OCS EIS/EA
BOEM 2016-070

Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York

Revised Environmental Assessment

U.S. Department of the Interior
Bureau of Ocean Energy Management
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Author
Bureau of Ocean Energy Management
Office of Renewable Energy Programs

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FINDING OF NO SIGNIFICANT IMPACT

Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf (OCS) Offshore New York

INTRODUCTION

The United States Department of the Interior (USDOI), Bureau of Ocean Energy Management (BOEM) prepared an environmental assessment (EA) to determine whether the issuance of a lease and approval of a site assessment plan (SAP) within the wind energy area (WEA) identified offshore New York would have a significant effect on the environment and whether an environmental impact statement (EIS) must therefore be prepared. BOEM conducted its analysis to comply 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, USDOI regulations implementing NEPA at 43 CFR 46, and USDOI Manual (DM) Chapter 15 (516 DM 15).

BOEM's environmental analysis was limited to the effects of lease issuance, including site characterization (i.e., surveys of the lease area and potential cable routes), and site assessment activities (i.e., construction and operation of a meteorological tower and/or buoys on the lease, if issued) within the WEA offshore New York. The WEA was identified by BOEM in March 2016 as potentially suitable for commercial wind development based on input from the BOEM-led New York Intergovernmental Task Force, comments on the *Notice of Intent to Prepare an Environmental Assessment* (NOI) (79 FR 102), comments on the *Commercial Leasing for Wind Power Development on the Outer Continental Shelf Offshore New York—Call for Information and Nominations* (Call) (79 FR 30645), and input received during public outreach efforts.

On June 6, 2016, BOEM published a Notice of Availability for the *Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York* (81 FR 36344) (the "EA") for a 30-day comment period. In response to stakeholder requests, BOEM extended the public comment period by an additional seven calendar days from the original comment deadline of July 6, 2016, to the extended deadline of July 13, 2016. All public comments received by BOEM can be viewed at http://www.regulations.gov by searching for docket ID BOEM-2016-0038. During the comment period, BOEM held five public meetings in New Jersey, New York, Rhode Island, and Massachusetts to provide an overview of the EA, solicit public comment, and discuss next steps in the environmental review and leasing processes. BOEM revised the EA to address comments received during the public comment period and public meetings, and incorporate the results of consultations. Section 5.1.3 of the revised EA includes a summary of public comments and revisions to the EA. This finding is accompanied by and cites the revised EA.

PURPOSE AND NEED OF THE PROPOSED ACTION

The purpose of the proposed action is to issue a lease and approve a SAP that would allow the lessee to assess the wind energy resources within the proposed lease area offshore New York.

BOEM's issuance of a lease is needed to ensure that survey activities carried out in support of a SAP and construction and operations plan are conducted in a safe and environmentally responsible manner. BOEM approval of a SAP is needed to adequately assess wind and environmental resources of the proposed lease area to determine if some or all areas within the proposed lease area are suitable for, and could support, commercial-scale wind energy production (Section 1.2 of the revised EA).

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the issuance of a commercial wind energy lease within the WEA offshore New York and approval of site assessment activities on that lease. Of the alternatives considered in the revised EA, Alternative A, the proposed action, would result in site characterization and assessment activities over the largest geographic area. One other action alternative and a No Action alternative were also analyzed by BOEM, in full, in this EA. The alternatives are described in Section 2 of the revised EA.

ENVIRONMENTAL ASSESSMENT SUMMARY

The revised EA considers the reasonably foreseeable environmental consequences associated with leasing, site characterization, and site assessment. In particular, the EA analyzed the environmental and socioeconomic impacts of surveys (including shallow hazards, geological, geotechnical, archeological, and biological); the installation, operation, and decommissioning of a meteorological tower and/or two buoys; and associated vessel traffic and onshore activities.

As part of the proposed action and alternatives, BOEM has developed Standard Operating Conditions (SOCs) to reduce or eliminate the potential risks to or conflicts with specific environmental resources (Section 2.5 of the revised EA). These SOCs were developed through the analyses presented in Section 4 of the revised EA and through consultations with other federal agencies (Section 5.3 of the revised EA). A brief summary of the key SOCs are outlined below. All SOCs can be found in Appendix B of the revised EA. If a lease isis issued within all or part of the WEA, BOEM will require the lessee to comply with the SOCs through lease stipulations and/or as conditions of SAP approval.

- Appendix B of the revised EA sets forth SOCs to minimize or eliminate potential impacts to marine mammals, sea turtles, and fish. These conditions include vessel strike avoidance; marine debris prevention; protected species observers; exclusion and monitoring zones; sound source verification, ramp up, soft start, and shutdown procedures; visibility, seasonal, and frequency-dependent restrictions for various activities; and multiple reporting requirements.
- Section B.6 of Appendix B of the revised EA sets forth SOCs to minimize or eliminate potential impacts to avian species including: the use of red flashing aviation obstruction lights; the use of navigation lights that meet the United States Coast Guard (USCG) Private Aids To Navigation requirements for shipping vessels; the requirement that additional lights only be used when necessary and be hooded downward and directed when possible; the requirement that a meteorological tower, if installed, be designed to avoid using guy wires; reporting obligations; and the use of anti-perching devices on the meteorological tower and buoys.

- BOEM's August 2016 *Finding of No Adverse Effect* sets forth conditions for the purposes of meeting its obligations under Section 106 of the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 306108). These conditions include identification and avoidance measures that will be included in a commercial lease issued within the New York WEA to ensure that the proposed undertaking will not adversely affect historic properties (Section 4.4.3.1 of the revised EA).

ALTERNATIVES

BOEM considered the proposed action (Alternative A) and two alternatives. Alternative A, the preferred alternative, is the issuance of a wind energy lease within the WEA offshore New York and approval of site assessment activities (Section 2.1 of the revised EA), except for those aliquots identified as Cholera Bank sensitive habitat by BOEM, specifically aliquots F, G, H, K, and L of OCS Block 6655 (westernmost corner of the New York WEA). While the aliquots transected by the 1 nm (1.9 km) setback line of the two Traffic Separation Schemes (TSSs) (the Hudson Canyon to Ambrose TSS and the Ambrose to Nantucket TSS) that boarder the WEA (Figure 2–1) would be offered for lease, the portions of those aliquots located within 1 nm of the TSSs would not be available for construction or placement of site assessment structures (i.e., a meteorological tower and/or two buoys). Alternative B would offer the same area for lease as Alternative A; however, BOEM would not allow placement of site assessment structures (i.e., a meteorological tower and/or two buoys) within 2 nm (3.7 km) of the two TSSs that border the WEA (Figure 2–2) (Section 2.2 of the revised EA). Under Alternative C, the No Action Alternative (Section 2.3 of the revised EA), a wind energy lease would not be issued, and no site assessment activities would be approved within the WEA offshore New York. Site characterization surveys do not require BOEM approval and could still be conducted under Alternative C; however, a potential lessee is not likely to undertake these activities without a commercial wind energy lease.

Alternative A is generally anticipated to have the greatest environmental consequences of the action alternatives. As a result, Alternative A is the focus of the environmental analysis in the EA, and is the alternative against which the lesser or equal impacts of the other alternatives are compared.

Environmental and Socioeconomic Consequences of Alternative A (Preferred Alternative): The Proposed Action

Like the other action alternative, Alternative A assumes that the lessee would undertake the maximum amount of site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological, and biological surveys) in their leased area. Under Alternative A, BOEM anticipates that up to one meteorological tower or two meteorological buoys, or some combination of a meteorological tower and buoy(s), would be installed. BOEM projects that site characterization and assessment activities would result in 332 to 1,066 round-trips by vessels over a seven year period, likely divided among major and smaller ports in New York and New Jersey. Under Alternative A, as well as the other action alternative, BOEM would require the lessee to comply with various SOCs while conducting activities on their lease, for the purpose of ensuring that potential impacts to the environment are avoided or minimized. The SOCs will be implemented through lease stipulations and/or as conditions of approval of a SAP.

The reasonably foreseeable impacts of Alternative A on environmental resources and socioeconomic conditions are described in detail in Section 4.4 of the revised EA: air quality (Section 4.4.1.1); water quality (Section 4.4.1.2); birds (Section 4.4.2.1); bats (Section 4.4.2.2); benthic resources (Section 4.4.2.3); coastal habitats (Section 4.4.2.4); marine mammals (Section 4.4.2.5); sea turtles (Section 4.4.2.6); finfish, invertebrates, and essential fish habitat (Section 4.4.2.7); ESA-listed fish species (Section 4.4.2.8); military use (Section 4.4.2.9); navigation/vessel traffic (Section 4.4.2.10); cultural, historical, and archaeological resources (Section 4.4.3.1); demographics and employment (Section 4.4.3.2); environmental justice (Section 4.4.3.3); recreation and tourism (Section 4.4.3.4); commercial and recreational fisheries (Section 4.4.3.5); and visual resources (Section 4.4.3.6).

