.

Key determinants of where a lessee would choose to stage its operations include prior site assessment proposals, proximity to lease blocks, capacity to handle the proposed activities, and/or established business relationships between port facilities and lessees.

In order to survey all of the potential leases in the WEA, site characterization surveys would have to use multiple vessels and would likely take place over several years, considering there may be up to five leases awarded. Preferred vessels could accommodate all of the necessary survey equipment and could conduct as many surveys simultaneously. BOEM anticipates that 65 to 100 feet long vessels would be used, depending on availability. Vessels must be able to accommodate a crew for several days and be large enough to mount enough cable to tow instruments. Survey vessels would use existing ports and harbors for trip departures and returns and require a diesel refueling station. Vessels conducting HRG surveys and geotechnical exploration work can either depart from one of the ten major ports or from one of the 21 smaller ports identified in the EA. Because the survey vessels used for HRG surveys and geotechnical exploration are smaller than most commercial ocean-going vessels and require a smaller navigation channel depth, survey vessels can use most existing commercial ports in the Massachusetts and Rhode Island coastal area. Because anticipated offshore site characterization work is generally smaller in scale than other activities within existing ports, port infrastructure requirements are also likely to be smaller. Because of their proximity to the WEA, the majority of onshore activities would be divided among existing commercial and/or smaller ports in Massachusetts and Rhode Island.

Vessel Traffic

Approximately 2,808 to 6,500 total vessel round trips are anticipated to occur as a result of the proposed action over a five year period. Approximately 2,588 to 4,800 of these vessel trips (round trips) would be associated with all site characterization surveys as a result of the proposed action over five years, from 2013 to 2018. The total vessel traffic estimated as a result of the installation, decommissioning, and routine maintenance of the meteorological towers and meteorological buoys that could be reasonably anticipated in connection with the proposed action would range from 220 to 1,700 round trips over a five-year period.

The total vessel traffic estimated as a result of the HRG surveys and geotechnical exploration work that could be reasonably anticipated in connection with the proposed action would range from about 2,168 to 4,200 round trips over five years and spread over existing and available port facilities in Rhode Island and Massachusetts. In addition, BOEM presumes 420 to 600 extra independent surveys conducted to characterize avian resources under the proposed action.

Should each potential lessee decide to install a meteorological tower on its leasehold, a total of 200 round trips are estimated for construction (40 trips per tower multiplied by 5 towers [see Table 3-6 of the EA]). These vessel trips may be spread over multiple construction seasons as a result of the various times at which lessees acquire their leases, weather and sea state conditions, the time to assess suitable site(s), the time to acquire the necessary permits, and the availability of vessels, workers, and tower components. Because the decommissioning process would basically be the reverse of construction, vessel usage during decommissioning would be similar to vessel usage during construction, so another 200 round trips are estimated for decommissioning of towers. Meteorological buoys would typically take 1 to 2 days to install by one vessel, and 1 to 2 days to decommission by one vessel. Maintenance trips to each meteorological tower may occur weekly to quarterly, and monthly to quarterly for each buoy. However, to provide for a conservative scenario, total maintenance vessel trip calculations are based on weekly trips for towers and monthly trips for buoys over the entire 5-year period (see Table 3-6 of the EA). The total vessel traffic estimated as a result of the installation, decommissioning, and routine maintenance of the meteorological towers/buoys that could be anticipated in connection with the proposed action is anticipated to be between 220 and 1,700 round trips over a 5-year period.

3. STATE ENFORCEABLE POLICIES

As part of this CD, BOEM has evaluated and documented in the enclosed table (Table 3), policies identified by Massachusetts and Rhode Island as enforceable, applicable offshore and coastal resources or uses, and CZMA "reasonably foreseeable coastal effects" that might be expected for activities conducted under the proposed action. While reviewing and making these determinations on the policies the states have identified as enforceable in this CD, BOEM has considered the common enforceable policies identified by each of the two states as enforceable in their CMP as listed in Table 3.

4. CONSISTENCY DETERMINATION

BOEM has evaluated all applicable enforceable policies of Massachusetts and Rhode Island and the potential activities resulting from the proposed action. This CD has examined whether the proposed action described in Section 1 is consistent to the maximum extent practicable with the policies and provisions identified as enforceable by the CMPs of Massachusetts and Rhode Island (see Table 3). Based on the preceding information and analyses, and the incorporated-by-reference Programmatic EIS and the EA, BOEM has determined the proposed action will be consistent to the maximum extent practicable with the policies that Massachusetts and Rhode Island have identified as enforceable.

Table 3: Applicable Enforceable Policies for the Coastal Management Programs for Massachusetts and Rhode Island		
CATEGORY	**ENFORCEABLE POLICIES: APPLICABLE COASTAL ZONE MANAGEMENT RULES**	**REASONABLY FORESEEABLE COASTAL EFFECTS (CZMA COASTAL EFFECTS)**
Coastal Hazards	Coastal Hazards Policies #1 - 4 (MA) Massachusetts Wetland Protection Act (M.G.L. c.131,§40) (MA) Massachusetts General Law Chapter 91 (MA) RI SAMP Section 1160.2.3 Areas of Particular Concern (RI) RI SAMP Section 1160.3 - 4 Prohibitions and Areas Designated for Preservation (RI)	See Section 4.2.2.4 of the environmental assessment (EA) for additional information on impacts to coastal habitats and coastal wetland habitats and ecosystems. For the proposed action, a maximum of approximately 6,500 vessel trips from site characterization and assessment activities are projected to occur over a 5-year period if the entire Wind Energy Area (WEA) were leased and the maximum number of site characterization surveys were conducted in the lease areas of the WEA. Indirect impacts from routine activities may occur from wake erosion caused by vessel traffic in support of the proposed action. These trips would be divided among New Bedford, Providence, Quonset Point, New London, and Groton, slightly increasing traffic in already heavily used waterways. If all ports are used equally, this would average 268 round trips per year to each of the ports in Massachusetts, Rhode Island, and Connecticut. Wake erosion and sedimentation effects would be limited to approach channels and the coastal areas near ports and bays used to conduct activities. Given the existing amount and nature of vessel traffic (including tanker ships, container ships, and other very large ships) into and out of the ports (see Section 4.2.3.8 of the EA), there would be a negligible, if any, increase to wake-induced erosion of associated channels based on the relatively small size and number of vessels associated with the proposed action. Moreover, all approach channels to these ports are armored, and speed limits would be enforced, which also helps to prevent most erosion. Non-routine events such as spills can occur in a channel or bay from several activities, such as transit of WEA-related vessels to or from the ports, survey activities in the WEA, or installation, maintenance, and decommissioning of meteorological towers and buoys. Should a spill occur in a channel or bay and contact shore, the impacts on coastal habitats would depend on the type of material spilled, the size and location of the spill, the meteorological conditions at the time, and the speed with which cleanup plans and equipment could be employed. These impacts are expected to be minimal because vessels are expected to comply with USCG regulations at 33 CFR 151 relating to the prevention and control of oil spills. Based on the distance from shore where these activities would occur and the rapid evaporation and dissipation of diesel fuel, a spill occurring in the WEA