The impact levels BOEM applied throughout the revised EA are derived by BOEM from a four-level classification scheme used to characterize the predicted impacts if the proposal is implemented and activities occur as described (Section 4.1 of the revised EA). This classification scheme was originally defined in the *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf* (MMS, 2007). For most resources analyzed in the revised EA, the reasonably foreseeable impacts for the proposed action described in the EA range from negligible to minor. Potential moderate impacts would be limited to marine mammals and sea turtles, and would only result from noise generated during pile-driving activities. This noise would only occur during the installation of a meteorological tower, and would be temporary.

BOEM's SOCs were developed to minimize or eliminate potential impacts to protected species, including ESA-listed species of marine mammals and sea turtles. These SOCs were developed through the analysis presented in Section 4.4 of the EA, as well as through consultation with other federal and state agencies. This EA considers the SOCs to be part of the proposed action. BOEM anticipates no population impacts to protected species. BOEM will nonetheless request additional consultation with NMFS under Section 7 of the ESA prior to the approval of any activities in a SAP that may affect any ESA-listed species occurring in the proposed lease area offshore New York. Because no critical habitat has been designated in the action area, none will be affected by the action.

With respect to cumulative impacts, the incremental impact of the proposed action, when added to other past, present, and reasonably foreseeable actions that may affect the environment, would be negligible to moderate (Section 4.7 of the revised EA). Moreover, the proposed action would facilitate the gathering of information related to seafloor conditions, biological data, and wind speeds necessary to successfully determine the feasibility of the proposed lease area for commercial wind energy development.

BOEM placed heavy weight on public and stakeholder comments, consultations, and information received through BOEM's outreach efforts. BOEM finds that the issuance of a commercial wind energy lease within the New York WEA and subsequent site characterization and site assessment activities would have no significant impact on the environment. As a result, it is not necessary for BOEM to prepare of an EIS in order to issue a commercial wind energy lease within the New York WEA and approve site assessment activities on that leasehold.

SUPPORTING DOCUMENTS

The revised EA and the following documents support this finding of no significant impact and are available upon request or at www.boem.gov/:

- Comments received in response to the January 4, 2013 Request for Interest (RFI) and the May 28, 2014 Call associated with wind energy planning offshore New York;
- Public response to the May 28, 2014 NOI to prepare this EA;
- Ongoing consultation and coordination with the members of BOEM's New York Intergovernmental Renewable Energy Task Force;
- Ongoing or completed consultations with other federal agencies, including the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the U.S. Department of Defense (DOD), and USCG;
- Research and review of current relevant scientific and socioeconomic literature;
- *Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas: Final Programmatic Environmental Impact Statement*, February 2014 (BOEM, 2014a);
- *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (MMS, 2007a);
- Relevant material from the *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina* (BOEM, 2015a);
- *Atlantic Region Wind Energy Development: Recreation and Tourism Economic Baseline Development, Impacts of Offshore Wind on Tourism and Recreation Economics* (BOEM, 2012a);
- Relevant material from the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment* (BOEM, 2012b);
- *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts* (BOEM, 2013a);
- *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts* (BOEM, 2014b);
- *Revised Environmental Assessment for Virginia Offshore Wind Technology Advancement Project on the Atlantic Outer Continental Shelf Offshore Virginia* (BOEM, 2015b);
- Biological Assessment for *Commercial Wind Lease Issuance, Associated Site Characterization Activities, and Subsequent Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia*, (BOEM, 2012e);
- Relevant material from the Endangered Species Act Section 7 Consultation Biological Opinion for *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* (Atlantic OCS WEAs Biological Opinion) (NMFS, 2013a);

- *Development of Mitigation Measures to Address Potential Use Conflicts between Commercial Wind Energy Lessees/Grantees and Commercial Fishers on the Atlantic Outer Continental Shelf* (BOEM, 2014c);
- New York Department of State *Offshore Atlantic Ocean Study* (NYDOS, 2013);
- *Final Environmental Impact Statement for the Port Ambrose Project Deepwater Port Application* (USCG, 2015a);
- *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (BOEM, 2012c);
- Relevant material from the *Project Plan for the Installation, Operation, and Maintenance of Buoy Based Environmental Monitoring Systems OCS Block 6931, New Jersey* (Fishermen's Energy of New Jersey, LLC, 2011); and
- Relevant material from the *Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey* (MMS, 2009a).

BOEM has conducted several other environmental analyses that were used to inform the revised EA, consistent with the CEQ directive at 40 CFR 1502.21 to incorporate information by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. BOEM has completed five other EAs that evaluated the same site characterization and site assessment activities considered in the revised EA, but in other geographic areas of the Atlantic OCS offshore Massachusetts, Rhode Island, and from New Jersey to North Carolina, each resulting in a finding of no significant impact. These EAs are incorporated by reference in the revised EA for activities offshore New York. These documents are also referenced throughout Section 4.4 of the revised EA as appropriate.

CONCLUSION

I have thoroughly considered the issues and concerns identified in the revised EA and by the public and cooperating and consulting agencies in their comments; the evaluation of the potential effects of the proposed action and alternatives in the attached, revised EA; and the significance factors in 40 CFR 1508.27. It is my determination that there are no substantial questions regarding the reasonably foreseeable impacts of the proposed action or alternatives, and that no reasonably foreseeable significant impacts are expected to occur as the result of the preferred alternative or any of the alternatives contemplated in the revised EA. It is therefore my determination that implementing the proposed action or any of the alternatives would not constitute a major federal action significantly affecting the quality of the human environment under Section 102(2)(C) of the National Environmental Policy Act of 1969. As a result, an EIS is not required, and I am issuing this finding of no significant impact.

Michelle Morin (signature) — 10/21/2016

Michelle Morin
Chief, Environment Branch for Renewable Energy
Office of Renewable Energy Programs

Date

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
μPa	micropascal
μPa^2-s	micropascal squared second
μs	microsecond
ac	acres
ACHP	Advisory Council on Historic Preservation
ADCP	Acoustic Doppler Current Profiler
AIS	automatic identification systems
AOI	Area of Interest
APPS	Act to Prevent Pollution from Ships
Area ID	Area Identification
ASMFC	Atlantic States Marine Fisheries Commission
BOEM	Bureau of Ocean Energy Management
B.P.	before present
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
CH_4	methane
CHIRP	Compressed High Intensity Radar Pulse
cm	centimeters
CO	carbon monoxide
COA	Clean Ocean Action
CODAR	Coastal Ocean Dynamic Applications Radar
COLOS	Coastal Oceanographic Line-of-Sight
ConEd	Consolidated Edison
COP	construction and operation plan
CPT	cone penetrometer test
CWA	Clean Water Act
dB	decibels
dB (RMS)	dB re 1μPa (RMS)
dB_{peak}	peak sound pressure
DOD	U.S. Department of Defense
DP	ducted propeller
DPS	distinct population segments
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration

FCP	Fisheries Communication Plan
FIIS	Fire Island National Seashore
FAO	Food and Agriculture Organization of the United Nations
FLiDAR	floating LiDAR [light detection and ranging]
FSF	Fisheries Survival Fund
ft	feet
ft^2	square feet
G&G	geological and geophysical
GAP	General Activities Plan
GHG	greenhouse gas
GT	gross tonnage
ha	hectares
HAPC	Habitat Areas of Particular Concern
HRG	high-resolution geophysical
Hz	hertz
IPaC	Information for Planning and Consultation
in.	inch/inches
kg	kilograms
kHz	kilohertz
kJ	kilojoules
km	kilometers
km^2	square kilometers
km/hr	kilometers per hour
KOP	Key Observation Point
lb	pound
LiDAR	light detection and ranging
LIPA	Long Island Power Authority
L_{rms}	mammal hearing weighted (M-weighted) sound levels
m	meters
m^2	square meters
M-weighted	mammal hearing weighted
MADMF	Massachusetts Division of Marine Fisheries
MAFMC	Mid-Atlantic Fishery Management Council
MARAD	U.S. Department of Transportation Maritime Administration
MARPOL	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
mi	miles
mi^2	square miles
mm	millimeters
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MOU	Memorandum of Understanding
MPG	Marine Planning Guidelines
MW	megawatts

N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NARW	North Atlantic Right Whale
NCP	National Contingency Plan
n.d.	no date
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NGO	non-governmental organizations
NH_3	ammonia
NHPA	National Historic Preservation Act
NCCOS	National Centers for Coastal Ocean Science
NJDEP	New Jersey Department of Environmental Protection
nm	nautical miles
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOMAD	Naval Oceanographic and Meteorological Automated Device
NOS	National Ocean Service
NO_x	nitrogen oxides
NPS	National Park Service
NRHP	National Register of Historic Places
NWP	Nationwide Permit
NYPA	New York Power Authority
NYSERDA	New York State Energy Research and Development Authority
NYSDEC	New York State Department of Environmental Conservation
O_3	ozone
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OPA	Oil Pollution Act
OPAREA	Military Operating Area
PATON	Private Aids To Navigation
Pb	lead
PEIS	Programmatic Environmental Impact Statement
PM	particulate matter
$PM_{2.5}$	particulate matter with aerodynamic diameters of 2.5 microns or less
PM_{10}	particulate matter with aerodynamic diameters of 10 microns or less
ppt	parts per thousand
PSO	protected species observer
PTS	Permanent Threshold Shift
RFI	Request for Interest
PVC	Polyvinyl chloride
RFMRP	Riverhead Foundation for Marine Research and Preservation

RIDEM	Rhode Island Department of Environmental Management
RMS	root mean square
ROV	remotely operated underwater vehicle
SAP	Site Assessment Plan
SEL	sound exposure level
SEL_{cum}	cumulative sound exposure level
SHPO	State Historic Preservation Office
SMA	Seasonal Management Area
SMAST	School for Marine Science and Technology
SMB	squid, mackerel, butterfish (fisheries)
SO_2	sulfur dioxide
SOC	Standard Operating Condition
SODAR	Sonic Detection and Ranging
SO_x	sulphur oxides
SPL	sound pressure level
SPUE	sightings per unit effort
Task Force	BOEM's New York Intergovernmental Renewable Energy Task Force
TNC	The Nature Conservancy
TSS	Traffic Separation Scheme
TTS	Temporary Threshold Shift
USACE	U.S. Army Corps of Engineers
U.S.	United States
U.S.C.	U.S. Code
USCG	U.S. Coast Guard
USDOI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
VIMS	Virginia Institute of Marine Science
VOC	volatile organic compound
VPG	National Pollutant Discharge Elimination System Vessel General Permit
WEA	Wind Energy Area

1 INTRODUCTION

The United States Department of the Interior (USDOI), Bureau of Ocean Energy Management (BOEM) has prepared this Environmental Assessment (EA) to determine whether the issuance of a lease and approval of a Site Assessment Plan (SAP) within the Wind Energy Area (WEA) offshore New York would lead to reasonably foreseeable significant impacts on the environment and, thus, whether an Environmental Impact Statement (EIS) should be prepared before a lease is issued.

1.1 Background

1.1.1 BOEM Authority and Regulatory Process

The Energy Policy Act of 2005, Public Law 109-58, added Section 8(p)(1)(C) to the Outer Continental Shelf Lands Act (OCSLA), which authorized the Secretary of the Interior to issue leases, easements, or rights-of-way on the Outer Continental Shelf (OCS) for the purpose of wind energy development (43 U.S.C. § 1337[p][1][C]). The Secretary of the Interior delegated this authority to the former Minerals Management Service (MMS), now BOEM. Final regulations implementing this authority at Title 30 of the Code of Federal Regulations (CFR) Part 585 were promulgated on April 22, 2009.

In 2010, the creation of BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) focused on dividing regulatory responsibility for the offshore mineral development program and left regulatory responsibility for renewable energy entirely with BOEM. However, the Secretarial Order that created the two bureaus always envisioned that there would be a future division of administrative responsibility for renewable energy.

This division of responsibility for renewable energy would have BOEM continue to oversee the identification and leasing of offshore areas for renewable energy development and evaluation of proposed development plans; while BSEE's mission is to enforce safety, environmental, and conservation compliance with any associated legal and regulatory requirements during project construction and future operations. The bureaus are working together to implement these changes. Though the division of responsibility will require regulatory changes to 30 CFR Part 585, these changes will not substantially alter the process described in this EA. BOEM will retain authority to approve, approve with modification, or disapprove any SAPs, while BSEE will be in charge of the review of Facility Design and Fabrication and Installation Reports, oversee inspections/enforcement actions as appropriate, oversee closeout verification efforts, oversee facility removal inspections/monitoring, and oversee bottom clearance confirmation. Under the renewable energy regulations, the issuance of leases and subsequent approval of wind energy development on the OCS is a staged decision-making process.

BOEM's wind energy program occurs in four distinct phases, as shown in Figure 1-1 below.

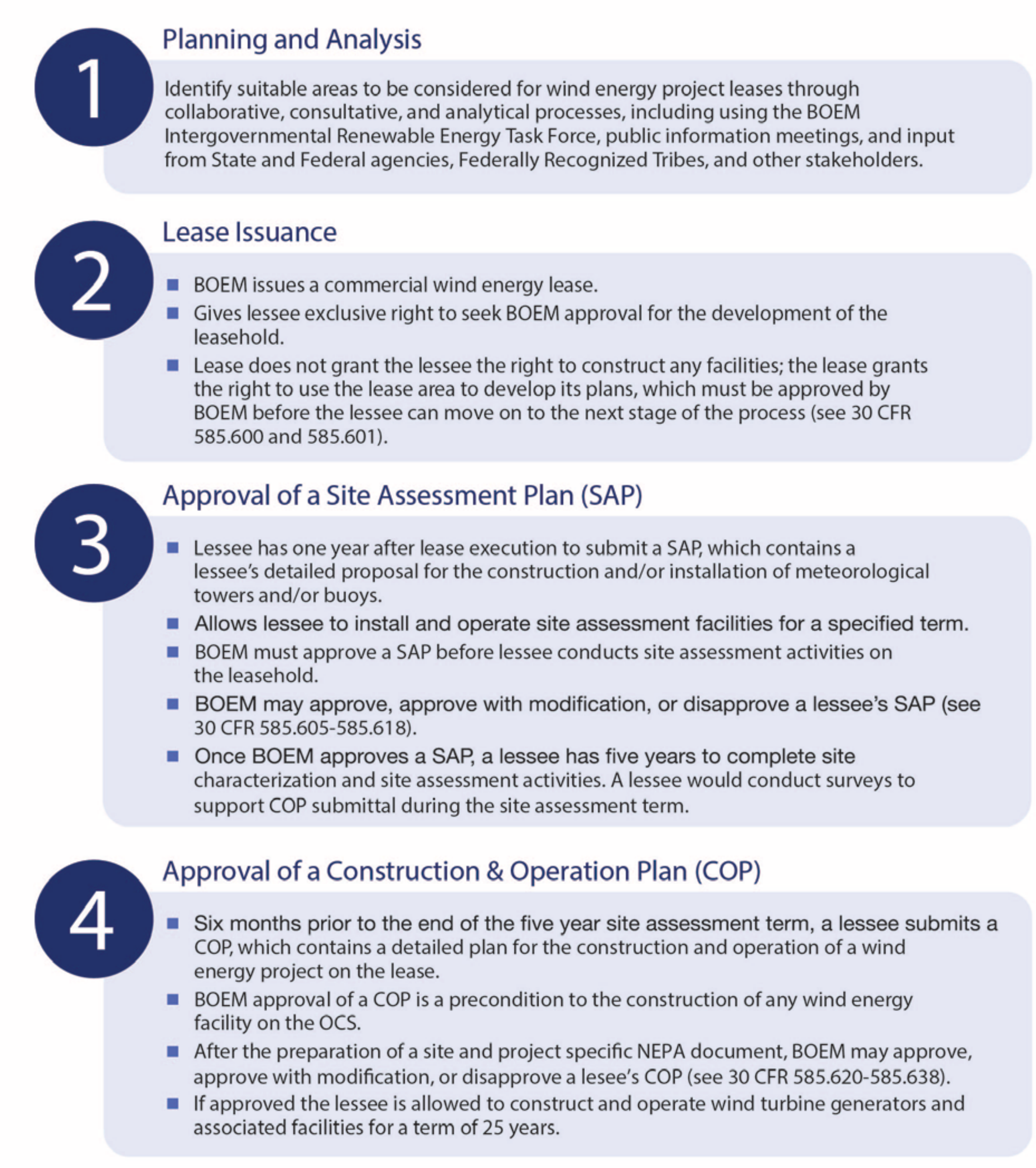
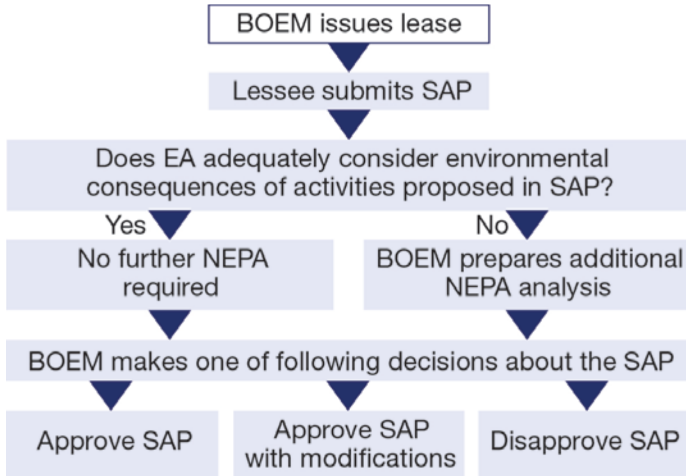


Figure 1-1 Phases of BOEM's Wind Energy Planning/Authorization Process

The regulations also require that a lessee provide the results of shallow hazard, geological, geotechnical, biological, and archaeological surveys with its SAP or construction and operation plan (COP). BOEM refers to these surveys as "site characterization" activities. Although BOEM does not issue permits for these site characterization activities, BOEM regulations require that a lessee include the results of these surveys in its application for SAP or COP approval (see 30 CFR 585.610[b] and 30 CFR 626 [a]). The flow chart below (Figure 1–2) outlines BOEM's evaluation of a SAP pursuant to the National Environmental Policy Act (NEPA).