		would likely not contact shore. Collisions between vessels and allisions between vessels and meteorological towers and buoys are unlikely. However, if a vessel collision or allision were to occur, and in the unlikely event that a spill would result, the most likely pollutant to be discharged into the environment would be diesel fuel. Diesel dissipates very rapidly in the water column, then evaporates and biodegrades within a few days (MMS, 2007b), resulting in negligible, if detectable, impacts to the area of the spill. Existing fabrication sites, staging areas, and ports in Massachusetts, Rhode Island, and Connecticut would support survey, construction, operation, and decommissioning activities as discussed in Section 3.1.4.4 of the EA. No expansion of these existing areas is anticipated in support of the proposed action. Existing channels could accommodate the vessels anticipated to be used, and no additional dredging would be required as a result of the proposed action. Impacts on coastal habitats could occur from an accidental diesel fuel spill and if this does occur, it is expected to be localized and temporary, and therefore negligible. No dunes, beaches, coastal banks, marshes, or wetlands will be altered as a result of the proposed action. No proposed activities will remove, fill, dredge or alter any barrier beach or wetland resource area as defined under Massachusetts Wetlands Protection Act M.G.L. c. 131, §40 and Massachusetts Coastal Management Program's (CMP) Coastal Hazards Policy #1. No installation or expansion of existing coastal infrastructure or of a coastal engineering structure, or a nonwater-dependent project, as defined under MA CMP Coastal Hazards Policy #1, is anticipated to occur as a result of the proposed action. The proposed action will not interfere with water circulation or sediment transport processes, alter bottom topography, increase erosion, or impact littoral drift volumes, as defined in the MA CMP's Coastal Hazards Policy #2. No state or federally-funded public works projects, as defined in the MA CMP's Coastal Hazards Policy #3, will occur as a result of the proposed action.
Energy	Energy Policy #1 (MA)	The proposed action does not include the consideration or approval of any commercial wind energy facility. The purpose of the proposed action is to assess the wind resources in the lease area and characterize the environmental and socioeconomic resources and conditions so that a lessee can determine whether the site is suitable for future commercial development and, if so, submit a Construction and Operations Plan (COP) for BOEM review. Since no entity is currently in a position to submit a COP (as no entity has yet been awarded a lease or acquired the necessary leasehold information to formulate such a plan), and since the specific information contained in such a plan would be determined by the reasonably foreseeable environmental consequences associated with the development of any lease, no coastally dependent energy facilities are anticipated to be constructed as a result of the proposed action; and no wind power generation facilities will be part of the proposed activities.

Habitat	Habitat Policy #1 – 2 (MA) RI SAMP Section 1160.3 Prohibitions and Areas Designated for Preservation (RI)	The proposed action will not adversely impact coastal, estuarine, and marine habitats, nor will the proposed action interrupt the ecosystem services provided by these habitats, as defined in CMP's Habitat Policy #1. The proposed action is subject to oversight and regulation under the enforceable standards of the Massachusetts Ocean Management Plan as contained in Appendix 5 of the MA Office of Coastal Zone Management's October 2011 Policy Guide. No potential adverse impacts to coastal, estuarine, and marine habitats, including designated Special, Sensitive and Unique Resources Areas under the MA Ocean Management Plan, are anticipated as a result of the proposed action and leases will engage in all feasible measures to avoid, minimize, and mitigate damage to any coastal, estuarine, and marine habitat, as described in CMP's Habitat Policy #2. No impact to Areas Designated for Preservation within the RI Ocean Special Area Management Plan (SAMP), which are afforded additional protection than Areas of Particular Concern, are anticipated as a result of the proposed action. The proposed action does not include underwater cables within Areas Designated for Preservation, although underwater cables are exempt from existing prohibition of any Large-Scale Offshore Development, mining and extraction of minerals, or other development that has been found to be in conflict with the intent and purpose of an Area Designated for Preservation within the Ocean SAMP. No mining and extraction of minerals, including sand and gravel, from tidal waters and salt ponds would occur as a result of the proposed action. No impacts to Critical Habitat under the Endangered Species Act would occur as a result of the proposed action. In addition, the proposed action does not include the disposal of dredged material in the following Areas of Particular Concern: historic shipwrecks and archaeological or historic sites; offshore dive sites; navigation, military, and infrastructure areas; and moraines. All disposal of dredged material, as defined in and subjected to regulations of RI Coastal Resources Management Plan (CRMP) Section 300.9, will be conducted in accordance with the U.S. EPA and U.S. Army Corps of Engineers' manual, *Evaluation of Dredged Material Proposed for Ocean Disposal*. Routine activities in the WEA (described in Section 3.1 of the EA) would not have direct impacts on coastal benthic resources and coastal benthic habitats because the proposed site assessment activities would take place at least 12 nautical miles (nmi) from the shore. Direct impacts from the proposed action on benthic habitats would be limited to short-term disturbance and only minimal removal of available benthic habitat in the long-term. Sensitive benthic areas such as coral reefs, hard-bottom areas, seagrass beds, and chemosynthetic communities would be avoided when placing meteorological towers and buoys.

		Section 4.2.2.4.2 of the EA, which describes the reasonably foreseeable impacts of the proposed action on wetland ecosystems, concludes that no direct impacts on wetlands or other coastal habitats would occur from routine activities in the WEA based on the distance of the WEA from shore. Additionally, existing ports or industrial areas in Massachusetts, Rhode Island, and Connecticut are expected to be used in support of the proposed project. No expansion of existing facilities is expected to occur as a result of the proposed action. Indirect impacts from routine activities may occur from wake erosion and associated added sediment caused by increased traffic in support of the proposed action. Given the volume and nature of existing vessel traffic in the area, a negligible increase of wake-induced erosion may occur. Should an incidental diesel fuel spill occur as a result of the proposed action, the impacts on coastal habitats are expected to be negligible.
Ocean Resources		The proposed action will not adversely affect any state-regulated aquaculture, marine mineral resource extraction, or offshore sand and gravel extraction as described in CMP's Ocean Resources Policies #1, #2, and #3, respectively. No hazardous impacts to commercial navigation are anticipated as a result of the proposed action, including the MA designated Areas of Concentrated Existing Water Dependent Uses. The MA WEA avoids Areas of High Intensity Commercial Marine Traffic, defined as having 50 or more vessel counts within a 1-km by 1-km grid, in RI state waters. Buoys associated with the proposed action are not anticipated to result in significant environmental consequences when added to the existing buoys offshore of MA and RI. While approximately 2,808 to 6,500 round trips are expected for site characterization and assessment activities associated with the proposed action over a five-year period, this is relatively minor when compared with existing vessel traffic from commercial shipping, personal recreational vessels, passenger vessels, military vessels, and commercial/recreational fishing vessels (see Section 4.2.3.8 of the EA).
Ports and Harbors	Ports and Harbors Policy #1 – 4 (MA) RI SAMP Section 1160.2 (1) and (2) Areas of Particular Concern (RI)	All vessels associated with the proposed action will use existing ports and facilities, including Designated Port Areas (DPAs) in Massachusetts. No new dredging is anticipated as a result of the proposed action. BOEM anticipates that all staging activities for meteorological tower construction and meteorological buoy deployment will occur at existing facilities (including DPAs in Massachusetts). BOEM does not anticipate the development or expansion of port facilities as a result of the proposed action. No modifications or expansions to existing ports are anticipated as a result of the proposed action. The increase in activities associated with site characterization and the installation/operation of the meteorological towers and buoys would not measurably impact current or projected land use or coastal infrastructure for several reasons: existing large to small commercial ports and harbors or

		industrial areas comprising the coastal infrastructure in MA and/or RI are expected to be used when implementing the proposed action, and the few structures in the WEA would have a small footprint and would be dispersed over a wide area of ocean. Impacts on land use and coastal infrastructure for site characterization and assessment activities are expected to be very low.
Protected Areas	Protected Areas Policy #1 – 3 (MA) RI SAMP Section 1160.2 Areas of Particular Concern (RI) RI SAMP 1160.3 Prohibitions and Areas Designated for Preservation (RI)	HRG survey noise on marine fish and shellfish are generally expected to be limited to avoidance around the HRG survey activities and short-term changes in behavior. Thus, potential population-level impacts to fish resulting from HRG surveys are expected to be negligible. Meteorological tower construction noise could disturb normal behaviors. As discussed in the analysis of HRG surveys, behavioral reaction may include avoidance of, or flight from, the sound source. Fish that do not flee the immediate action area during pile-driving procedures could be exposed to lethal SPLs. However, the SOCs (see Appendix B), including the implementation of a "soft start" procedure, will minimize the possibility of exposure to lethal sound levels. As a result of the small geotechnical exploration footprint, BOEM expects this activity would have negligible benthic effects that could affect fish species and their habitat, including EFH, which may occur in the WEA. Impacts related to meteorological tower/buoy installation, operation, and decommissioning are expected to be minor and are not expected to result in changes in local fish community assemblage and diversity. Pursuant to Rhode Island's Federal Consistency List (Table 2, viii) a Federal consistency review must occur for "meteorological towers deployed in lease blocks within the Area of Mutual Interest (AMI area) between Rhode Island and Massachusetts where mobile gear fishing activity is prevalent (OCS lease blocks 6816, 6817, 6864, 6865, 6866, 6867, 6914, 6915, 6916, 6964, 6965, 6966, 6967, 6968, 7014, 7015, 7016, 7017, 7018, 7019, 7020, 7021, 7064, 7065, 7066, 7067, 7068, 7069, 7070, 7071, 7114, 7115, 7116, and 7117". However, the deployment of meteorological towers in lease blocks within the AMI area where mobile gear fishing is not prevalent (OCS lease blocks 6764, 6765, 6766, 6814, 6815, 6917, 6918, 6919, 6969, 6970, and 6971) is considered to have either no reasonably foreseeable coastal effect or insignificant effects and does not warrant federal consistency review. Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. The entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during normal operations. Impacts on fish and their habitat, including EFH, from the discharge of waste materials or the accidental release of fuels are expected to be minor because of the small number of structures and vessels

		involved with construction, operation, and decommissioning. See Section 4.2.2.5 of the EA for additional information on Finfish, Shellfish, and Essential Fish Habitat. No direct impacts on wetlands or other coastal habitats would occur from routine activities in the WEA based on the distance of the WEA from shore. Additionally, existing ports or industrial areas in Massachusetts, Rhode Island, and Connecticut are expected to be used in support of the proposed project. No expansion of existing facilities is expected to occur as a result of the proposed action. Indirect impacts from routine activities may occur from wake erosion and associated added sediment caused by increased traffic in support of the proposed action. Given the volume and nature of existing vessel traffic in the area, a negligible increase of wake-induced erosion may occur. Should an incidental diesel fuel spill occur as a result of the proposed action, the impacts on coastal habitats are expected to be negligible. See Section 4.2.2.4 of the EA for additional information on Coastal Habitats. Meteorological towers installed under the proposed action would likely not be visible from shore based on the narrow profile of the structure; distance from shore; and earth curvature, waves, and atmosphere. While lighting on meteorological towers may be visible from several miles away at night, the tower lighting would be faint and difficult to distinguish from other lighting present (e.g., vessel traffic). Existing ports and other onshore infrastructure are capable of supporting site assessment activities with no expansion (see Section 3.1.2). Visual impacts to onshore cultural resources would be limited and temporary in nature and would consist predominately of vessel traffic, which most likely also would not be distinguishable from existing vessel traffic. Therefore, the likelihood of impacts on onshore cultural resources from meteorological structures and from construction vessel traffic also would be very low (see Appendix H). See Section 4.2.3.4 Recreation and Visual Resources of the EA for additional information on Aesthetics and Visual Impacts. BOEM does not anticipate impacts to public recreation areas in MA and RI as a result of the proposed action. No new onshore coastal structures would be built if the proposed action is implemented, and the amount of associated vessel traffic is expected to be small, thereby limiting the number of potential spills. Additionally, because the WEA is proposed to be located more than 12 nm offshore, there would be no visual impacts on recreational resources. Impacts may occur as a result of the proposed from marine trash and debris. However, it is unlikely that this debris would be differentiated from other sources of trash in the area. See Section 4.2.3.4 of the EA for additional information on public recreation areas.