Note: Use of a Categorical Exclusion may be appropriate for a SAP that proposes deployment of meteorological buoys only.

Figure 1-2 BOEM Evaluation of a SAP

Figure 1-3 outlines BOEM's evaluation of a COP pursuant to NEPA. Preparation of an EIS to evaluate the reasonably foreseeable environmental consequences associated with proposed COP activities would provide additional opportunities for public involvement pursuant to NEPA and the Council on Environmental Quality (CEQ) regulations at 40 CFR Parts 1500–1508. These additional opportunities for public involvement include: 1) a formal scoping period during which BOEM will host public scoping meetings to verify information submitted by the lessee and gather input on issues, alternatives, and mitigation measures to be considered in the project-specific NEPA document; and 2) a public comment period on the draft NEPA document, during which BOEM will host additional public meetings. BOEM will use the EIS to decide whether to approve, approve with modification, or disapprove a lessee's COP pursuant to 30 CFR Part 585.638. Depending on the potential impacts and the effectiveness of mitigation measures associated with the activities proposed in the COP, BOEM has the discretion to limit activities, the area, and/or the time in which activities are performed. These decisions will be informed by the project-specific NEPA analysis associated with the COP.

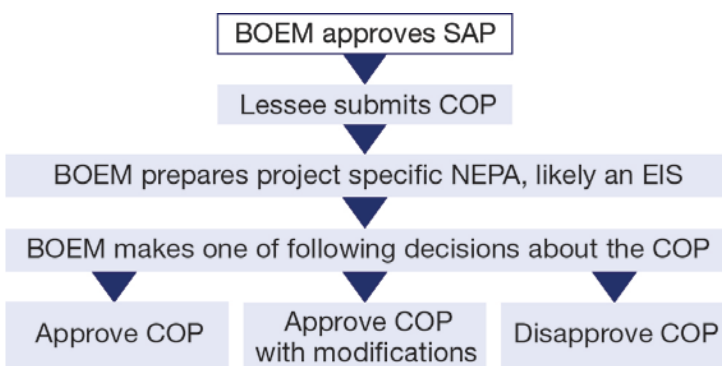


Figure 1-3 BOEM Evaluation of a COP

1.2 Purpose and Need

The purpose of the proposed action is to issue a lease and approve a SAP that would allow the lessee to assess the wind energy resources within the proposed lease area[1] offshore New York. BOEM's issuance of a lease is needed to ensure that survey activities carried out in support of a SAP and COP are conducted in a safe and environmentally responsible manner. BOEM approval of a SAP is needed to adequately assess wind and environmental resources of the proposed lease area to determine if some or all areas within the proposed lease area are suitable for, and could support, commercial-scale wind energy production.

1.3 Description of the Proposed Action

The proposed action is the issuance of a commercial wind energy lease within the WEA offshore New York and approval of site assessment activities on that lease. Of the alternatives considered in this EA, Alternative A, the proposed action, would result in site characterization and assessment activities over the largest geographic area. One other action alternative and a No Action alternative were also analyzed by BOEM, in full, in this EA. The alternatives are described in Section 2.

1.4 Objective of the Environmental Assessment

Pursuant to NEPA, 42 U.S.C. §§ 4321–4370f, as well as the CEQ regulations at 40 CFR 1501.3, this EA was prepared to assist BOEM in considering whether issuing a lease and approving site assessment activities within the WEA offshore of New York would lead to reasonably foreseeable significant impacts on the human environment and, thus, whether an EIS should be prepared before leases are issued.

1.4.1 Information Considered

Information considered in scoping this EA includes:

- Comments received in response to the January 4, 2013 Request for Interest (RFI) and the May 28, 2014 Call for Information and Nominations (Call) associated with wind energy planning offshore New York;
- Public response to the May 28, 2014 Notice of Intent (NOI) to prepare this EA;
- Ongoing consultation and coordination with the members of BOEM's New York Intergovernmental Renewable Energy Task Force (Task Force);
- Ongoing or completed consultations with other federal agencies, including the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the U.S. Department of Defense (DOD), and the U.S. Coast Guard (USCG);
- Research and review of current relevant scientific and socioeconomic literature;

[1] The proposed lease area is located within the New York WEA, as further explained in Section 2-1.

- *Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas: Final Programmatic Environmental Impact Statement*, February 2014 (G&G Final PEIS) (BOEM, 2014a);
- *Programmatic Environmental Impact Statement (PEIS) for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (MMS, 2007a);
- Relevant material from the *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina* (BOEM, 2015a);
- *Atlantic Region Wind Energy Development: Recreation and Tourism Economic Baseline Development, Impacts of Offshore Wind on Tourism and Recreation Economics* (BOEM, 2012a);
- Relevant material from the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia Final Environmental Assessment* (Mid-Atlantic EA) (BOEM, 2012b);
- *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts* (BOEM, 2013a);
- *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts* (BOEM, 2014b);
- *Revised Environmental Assessment for Virginia Offshore Wind Technology Advancement Project on the Atlantic Outer Continental Shelf Offshore Virginia* (BOEM, 2015b);
- Biological Assessment for *Commercial Wind Lease Issuance, Associated Site Characterization Activities, and Subsequent Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia*, (BOEM, 2012e);
- Relevant material from the Endangered Species Act (ESA) Section 7 Consultation Biological Opinion for *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* (Atlantic OCS WEAs Biological Opinion) (NMFS, 2013a);
- *Development of Mitigation Measures to Address Potential Use Conflicts between Commercial Wind Energy Lessees/Grantees and Commercial Fishers on the Atlantic Outer Continental Shelf* (BOEM, 2014c);
- New York Department of State *Offshore Atlantic Ocean Study* (NYDOS, 2013);
- *Final Environmental Impact Statement for the Port Ambrose Project Deepwater Port Application* (USCG, 2015a);

- *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (BOEM, 2012c);
- Relevant material from the *Project Plan for the Installation, Operation, and Maintenance of Buoy Based Environmental Monitoring Systems OCS Block 6931, New Jersey* (Fishermen's Energy of New Jersey, LLC, 2011); and
- Relevant material from the *Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey* (MMS, 2009a).

The G&G Final PEIS (BOEM, 2014a) includes a programmatic analysis of some of the same activities that are also part of the commercial wind lease issuance and site assessment activities considered in this EA.[2] Geological and geophysical (G&G) survey activities for three program areas (oil and gas, renewable energy, and marine minerals) during the 2012–2020 time period were evaluated in the G&G Final PEIS. Alternative C (which was the No Action alternative and assumed that alternative energy development would continue on a project-by-project basis) in the G&G Final PEIS included the same site characterization activities undertaken as part of renewable energy development that are evaluated in this EA for areas offshore New York. These activities include:

- High-resolution geophysical (HRG) surveys;
- Geotechnical/sub-bottom sampling; and
- Biological resource surveys using vessel and/or aerial surveys to characterize the proposed lease area for: (1) benthic habitats, (2) avian resources, and (3) marine fauna.

Although the geographic area evaluated in the G&G Final PEIS does not cover the area proposed for the New York WEA (it covered BOEM's Mid-Atlantic and South Atlantic Planning Areas), the PEIS evaluated the G&G survey activities proposed in this EA. Consequently, the G&G Final PEIS *scenario* of impact-producing factors and the *types* of impacts that may result from G&G surveys, are applicable to the New York WEA and surrounding areas. Additionally, although the Atlantic OCS varies regionally, the resources evaluated in the G&G Final PEIS would generally be affected in similar ways on the OCS in the vicinity of the New York WEA. Therefore, to avoid redundancy, BOEM has incorporated by reference the relevant portions of the G&G Final PEIS into this EA.

1.4.2 Scope of Analysis

This analysis covers the effects of lease issuance, site characterization activities (i.e., surveys of the proposed lease area), and approval of site assessment activities (i.e., construction and operation of a meteorological tower and/or two buoys) within the proposed lease area. This analysis does not consider construction and operation of any commercial wind power facilities, which would be evaluated if the lessee submits a COP. BOEM takes this approach based on several factors.

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[2] More information about the G&G Final PEIS is located at: http://www.boem.gov/Atlantic-G-G-PEIS/.

First, BOEM does not consider the issuance of a lease to constitute an irreversible and irretrievable commitment of agency resources. Section 1.1.1 of this EA describes BOEM's phased planning and authorization process for offshore wind development. Under this process, the issuance of a lease only grants the lessee the exclusive right to submit to BOEM for approval a SAP and COP proposing development of the leasehold; the lease does not, by itself, authorize any activity within the lease area.[3] After lease issuance, a lessee would conduct surveys and, if authorized to do so pursuant to an approved SAP, install meteorological measurement devices to characterize the site's environmental and socioeconomic resources and conditions and to assess the wind resources in the proposed lease area. A lessee would collect this information to determine whether the site is suitable for commercial development and, if so, submit a COP with its project-specific design parameters, for BOEM's review.