		BOEM does not anticipate any new coastal development as a result of the proposed action. Scenic rivers will not be impacted as a result of the proposed action. The proposed action is not anticipated to impact historical resources physically, visually, audibly, or atmospherically. Meteorological towers installed under the proposed action would likely not be visible from shore based on the narrow profile of the structure; distance from shore; and earth curvature, waves, and atmosphere. While lighting on meteorological towers may be visible from several miles away at night, the tower lighting would be faint and difficult to distinguish from other lighting present (e.g., vessel traffic). Existing ports and other onshore infrastructure are capable of supporting site assessment activities with no expansion (see Section 3.1.2 of the EA). Visual impacts to onshore cultural resources would be limited and temporary in nature and would consist predominately of vessel traffic, which most likely also would not be distinguishable from existing vessel traffic. Bottom-disturbing activities have the potential to affect pre-contact and cultural resources. However, existing regulatory measures, information generated for a lessee's initial site characterization activities, and the unanticipated discoveries requirement make the potential for bottom-disturbing activities (e.g., coring, anchoring, and installation of meteorological towers and buoys) to have an adverse effect (i.e., cause significant impact or damage) on cultural resources very low. See Section 4.2.3.1 of the EA for additional information on Cultural Resources. See the Historical Properties section below for additional information on Historic/archeological resources. The MA WEA is located in water depths greater than 20 meters (65.6 ft.) and therefore is not located in a sea duck foraging habitat Area Designated for Preservation (RI Ocean SAMP 1160.3 1(i)). See Section 4.2.2.1 of the EA for additional information on birds. In addition, areas of high sea duck occurrence were removed from the MA Call Area during the Area Identification process. These areas have been excluded from leasing consideration. See Section 1.5.2 of the EA for additional information. No modifications or expansions to existing ports are anticipated as a result of the proposed action. All vessels associated with the proposed action will use existing ports and facilities, including DPAs in Massachusetts. No dredging is anticipated as a result of the proposed action. BOEM anticipates that all staging activities for meteorological tower construction and meteorological buoy deployment will occur at existing facilities (including DPAs in Massachusetts). BOEM does not anticipate the development or expansion of port facilities as a result of the proposed action.
Public Access	Public Access Policy #1 (MA)	No direct impacts on wetlands or other coastal habitats would occur from routine activities in the WEA based on the distance of the WEA from shore. Additionally, existing ports or industrial areas

	RI SAMP 1160.2 Areas of Particular Concern (RI)	in Massachusetts, Rhode Island, and Connecticut are expected to be used in support of the proposed project. No expansion of existing facilities is expected to occur as a result of the proposed action. Indirect impacts from routine activities may occur from wake erosion and associated added sediment caused by increased traffic in support of the proposed action. Given the volume and nature of existing vessel traffic in the area, a negligible increase of wake-induced erosion may occur. Should an incidental diesel fuel spill occur as a result of the proposed action, the impacts on coastal habitats are expected to be negligible. The proposed action is not anticipated to restrict public use and general enjoyment of the water's edge. See Section 4.2.2.4 of the EA for additional information on Coastal Habitats. The proposed action is not anticipated to impact historical resources physically, visually, audibly, or atmospherically. Meteorological towers installed under the proposed action would likely not be visible from shore based on the narrow profile of the structure; distance from shore; and earth curvature, waves, and atmosphere. While lighting on meteorological towers may be visible from several miles away at night, the tower lighting would be faint and difficult to distinguish from other lighting present (e.g., vessel traffic). Existing ports and other onshore infrastructure are capable of supporting site assessment activities with no expansion (see Section 3.1.2 of the EA). Visual impacts to onshore cultural resources would be limited and temporary in nature and would consist predominately of vessel traffic, which most likely also would not be distinguishable from existing vessel traffic. See the Historical Properties section below for additional information on Historic/archeological resources. BOEM does not anticipate impacts to public recreation areas in MA and RI as a result of the proposed action. No new onshore coastal structures would be built if the proposed action is implemented, and the amount of associated vessel traffic is expected to be small, thereby limiting the number of potential spills. Additionally, because the WEA is proposed to be located more than 12 nm offshore, there would be no visual impacts on recreational resources. Impacts may occur as a result of the proposed from marine trash and debris. However, it is unlikely that this debris would be differentiated from other sources of trash in the area. See Section 4.2.3.4 of the EA for additional information on public recreation areas. The WEA is not located within the RI Area of Particular Concern for recreational boating and sailboat racing. The proposed action is not anticipated to have an adverse impact on recreational resources.
Water Quality	Water Quality Policy #1 (MA) (Point Source)	The routine activities associated with the proposed action whichwould impact coastal and marine water quality include vessel discharges (including bilge and ballast water and sanitary waste) and structure installation and removal. Additional information on water quality and impacts to coastal