Should a lessee submit a COP, BOEM would consider its merits, perform the necessary consultations with the appropriate state, federal, local, and tribal entities, solicit input from the public and the Task Force, and perform an independent, comprehensive, site- and project-specific NEPA analysis. This separate site- and project-specific NEPA analysis may take the form of an EIS and would provide additional opportunities for public involvement pursuant to NEPA and the CEQ regulations at 40 CFR Parts 1500–1508. BOEM would use this information to evaluate the potential environmental and socioeconomic consequences associated with the lessee-proposed project, when considering whether to approve, approve with modification, or disapprove a lessee's COP pursuant to 30 CFR 585.628. After lease issuance but prior to COP approval, BOEM retains the authority to prevent the environmental impacts of a commercial wind power facility from occurring. BOEM would do this by disapproving a COP for failure to meet the statutory standards set forth in OCSLA.

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

Additionally, while BOEM has issued 11 OCS commercial wind energy leases, only one lessee has submitted a COP to date. Construction of a commercial wind power facility on the OCS has yet to commence. Given the nascent nature of the offshore wind industry and market

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[3] BOEM's renewable energy commercial lease form is located at: http://www.boem.gov/BOEM-0008/.

uncertainties, it is speculative at this time whether and when projects will be proposed within these areas.

Based on the above, this EA will analyze two distinct BOEM actions in the WEA—lease issuance and SAP approval—and the reasonably foreseeable consequences associated with the following actions:

a. Conducting shallow hazard, geological, geotechnical, biological, and archaeological resource surveys in the proposed lease area (site characterization); and
b. Installing, operating, and decommissioning of a meteorological tower, meteorological buoys, or a combination of the two (site assessment).

1.5 Supporting NEPA Evaluations

BOEM has conducted several other environmental analyses that will be used to inform this EA, consistent with the CEQ directive at 40 CFR 1502.21 to incorporate information by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. BOEM has prepared six EAs that evaluated the same site characterization and site assessment activities considered in this EA, but in other geographic areas of the OCS. The impacts associated with these activities were predominantly found to be negligible to minor; however, BOEM determined there would be potential for moderate impacts to threatened and endangered species from vessel strikes, and to marine mammals and sea turtles from noise associated with pile driving. These EAs have been prepared for the following states and are incorporated by reference in this EA for activities offshore New York. These documents are also referenced throughout Section 4.4 of this EA as appropriate.

1. New Jersey, Delaware, Maryland, and Virginia (BOEM, 2012b), available at: http://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/Smart_from_the_Start/Mid-Atlantic_Final_EA_012012.pdf;
2. New Jersey and Delaware (MMS, 2009a), available at: http://www.boem.gov/uploadedFiles/FinalEA_MMS2009-025_IP_DE_NJ_EA.pdf;
3. Rhode Island and Massachusetts (BOEM, 2013a), available at: http://www.boem.gov/uploadedFiles/BOEM/Renewable_Energy_Program/State_Activities/BOEM%20RI_MA_Revised%20EA_22May2013.pdf;
4. Massachusetts (BOEM, 2014b), available at: http://www.boem.gov/Revised-MA-EA-2014/;
5. Georgia (BOEM, 2014d), available at: http://www.boem.gov/2014-017/; and
6. North Carolina (BOEM, 2015a), available at http://www.boem.gov/NC-EA-Camera-FONSI/.

1.6 Development of New York Wind Energy Area

BOEM identified the WEA through extensive collaboration and consultation with stakeholders including the Task Force, federal agencies, federally recognized tribes, the New York Department of State and other state agencies, the general public, and other relevant stakeholders beginning in November 2010. The Task Force held planning meetings in New York in November 2010, April 2012, September 2013, and April 2016.

1.6.1 Unsolicited Lease Request Submitted by the New York Power Authority

In September 2011, BOEM received an unsolicited request for a commercial lease offshore New York from the New York Power Authority (NYPA). NYPA worked together with the Long Island Power Authority (LIPA) and Consolidated Edison (ConEd) to propose a 350- to 700-megawatt (MW) offshore wind power project south of Long Island, New York, approximately 13 miles (mi) (21 kilometers [km]) off Rockaway Peninsula. The area initially proposed by NYPA is shown in Figure 1-4. In subsequent discussions, USCG recommended a minimum of 1 nautical mile (nm) (1.9 km) separation distance from designated navigation lanes (USCG, 2011a). NYPA incorporated this guidance in its lease request by an amendment filed on June 20, 2012, requesting additional lease area to compensate for the area lost by the increased setback distance.[4]

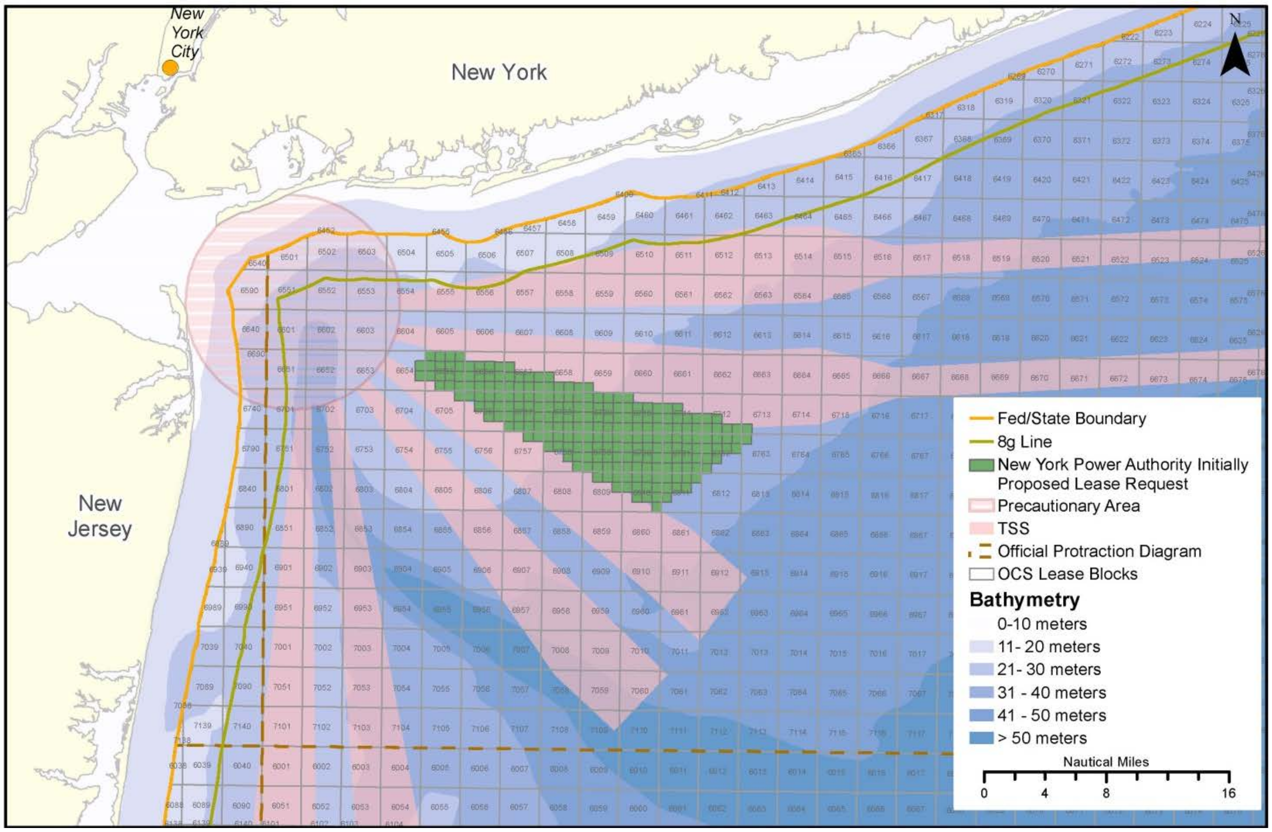

Figure 1-4 Area Initially Proposed by NYPA

1.6.2 Request for Interest

In response to the unsolicited NYPA proposal, as amended, BOEM published an RFI in the *Federal Register* on January 4, 2013 (Docket ID: BOEM-2012-0083; 78 FR 760-764), to assess whether other parties were interested in developing commercial wind facilities in the same area

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4 NYPA's unsolicited lease request and the amendment can be viewed at: http://www.boem.gov/Renewable-EnergyProgram/State-Activities/New-York.aspx.

proposed by NYPA. In addition to inquiring about competitive interest, BOEM also sought public comment on the NYPA proposal, its potential environmental consequences, and the use of the area in which the proposed project would be located. BOEM received indications of interest from Fishermen's Energy, LLC, and Energy Management, Inc.