	Water Quality Policy #2 (MA) (Nonpoint Source) Water Quality Policy #3 (MA) (Groundwater Discharges) Section 401 of the Clean Water Act (33 U.S.C. 1251 et seq.) (MA, RI)	and marine water quality can be found in Section 4.2.1.4 of the EA. The USEPA National Pollutant Discharge Elimination System (NPDES) storm water effluent limitation guidelines control storm water discharges from support facilities such as ports and harbors. Activities associated with staging and fabrication of the meteorological towers and buoys would account for a very small amount of activity at existing port facilities during staging, anticipated to take eight days to ten weeks (*see* "Installation" in Section 3.1.4.1 of the EA). The proposed action is not anticipated to increase runoff or onshore discharge into harbors, waterways, coastal areas, or the ocean environment. No entrainment or impingement of marine organisms from once-through cooling or for process water is anticipated as a result of the proposed action. Site characterization surveys are described in Section 3.1.3 of the EA and include HRG surveys, geotechnical surveys, and biological surveys. These surveys are performed during cruises where specialized instrumentation is typically attached to the survey vessel, either through the hull or in packages towed behind the vessel. Other instrumentation, such as dredges and grab samplers, Vibracores, and deep coring devices, are placed on the bottom to acquire data or samples. All of this instrumentation is self-contained with no discharges to affect the water quality in the WEA, including hydrography, nutrients, chlorophyll, DO, or trace metals. Survey vessels performing these characterization surveys may affect water quality both during the surveys in the WEA, as well as traveling to and from shore facilities. Vessels generate operational discharges that can include bilge and ballast water, trash and debris, and sanitary waste. Details of these waste discharges and the governing regulations are discussed in Section 3.1.3.5 of the EA. In the event of failure of the onboard equipment for treating such waste, water quality could be compromised, particularly in nearshore areas. However, in the WEA, coastal and oceanic circulation and the large volume of water would disperse, dilute, and biodegrade vessel discharges relatively quickly, and the water quality impact would be minor. Meteorological and oceanographic data collection towers and buoys are described in Section 3.1.4 of the EA. The construction and deployment of such equipment would disturb the seabed via anchoring, pile driving, and placement of scour protection devices. However, because the equipment is compact, only small, local changes in water quality (turbidity) in the vicinity of the structures would occur. The small changes would likely affect only approximately to 30 to 40 square ft (3 to 4 square m) in the vicinity of the equipment, assuming the area of influence is approximately 3 ft (1 m) above the equipment with a radius of one to two length scales around the equipment. These small changes would cease to occur during operation of towers and buoys.

		Impacts on water quality as a result of the proposed action would be minor. The instrumentation used for site characterization is self-contained, so there would be no discharges to affect the water quality in the WEA. Although there would be operational discharges from vessels during site characterization surveys, the coastal and oceanic circulation and large water volume would disperse, dilute, and biodegrade vessel discharges, so impacts on water quality would be minor. The disturbance to the seabed during construction and deployment of towers and buoys would cause small, localized impacts on the water quality in the vicinity of the structures. However, these small, localized impacts would cease during operation of the towers and buoys. Activities associated with the proposed action will follow Total Maximum Daily Load (TMDL) guidelines designed for specific watersheds within the WEA and will follow established state water quality standards for protecting public health and maintaining the designated beneficial uses of those waters. Vessels, generators, and pile-driving hammers used during site characterization and site assessment activities in the WEA and along potential transmission corridors comprise multiple sources of diesel fuel, lubricating oil, and hydraulic oil. Spills could occur during refueling or other fluid exchange or as the result of an allision or collision. A vessel allision with meteorological structures or collision with other vessels may result in a spill of diesel fuel, lubricating oil, or hydraulic oil. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. Spills are not projected to have significant impacts due to the small size of a projected spill. A spill could occur while en route to and from the WEA, but this is considered unlikely. If a spill were to occur, either inside or outside of the WEA, the estimated spill size would be small. Vessel allision with a meteorological buoy containing a diesel-powered generator may also occur. It is estimated that a buoy generator could contain 240 gallons of diesel fuel (Fishermen's Energy of New Jersey, LLC 2011 *as cited in* USDOI, BOEM, OREP 2012). If a diesel spill of this size were to occur, it would be expected to dissipate very rapidly in the open ocean, then evaporate and biodegrade within a few days. Impacts on coastal and marine waters from vessel discharges associated with the proposed action are expected to be of short duration and remain minimal and no significant impacts are expected. Sediment disturbance resulting from anchoring and coring would be short-term, temporarily impacting local turbidity and water clarity. As a result, sediment disturbance resulting from the proposed action is not anticipated to result in any significant impact on any area in Massachusetts or Rhode Island coastal waters. Since collisions and allisions occur infrequently and rarely result in oil spills, the risk of a spill would be small. In the unlikely event of a fuel, lubricating oil, or hydraulic oil spill, minimal impacts would be expected because the spill would very likely be small and would dissipate and biodegrade within a short time. As a result, if a spill occurred, the potential impacts on

		water quality are not expected to be significant. Moreover, storms may disturb surface waters and cause a faster dissipation of diesel if spilled, but impacts on water quality would be negligible and of a short duration. Therefore, impacts from vessel discharges, sediment disturbance, and potential spills associated with the proposed action on water quality of harbors, ports, coastal areas, and in the WEA are expected to be minor. Vessel discharges may affect water quality when vessels are traveling to and from the WEA and during site characterization surveys and site assessment activities in the WEA. Vessel discharges include bilge and ballast water and sanitary waste. Bilge water discharges may occur in nearshore and offshore waters provided that the effluent is processed by an approved oily water separator and the oil content is less than 15 parts per million. In navigable waters of the United States, vessels may not discharge any effluent that contains oil that causes a sheen on the surface of the water or an emulsion beneath the water, which is a violation of 40 CFR 110. Bilge water that cannot be discharged in compliance with these standards must be retained onboard the vessel for subsequent discharge at an approved port reception facility per 33 CFR 151.10(f). Ballast water is used to maintain stability of the vessel and may be pumped from coastal or marine waters. Generally, the ballast water is pumped into and out of separate compartments and is not usually contaminated with oil; however, the same discharge criteria for bilge water apply to ballast water (33 CFR 151.10). Ballast water also may be subject to the USCG's Ballast Water Management Program to prevent the spread of aquatic nuisance species. Vessels traveling through portions of the WEA that are outside the 12 nm- boundary could release bilge water and ballast water into the ocean. Gray water from vessels is not regulated outside state waters, and vessel operators may discharge gray water outside state waters. Since the WEA is outside state waters, it would be likely that vessels would discharge gray water while operating on the OCS. However, oceanic circulation and the volume of water increasingly serve to disperse, dilute, and biodegrade such contaminants, and while the discharge of bilge water, ballast water and gray water may affect the water quality locally and temporarily, the potential impacts from vessels associated with the proposed action, are expected to be minor. All vessels transiting in both MA and RI state waters would comply with boat sewage no discharge areas. No development on barrier beaches is anticipated to occur as a result of the proposed action due to the use of existing facilities. No expansion of existing facilities is anticipated as a result of the proposed action. The activities associated with the proposed action will not adversely affect the characteristics of Area of Critical Environmental Concern (ACEC) of the Commonwealth of Massachusetts (see

		Sections 4.2 and 4.7 of the EA for additional information).
Historical Properties	Protected Areas Policy #3 (MA) Rhode Island Historical Preservation Act and Antiquities Act (RI) RI SAMP Section 1160.1.12-17 Overall Regulatory Standards (RI) RI SAMP Section 1160.2.3(i) Areas of Particular Concern (RI)	The potential impact of the proposed action on cultural and historic resources has been evaluated in accordance with the National Historic Preservation Act and Antiquities Act, and additional information on Recreation and Visual Resources is located in Section 4.2.3.4 of the EA. See Section 4.2.3.1of the EA for additional information on impacts to cultural resources. The proposed action is not anticipated to impact historical resources physically, visually, audibly, or atmospherically. Meteorological towers installed under the proposed action would likely not be visible from shore based on the narrow profile of the structure; distance from shore; and earth curvature, waves, and atmosphere. Simulations were developed for the proposed action and assumed red flashing lighting would be implemented at the base and top of the towers; these simulations are provided in Appendix H of the EA. While lighting on meteorological towers may be visible from several miles away at night, the tower lighting would be faint and difficult to distinguish from other lighting present (e.g., vessel traffic). Weather conditions would also significantly limit the visibility; and fog, haze, clouds, or rough seas would likely prevent any potential visibility of the towers and lighting. For site assessment activities, the proposed action considers the impacts of construction and operation of up to five meteorological towers and up to 10 meteorological buoys. Although the construction of meteorological towers and buoys impacts the bottom, the lessee's SAP must be submitted to and approved by BOEM prior to construction. To assist BOEM in complying with the National Historic Preservation Act (NHPA) (see Section 5.3.4 of the EA) and other relevant laws (30 CFR 585.611(a),(b)(6)), the SAP must contain a description of the archaeological resources that could be affected by the activities proposed in the plan. Under its Programmatic Agreement (Appendix G of the EA), BOEM will then consult to ensure potential effects to historic properties are avoided, minimized, or mitigated under Section 106 of the NHPA. BOEM anticipates that bottom disturbance associated with the installation of meteorological towers and buoys would disturb the seafloor in a maximum radius of 1,500 ft (450 m) or 162 acres (65 hectares) around each bottom-founded structure. This includes all anchorages and appurtenances of the support vessels. Impacts on archaeological resources within 1,500 ft (450 m) of each meteorological tower and buoy would result from direct destruction or removal of archaeological resources from their primary context. Although this would be extremely unlikely given that site characterization surveys described above would be conducted prior to the installation of any structure (see e.g., 30 CFR 585.610 and 585.611), should contact between the activities associated with the proposed action and a historic or pre-contact site occur, there may be damage or loss to archaeological resources.

		Should the surveys reveal the possible presence of an archaeological resource in an area that may be affected by its planned activities, the applicant would have the option to demonstrate through additional investigations that an archaeological resource either does not exist or would not be adversely affected by the seafloor/bottom-disturbing activities (see 30 CFR 585.802(b) and the PA in Appendix G of the EA). Although site assessment activities have the potential to affect cultural resources either on or below the seabed or on land, existing regulatory measures, coupled with the information generated for a lessee's initial site characterization activities and presented in the lessee's SAP, make the potential for bottom-disturbing activities (e.g., anchoring, installation of meteorological buoys and/or towers) to damage to cultural resources very low. Impacts (including physical, visual, audible, and atmospheric) to shore-based historic resources are not anticipated to occur as a result of the proposed action, either directly or indirectly, from any proposed development activity. All new development (i.e., meteorological towers and buoys) has been reviewed in consultation with the Massachusetts Historical Commission (MHC) and with other consulting parties. BOEM has prepared a PA to guide its Section 106 activities for these undertakings pursuant to 36 CFR 800.14(b) (see Appendix G). Consulting parties invited to be signatories to the PA included the SHPOs of Rhode Island and Massachusetts, the Mashpee Wampanoag Tribe, the Narragansett Indian Tribe, the Wampanoag Tribe of Gay Head (Aquinnah), and the ACHP. The PA provides for Section 106 consultation to continue through both the leasing process and BOEM's decision making process regarding the approval, approval with modification, or disapproval of lessees' SAPs and allows a phased identification and evaluation of historic properties. The PA also establishes a process for determining and documenting the areas of potential effect for each undertaking to further identify historic properties located within these areas. If a historic property is found to be listed in, or is eligible for listing in, the National Register of Historic Places this established process assesses potential adverse effects and helps to avoid, reduce, or resolve any potential adverse effects. Although not all parties invited to participate in the development of the PA chose to sign the agreement, the PA has been executed and is in effect.

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

MAY 27 2014

Mr. Grover Fugate
Executive Director
Coastal Resources Management Council
Stedman Office Building
4808 Tower Hill Road
Wakefield, Rhode Island 02879-1900

Dear Mr. Fugate:

This document provides the State of Rhode Island with the Bureau of Ocean Energy Management's (BOEM) Consistency Determination (CD) for the Wind Energy Area (WEA) offshore the Commonwealth of Massachusetts, under the Coastal Zone Management Act (CZMA) Section 307 (c)(1) and 15 CFR Part 930 Subpart C. The information in this CD is provided pursuant to 15 CFR 930.36(a) and 930.39. The CD takes into consideration the reasonably foreseeable coastal effects of the proposed action and its consistency with the enforceable policies identified by Rhode Island's Coastal Zone Management Program. The proposed action includes:

- Lease issuance (including reasonably foreseeable consequences associated with shallow hazards, geological, geotechnical, archaeological resources, and biological surveys); and
- SAP approval (including reasonably foreseeable consequences associated with the installation of a meteorological tower(s) and meteorological buoys).

BOEM's analysis of the effects of the proposed action on land and water uses and/or natural resources can be found in the enclosed *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment* (EA). The Rhode Island Coastal Zone Management Program's applicable enforceable policies and reasonably foreseeable coastal effects are included in Table 3 (enclosed) for your review.