1.6.3 Call for Information and Nominations and NOI to Prepare an EA

BOEM reviewed the nominations received in response to the RFI and determined that competitive interest in the area proposed by NYPA exists. Therefore, BOEM stopped processing NYPA's unsolicited lease application and initiated the competitive leasing process pursuant to 30 CFR 585.211. Subsequently, on May 28, 2014, BOEM published in the *Federal Register* (Docket ID: BOEM-2013-0087; 79 FR 30645-30651) a Call offshore New York to seek additional nominations from companies interested in obtaining commercial wind energy leases within the Call Area (Figure 1-5). BOEM also sought public input on the potential for wind development in the Call Area, including comments on site conditions, resources, and existing uses of the area relevant to BOEM's wind energy development authorization process. Concurrently, BOEM published in the *Federal Register* (Docket ID: BOEM-2014-0003; 79 FR 30643-30645) the NOI to prepare an EA for commercial wind leasing and site assessment activities offshore New York. Comments that BOEM received from stakeholders on the unsolicited commercial lease request, the RFI, the Call, the NOI, at Task Force meetings and workshops, and from BOEM studies assisted in the identification of space use conflicts within the Call Area.

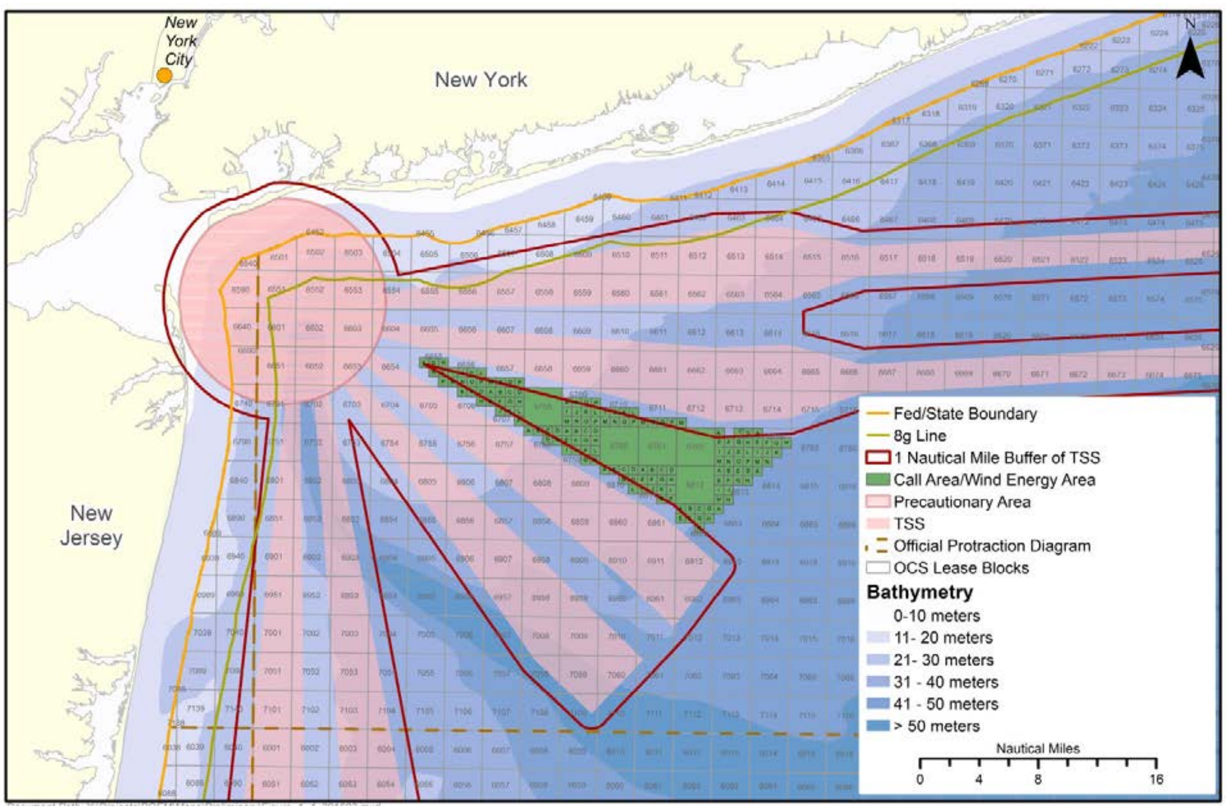

Figure 1-5 New York Call Area/Wind Energy Area

1.6.4 New York Area Identification

On March 16, 2016, BOEM released the Announcement of Area Identification (Area ID) (Appendix A). The WEA begins about 11 nautical miles (nm) (20 km) south of Long Beach, New York, and extends approximately 26 nm (48 km) southeast along its longest portion. The WEA contains 5 whole OCS blocks and 148 sub-blocks (127 square miles [mi^2] [329 square kilometers (km^2)] or 81,130 acres [ac] [32,832 hectares (ha)]). Because the WEA, announced in March 2016, is identical to the Call Area, see Figure 1–5 for a depiction of the WEA.

During the Area ID process, BOEM considered a range of information including, but not limited to, comments received on the RFI, Call, and NOI, information from the Task Force, input from federal and state agencies, comments from stakeholders, state and local renewable energy goals, and trends in global offshore wind development. Among the issues raised by stakeholders, BOEM identified the following three topics that warranted further review during the Area ID process:

1. Navigation and vessel traffic safety;
2. Commercial fisheries; and
3. Visual impacts.

BOEM initially considered one additional potential use conflict, a proposal by Liberty Natural Gas, LLC, to build the Port Ambrose Liquefied Natural Gas Deepwater Port (Port Ambrose) facilities in the New York Call Area. However, the project was vetoed by Governor Cuomo on November 12, 2015, and is no longer moving forward. Therefore, BOEM will not consider the impacts of the Port Ambrose project in this EA.

Navigation. The WEA is located between two Traffic Separation Schemes (TSSs) for vessels transiting into and out of the ports of New York and New Jersey. On January 21, 2015, USCG convened a maritime stakeholder workgroup to discuss navigation concerns with representatives from the maritime industry, BOEM, the Port Authority of New York and New Jersey, and other federal, state, and local partners. Following the workshop, on September 28, 2015, USCG submitted recommendations for buffer zones for the New York Call Area based upon their draft Marine Planning Guidelines (MPG) (USCG, 2015b).[5] USCG recommended that BOEM not allow the placement of permanent structures any closer than 2 nm (3.7 km) from the edge of the TSS lanes and 5 nm (9.3 km) from the entry/exit of the TSS lanes.

During Area ID, BOEM conducted trackline analysis, using available 2014 automatic identification system (AIS) data, to determine where the majority of vessels using the TSS lanes transit. This analysis indicates that the vast majority of vessels tend to stay within the TSS lanes when traversing the area, and that the traffic using the TSSs transit in those portions of the lanes farthest away from the area. In the future, if BOEM issues a lease and receives a COP, additional project-specific analysis and consultation will be conducted (i.e., a Navigational Safety Risk Assessment) to determine whether additional setbacks and the development of specific mitigation measures would be warranted.

[5] USCG did not make any changes to the MPG between the draft and final versions (USCG, 2016).

Commercial fisheries. In April 2014, BOEM held a commercial fisheries workshop on Long Island in Montauk, New York, to explain the offshore leasing process and discuss best management practices to reduce potential user conflicts. Area fishermen participated in the meeting, which included breakout sessions for one-on-one discussions, and their input was used to help build on the recommendations contained in the report titled *Development of Mitigation Measures to Address Potential Use Conflicts between Commercial Wind Energy Lessees/Grantees and Commercial Fishers on the Atlantic Outer Continental Shelf* (BOEM, 2014c). In November 2015, BOEM held three meetings with commercial and recreational fisherman in Point Pleasant, New Jersey; Long Beach, New York; and Riverhead, New York. Participants at the meetings represented fishermen from New Jersey, New York, Rhode Island, and Massachusetts. The goal of the workshops was to obtain fishing industry input on how the Call Area is used for fishing to help BOEM determine which areas should be made available for a lease. During the workshop, fishermen stated that the New York Call Area is heavily used for commercial fishing, with Atlantic sea scallop and longfin squid as the primary target species caught in the Call Area.

During Area ID, BOEM evaluated commercial fishing data from NMFS, information submitted by fishermen during and following the aforementioned meetings, relevant science concerning impacts to fisheries, and issues regarding access to fishery resources in commercial wind facilities. The data that BOEM analyzed showed that the Atlantic squid and scallop fisheries each derived less than one percent of their total average annual revenue from the New York WEA between 2007 and 2012 (full dataset is presented in Appendix G). For the fisheries that did overlap with the WEA, BOEM had no evidence to suggest that fishery resources would become completely inaccessible over the lifetime of a lease, with the exception of some disruption during construction activities. If a lessee submits a COP, design parameters and mitigation measures could potentially reduce disruption of fishing activities during construction and operation of a commercial facility. BOEM reserves the right to impose restrictions on development or require specific mitigation measures, if necessary.

Viewshed. The National Park Service (NPS), New York State Historic Preservation Office (SHPO), and New Jersey SHPO expressed concerns regarding the potential for visual impacts to onshore areas from wind power development (primarily Fire Island National Seashore [FIIS], Gateway Recreation Area, Jones Beach State Park, and various National Historic Landmarks) particularly during nighttime hours when Federal Aviation Administration (FAA) safety lighting makes wind turbines more visible. BOEM conducted stakeholder outreach with NPS, the New York SHPO, and the New Jersey SHPO.[6] Under BOEM's commercial wind energy leasing process, full identification of historic properties and consideration of visual impacts from commercial wind development (wind turbines) to these properties would occur under BOEM's review of a lessee's COP, during which Section 106 consultations under the National Historic Preservation Act (NHPA) will be conducted.