Based upon the above referenced information, data and analysis, BOEM finds the proposed action consistent to the maximum extent practicable with the enforceable policies of the Rhode Island Coastal Zone Management Program.

Pursuant to 15 CFR 930.41, the Rhode Island Coastal Zone Management Program has 60 days from the receipt of this letter in which to concur with or object to this CD, or request an extension under 15 CFR 930.41(b). Rhode Island's concurrence will be presumed if its response is not received by BOEM within 60 days of receipt of this determination. The State's response should be sent to:

Bureau of Ocean Energy Management
Office of Renewable Energy Programs
Environment Branch for Renewable Energy
Attn: Ms. Michelle Morin, Chief
381 Elden Street, HM 1328
Herndon, Virginia 20170-4817

We appreciate having a cooperative working relationship with the State of Rhode Island as we move forward with our review of potential offshore renewable energy activities.

Sincerely,

Maureen A. Bornholdt
Program Manager
Office of Renewable Energy Programs

Enclosures

State of Rhode Island and Providence Plantations
Coastal Resources Management Council
Oliver H. Stedman Government Center
4808 Tower Hill Road, Suite 3
Wakefield, RI 02879-1900

(401) 783-3370
Fax (401) 783-3767

August 6, 2014

Ms. Maureen A. Bornholdt
Program Manager
Office of Renewable Energy Programs
United States Department of the Interior
Bureau of Ocean Energy Management
Washington, DC 20240-0001

RECEIVED
AUG 13 2014
Office of Renewable Energy Programs

RE: **CRMC File No. 2014-06-095** - Federal Consistency Determination for Lease issuance and Site Assessment Plan (SAP) approval associated with the Wind Energy Area (WEA) located offshore of the Commonwealth of Massachusetts.

Dear Ms Bornholdt:

In accordance with Title 15 of the Code of Federal Regulations, Part 930, Subpart C (Consistency for Federal Activities) and review your letter dated May 27, 2014 including the attached Federal Consistency Determination (received by this office on June 17, 2014); the Rhode Island Coastal Resources Management Council hereby concurs with the determination that the referenced project is consistent with the federally approved Rhode Island Coastal Resources Management Program and applicable regulations therein.

Please contact this office at (401) 783-3370 should you have any questions.

Sincerely,

Grover J. Fugate

Grover J. Fugate, Executive Director
Coastal Resources Management Council

/lat

United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
WASHINGTON, DC 20240-0001

MAY 27 2014

Mr. Bruce Carlisle
Director
Office of Coastal Zone Management
Executive Office of Environmental Affairs
251 Causeway Street, Suite 800
Boston, Massachusetts 02114

Dear Mr. Carlisle:

This document provides the Commonwealth of Massachusetts with the Bureau of Ocean Energy Management's (BOEM) Consistency Determination (CD) for the Wind Energy Area (WEA) offshore the Commonwealth of Massachusetts under the Coastal Zone Management Act (CZMA) Section 307 (c)(1) and 15 CFR Part 930 Subpart C. The information in this CD is provided pursuant to 15 CFR 930.36(a) and 930.39. The CD takes into consideration the reasonably foreseeable coastal effects of the proposed action and its consistency with the enforceable policies identified by Massachusetts's Coastal Zone Management Program. The proposed action includes:

- Lease issuance (including reasonably foreseeable consequences associated with shallow hazards, geological, geotechnical, archaeological resources, and biological surveys); and
- SAP approval (including reasonably foreseeable consequences associated with the installation of a meteorological tower(s) and meteorological buoys).

BOEM's analysis of the effects of the proposed action on land and water uses and/or natural resources can be found in the enclosed *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment* (EA). The Commonwealth of Massachusetts's Coastal Zone Management Program's applicable enforceable policies and reasonably foreseeable coastal effects are included in Table 3 (enclosed) for your review.

Based upon the above referenced information, data and analysis, BOEM finds that proposed action is consistent to the maximum extent practicable with the enforceable policies of the Massachusetts Coastal Zone Management Program.

Pursuant to 15 CFR 930.41, the Massachusetts Coastal Zone Management Program has 60 days from the receipt of this letter in which to concur with or object to this CD, or to request an extension under 15 CFR 930.41(b). Massachusetts's concurrence will be presumed if its response is not received by BOEM within 60 days of receipt of this determination. The Commonwealth's response should be sent to:

Bureau of Ocean Energy Management
Office of Renewable Energy Programs
Environment Branch for Renewable Energy
Attn: Ms. Michelle Morin, Chief
381 Elden Street, HM 1328
Herndon, Virginia 20170-4817

We appreciate having a cooperative working relationship with the Commonwealth of Massachusetts as we move forward with our review of potential offshore renewable energy activities.

Sincerely,

Maureen A. Bornholdt
Program Manager
Office of Renewable Energy Programs

Enclosures

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
OFFICE OF COASTAL ZONE MANAGEMENT
251 Causeway Street, Suite 800, Boston, MA 02114-2136
(617) 626-1200 FAX: (617) 626-1240

July 29, 2013

Maureen Bornholdt
U.S. Department of the Interior
Bureau of Ocean Energy Management
Washington, DC 20240-0001

Re: CZM Federal Consistency Review of the Revised Environmental Assessment For Commercial Wind Lease Issuance and Site Assessment Activities on the Outer Continental Shelf Offshore Massachusetts; Statewide.

Dear Ms. Bornholdt:

The Massachusetts Office of Coastal Zone Management (CZM) has completed its review of the proposed commercial wind lease issuance and site assessment activities on the outer continental shelf offshore of Massachusetts

Based upon our review of applicable information, we concur with your finding that the proposed activity is not reasonably likely to directly or indirectly affect any of Massachusetts' coastal uses and resources and find that the activity's effects on resources and uses in Massachusetts coastal zone as proposed are consistent with the CZM enforceable program policies.

If the above-referenced project is modified in any manner, including any changes resulting from permit, license or certification revisions, including those ensuing from an appeal, or the project is noted to be having effects on coastal resources or uses that are different than originally proposed, it is incumbent upon the proponent to notify CZM, submit an explanation of the nature of the change pursuant to 15 CFR 930, and submit any modified state permits, licenses, or certifications. CZM will use this information to determine if further federal consistency review is required.