The ability of an onshore observer to see structures associated with offshore wind facilities depends on a variety of factors (i.e., visual contrast against the backdrop of the horizon, lighting

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[6] BOEM met with the SHPOs and NPS in August and November of 2015, respectively (Figure 1–6).

conditions, atmospheric haze, and meteorological conditions; the type, height, spacing, and arrangement; and a viewer's position, relative to height and distance of the structure). If, during the Section 106 review of a COP, it is determined that there will be adverse effects to historic properties, BOEM will work with the consulting parties to develop measures to avoid, minimize, or mitigate these adverse effects.

1.6.5 Summary

Ultimately, for the reasons listed above, BOEM decided not to expand the existing 1 nm (1.9 km) setback from the TSSs, nor remove additional areas for commercial fishing or viewshed concerns, at this stage. The Area ID decision balanced multiple competing uses and environmental concerns against the potential for commercial wind development. If, after a lease is issued, a lessee proposes to construct a commercial wind energy facility, the lessee would be required to submit a COP to BOEM for review and approval. BOEM would then conduct a project-specific NEPA and engineering reviews, which would include the lessee's proposed transmission line(s) to shore. If necessary, BOEM can impose restrictions at that time on development of the lease area, including prescribing specific mitigation measures for construction and operation activities, or not allowing development of certain portions of the area, pending the outcome of project-specific reviews and/or consultations. BOEM will use the project-specific NEPA and technical reviews to decide whether to approve, approve with modification, or disapprove a lessee's COP pursuant to 30 CFR Part 585.628.

Figure 1-6 depicts the process BOEM has taken to analyze and make determinations related to the New York WEA.

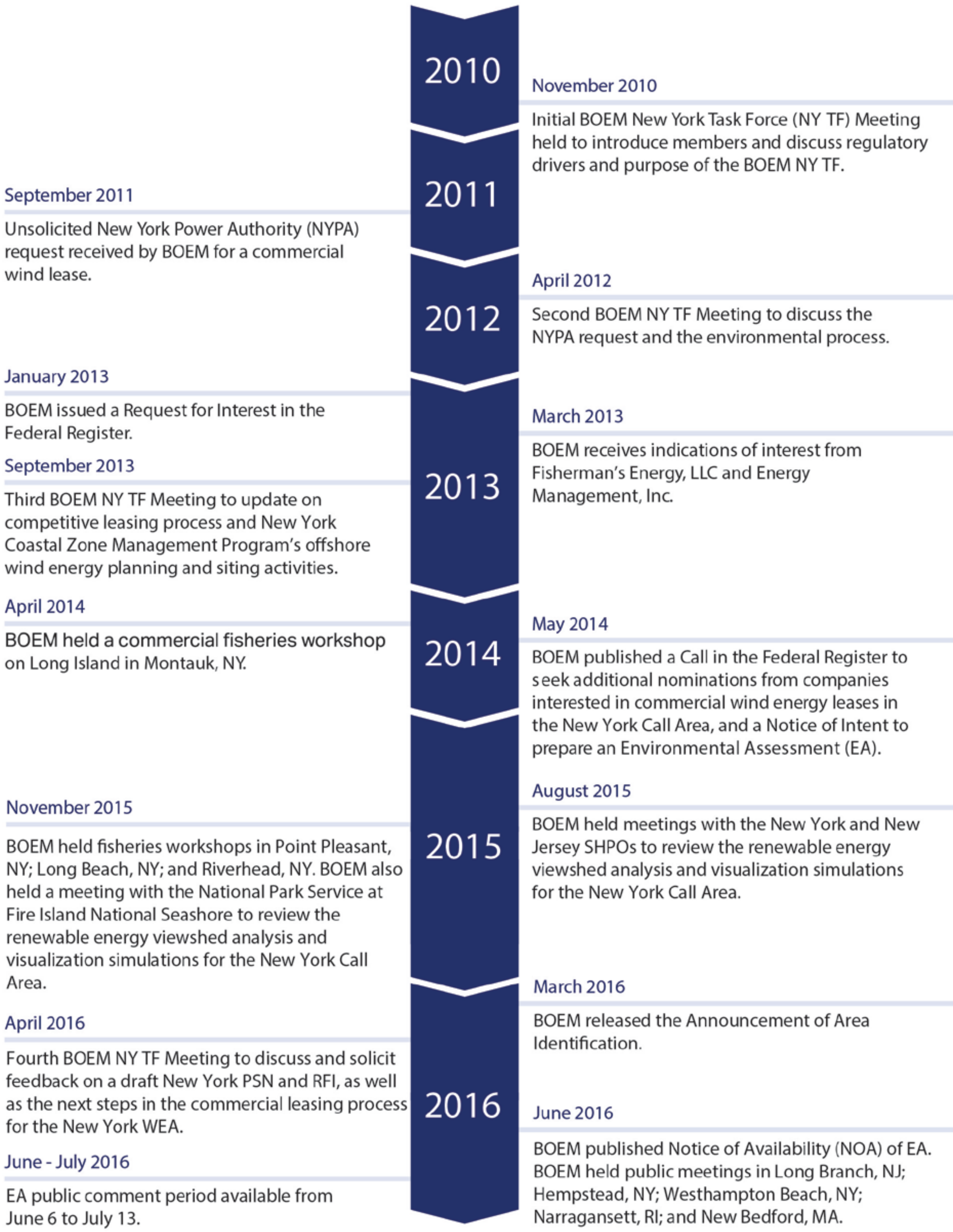

Figure 1-6 Wind Energy Area Planning Process Timeline

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes two action alternatives and the No Action Alternative for lease issuance and the approval of site assessment activities within the WEA offshore New York. The alternatives are described in Table 2–1 and the following sections.

Table 2–1
Alternatives Considered

Alternative	Description
Alternative A (Preferred Alternative) – Offer the WEA for lease, except for Cholera Bank sensitive habitat, while restricting site assessment structure placement within 1 nm (1.9 km) of the TSSs	Under Alternative A, lease issuance and approval of site assessment activities could occur in the WEA, however, no site assessment structures (i.e., meteorological tower and/or buoys) could be placed on the portion of the sub-blocks within 1 nm (1.9 km) of the TSSs. Neither leasing nor site assessment activities would occur in aliquots F, G, H, K, and L of OCS Block 6655, which were identified as Cholera Bank sensitive habitat.
Alternative B – Offer the WEA for lease, except for Cholera Bank sensitive habitat, while restricting site assessment structure placement within 2 nm (3.7 km) of the TSSs	Under Alternative B, lease issuance and site characterization activities could occur in the WEA, however, no site assessment structures (i.e., meteorological tower and/or buoys) could be placed within 2 nm (3.7 km) of the TSSs. Neither leasing nor site assessment activities would occur in aliquots F, G, H, K, and L of OCS Block 6655, which were identified as Cholera Bank sensitive habitat.
Alternative C – No Action	Under Alternative C, no lease would be issued nor site assessment activities approved in the WEA at this time.

TSS = Traffic Separation Scheme

Alternatives A and B were identified as a result of extensive coordination with the Task Force; relevant consultations with federal, state, and local agencies; and extensive input from the public and potentially affected stakeholders. Based on recommendations by USCG, BOEM refined the action alternatives to exclude the placement of site assessment structures in certain areas of the proposed lease area that border TSSs due to the potential for navigational use/safety conflicts. Since publication of the EA in June 2016, BOEM has refined Alternatives A and B, based on comments received during the June 2016 public comment period, as further explained below. Additional alternatives considered, but not analyzed in detail are discussed in Section 2.4 below.

2.1 Alternative A (Proposed Action) – Leasing of the Wind Energy Area Except for Cholera Bank Sensitive Habitat, While Restricting Site Assessment Structure Placement within 1 Nautical Mile of a TSS

Alternative A (the preferred alternative or proposed action) is the issuance of a commercial wind energy lease and approval of site assessment activities within the WEA, except those aliquots identified as Cholera Bank sensitive habitat by BOEM, specifically aliquots F, G, H, K, and L of OCS Block 6655 (westernmost corner of the New York WEA). While the aliquots transected by the 1 nm (1.9 km) setback line of the two TSSs (the Hudson Canyon to Ambrose TSS and the Ambrose to Nantucket TSS) that border the WEA (Figure 2-1) would be offered for lease, the portions of those aliquots located within 1 nm of the TSSs would not be available for construction or placement of site assessment structures (i.e., a meteorological tower and/or two buoys).