Thank you for your cooperation with CZM.

Sincerely,

Bruce K. Carlisle
Director

BKC/rlb
CZM# 14279

STATE OF NEW YORK
DEPARTMENT OF STATE
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99 WASHINGTON AVENUE
ALBANY, NY 12231-0001
HTTPS://DOS.NY.GOV

KATHY HOCHUL
GOVERNOR

ROBERT J. RODRIGUEZ
SECRETARY OF STATE

March 4, 2024

Sindey Chaky
Bureau of Ocean Energy Management
45600 Woodland Road
Mailstop VAM–OREP
Sterling, VA 20166
Sindey.Chaky@boem.gov

Re: F-2024-0031 (DA)
Bureau of Ocean Energy Management
Temporary (10-15 day) foundation testing of suction bucket equipment at up to 26 sites as an amendment to Beacon Wind's previously approved Site Assessment Plan. Lease Area OCS-A 0520
Concurrence with Consistency Determination

Dear Sindey Chaky:

The Department of State received the Bureau of Ocean Energy Management (BOEM)'s Consistency Determination and supporting information for this proposed Federal Agency Activity (15 CFR 930 Subpart C) on January 18, 2024.

The Department of State has completed its review of BOEM's consistency determination regarding the consistency of the above proposed federal agency activity with the New York State Coastal Management Program.

Based upon the information submitted, the Department of State concurs with BOEM's consistency determination regarding this matter.

When communicating with us regarding this matter, please contact Marika Krupitsky at Marika.Krupitsky@dos.ny.gov and refer to our file #F-2024-0031 (DA).

Sincerely,

Matthew P. Maraglio
Director, Development Division
Office of Planning, Development and Community Infrastructure

MM/rf/mk
ecc: BOEM – Laura Lee Wolfson, Lisa Landers, Jessica Stromberg
USACE New York District – Christopher Minck

State of Rhode Island
Coastal Resources Management Council
Oliver H. Stedman Government Center
4808 Tower Hill Road, Suite 116
Wakefield, RI 02879-1900

Phone (401) 783-3370
Fax (401) 783-3767

March 15, 2024

Ms. Jessica Stromberg, Chief
Environmental Branch for Renewable Energy
Office of Renewable Energy Programs
Bureau of Ocean Energy Management
45600 Woodland Road
Sterling, VA 20166

RE: **CRMC File 2024-01-046**
RI CRMC Federal Consistency Review, Site Assessment Plan Amendment, Beacon Wind Lease Area (OCS-A-0520) on the Outer Continental Shelf

Dear Ms. Stromberg,

The Coastal Resources Management Council (CRMC) is in receipt of the Bureau of Ocean Energy Management's (BOEM) Consistency Determination (CD) for the Site Assessment Plan (SAP) Amendment for proposed activities on the Outer Continental Shelf (OCS) in the Beacon Wind Lease Area OCS-A-0520. The CD was received by this office via email on **January 17, 2024**. The proposed action would consist of BOEM's approval of the SAP Amendment which provides for foundation testing trials using suction bucket technology to collect site-specific data to better inform and support engineering design of wind turbine and substation foundations within the Lease Area. Testing would be conducted by repeatedly using a single suction bucket in up to 35 trials at 26 sites within the Lease Area.[1]

I. Coastal Zone Management: Federal consistency

The proposed action is a direct Federal activity subject to the Coastal Zone Management Act (CZMA) at 16 U.S.C. § 1456(c) and the CZMA's implementing regulations at 15 C.F.R. Part 930 Subpart C. The project area is located on the OCS outside of Rhode Island's 2011 and 2018 geographic location description (GLD) areas but may have reasonably foreseeable coastal effects on Rhode Island coastal resources/uses. Thus, BOEM has submitted a CD stating the proposed action will be carried out in a manner which is consistent to the maximum extent practicable[2] with

[1] *See* Beacon Wind Foundation Testing Consistency Determination at 3-4.
[2] *See* 15 C.F.R. § 930.39; *see also* Beacon Wind Foundation Testing Consistency Determination at 1.

the applicable enforceable policies of the Rhode Island Coastal Resources Management Plan (RI CRMP) located at 650-RICR-20-05-11.10.[3]

II. The Proposed Action as it relates to applicable enforceable policies

Based on the description of the proposed action in the CD, the CRMC finds the action will be conducted in a manner consistent to the maximum extent practicable with Rhode Island's enforceable policies. The action will not have significant or population level impacts to finfish, shellfish and crustacean species targeted by commercial and recreational fishermen or those species habitats.[4] No known sensitive habitats would be impacted. Foundation testing activities will be short term in nature requiring approximately 10-15 days with allowances for adverse weather conditions in addition to 13-16 days for transit. Overall bottom disturbance is expected to be approximately one acre (0.028 acre per location) with suction bucket penetration up to 39 ft. Testing should take an estimated six to nine hours, further limiting the amount of disturbance. Furthermore, acoustic impacts will be greatly reduced as compared to noise generated from pile-driving, further reducing impacts to commercially targeted species. Overall, effects on commercial and for-hire fishing would be negligible.

III. Concurrence

The Rhode Island CRMC has determined that based on the information provided in the CD, the requirements of 15 C.F.R. § 930.36 are satisfied and the CRMC is issuing a **concurrence** for the proposed action.

Please contact Kevin Sloan (ksloan@crmc.ri.gov) should you have any questions regarding this concurrence.

Sincerely,

Jeffrey M. Willis, Executive Director
Coastal Resources Management Council

[3] *See* § 11.10 (Ocean SAMP enforceable policies). The Consistency Determination appears to site outdated Ocean SAMP regulations/format. The SAMP has since been reorganized, renumbered, and codified in the Rhode Island Code of Regulations. https://rules.sos.ri.gov/regulations/Part/650-20-05-11
[4] *See* 650-RICR-20-05-11.10.1(H)-(I); 11.10.2(A)-(C).

BOEM did not receive a consistency determination from the Massachusetts Office of Coastal Zone Management. In accordance with 15 CFR § 930.41(a), the federal agency may presume state agency concurrence if the state agency's response is not received within 60 days from receipt of the federal agency's consistency determination and supporting information required by § 930.39(a).