In a comment letter on the June 2016 EA, NMFS identified the Cholera Bank feature as a sensitive habitat to be avoided for the placement of site assessment structures. Based upon high-resolution bathymetry data and notation on NOAA nautical charts, BOEM identified aliquots F, G, H, K, and L of OCS Block 6655 (in the westernmost corner of the New York WEA) as Cholera Bank sensitive habitat. Under Alternative A, these five aliquots would be excluded from leasing (Figure 4–9 for detailed image). The five excluded aliquots contain a total of 1,779 ac. BOEM revised the proposed action accordingly, and the revised lease area under Alternative A is two percent smaller than the proposed lease area considered in the June 2016 EA. Total area available for placement of site assessment structures, which excludes those areas within 1 nm of the TSS, would be 65,945 ac, compared to 66,442 ac under the original Alternative A as described in the June 2016 EA.

The proposed lease area begins about 11.5 nm (21 km) south of Jones Beach State Park, New York, and extends approximately 24 nm (45 km) southeast along its longest portion (Figure 2-1). The center of the proposed lease area is approximately 46 nm (85 km) by vessel from the nearest major ports of New York and New Jersey, with the nearest border being approximately 29.5 nm (54.6 km) by vessel from the nearest major port, which is Bayonne, New Jersey. The area proposed for leasing is approximately 79,350 ac (32,112 ha), including all OCS blocks in the 1 nm (1.9 km) TSS buffer zone, and contains 5 whole OCS blocks and 143 sub-blocks. Portions of 63 sub-blocks are in the

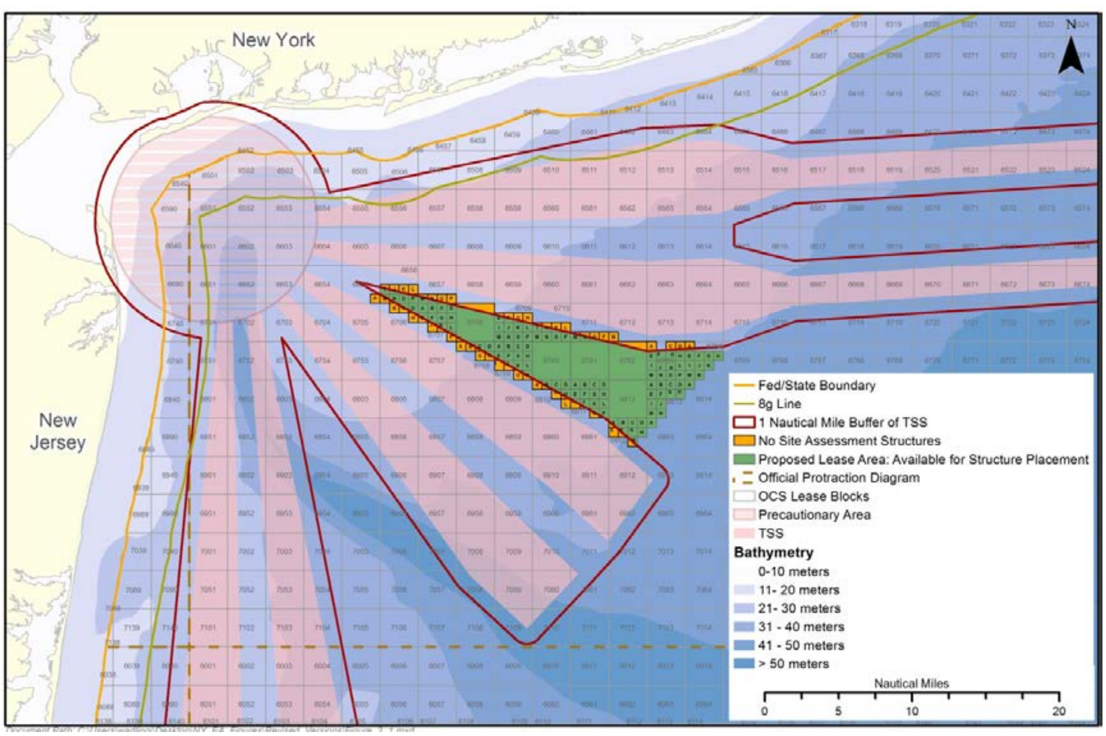

Figure 2-1 Alternative A Proposed Lease Area

1 nm (1.9 km) TSS buffer zone and therefore would not be available for placement of a meteorological tower and/or two buoys.

Table 2–2 shows the number of whole and partial OCS blocks within the Alternative A proposed lease area as well as the blocks available for placement of site assessment structures.

Alternative A assumes that the lessee would undertake the maximum number of site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological, and biological surveys) in their proposed lease area. Under Alternative A, assuming that the lessee chooses to install meteorological facilities, BOEM anticipates that no more than one meteorological tower, two meteorological buoys, or some combination of a meteorological tower and buoy(s) would be installed within the proposed lease area.

Under Alternative A, BOEM would require the lessee to avoid or minimize potential impacts on the environment by complying with various requirements. These requirements are referred to as Standard Operating Conditions (SOCs)[7] and would be implemented through lease stipulations and/or as conditions of SAP approval. The impacts of Alternative A on environmental and socioeconomic resources are described in detail in Section 4.4 *Alternative A – The Proposed Action*.

Table 2–2
Alternative A Number of Whole OCS Blocks and Sub-blocks in the Proposed Lease Area, in the TSS Buffer Zone, and Available for Placement of Site Assessment Structures

Description	Number
Number of whole OCS blocks available for leasing	5
Sub-blocks available for leasing not included in the 5 whole OCS blocks	143
Total number of sub-blocks available for leasing	223[(1)]
Sub-blocks overlapping TSS buffer boundary (not available for site assessment structure placement)[(2)]	63
Number of sub-blocks available for site assessment structure placement	160

[(1)] There are 16 sub-blocks in a single OCS block.
[(2)] For purposes of estimation in this EA, BOEM assumes site assessment structures would not be placed in partial sub-blocks. Note there is one sub-block fully within the TSS buffer zone that is not available for site assessment structure placement.

[7] SOCs are provided in Appendix B of this EA and described further in Section 2.5.

2.2 Alternative B – Leasing of the Wind Energy Area Except for Cholera Bank Sensitive Habitat, While Restricting Site Assessment Structure Placement within 2 Nautical Miles of a TSS

Alternative B, like Alternative A, is the issuance of a commercial wind energy lease for the WEA; however, BOEM would not allow placement of site assessment structures (i.e., a meteorological tower and/or two buoys) within 2 nm (3.7 km) of the two TSSs that border the WEA (Figure 2-2). For aliquots transected by the 2 nm (3.7 km) setback line, BOEM would not allow construction or placement of site assessment structures (i.e., a meteorological tower and/or two buoys) on the portions of those aliquots within 2 nm (3.7 km) of the TSSs.

As described in Section 1.6.4 *New York Area Identification*, USCG developed the MPG to assist offshore developers and marine planners with evaluating the navigational impacts for siting of offshore structures near shipping routes (USCG, 2016). According to USCG's guidelines, a 2 nm (3.7 km) buffer for all permanent structures (including meteorological towers and/or buoys) around the TSSs would further reduce the risk of collision/allision. The MPG also recommends a 5 nm (9.3 km) buffer from the entry/exit of the TSSs. In a comment letter on the June 2016 EA, USCG recommended a minimum 5 nm setback from the western entry/exit of the TSSs, for the meteorological tower until a final setback distance for turbines is established. With the removal of the cholera bank sensitive habitat, less than one aliquot in the western tip of the proposed lease area is within 5 nm of the TSS entry/exit.

BOEM staff analyzed three years (2014, 2013, and 2011) of AIS data in the Hudson Canyon to Ambrose, and Ambrose to Nantucket Traffic Lanes. Assessment of 2014 AIS track lines of those vessels that enter and exit the Traffic Lane from the ends and travel parallel within the lane, found that 90 percent of the vessels traversing the Traffic Lanes adjacent to the WEA position themselves toward the inner edges of the Traffic Lanes, near the Separation Zone, and away from the WEA. This creates a de facto buffer that reduces the risk (Figure 2–3) of allision. A consistent pattern is observable by large commercial vessels (cargo and tanker) that transit the Traffic Lanes adjacent to the WEA. Analysis of 2013 and 2011 AIS derived cargo and tanker track lines indicates that 93 to 96 percent of those vessels utilizing the full length of the Traffic Lane fall within the 90 percent polygon derived from 2014 AIS data (Figure 2–3). Further, a Shipping Safety Fairway exists to the north of the WEA, whereby vessels transiting outbound in the Ambrose to Nantucket Traffic Lane are funneled from the Traffic Lane to the Shipping Safety Fairway, and are less likely to approach the entrance/exit from different directions.

BOEM strives to ensure that lessees have sufficient flexibility to microsite a project within their lease areas, especially given that data critical to siting decisions (e.g., results from geophysical and geotechnical surveys, environmental surveys, site specific resource assessment data, etc.) will not be gathered until after lease issuance. Such data collection and analysis could demonstrate that a restriction on the construction of permanent structures (e.g., meteorological towers, or future wind turbines) within 2 nm (3.7 km) of the TSS lanes is unnecessary, and/or that mitigation measures can partially or wholly resolve conflicts. Therefore, BOEM did not select the reduction of the proposed lease area under Alternative B as the preferred alternative.

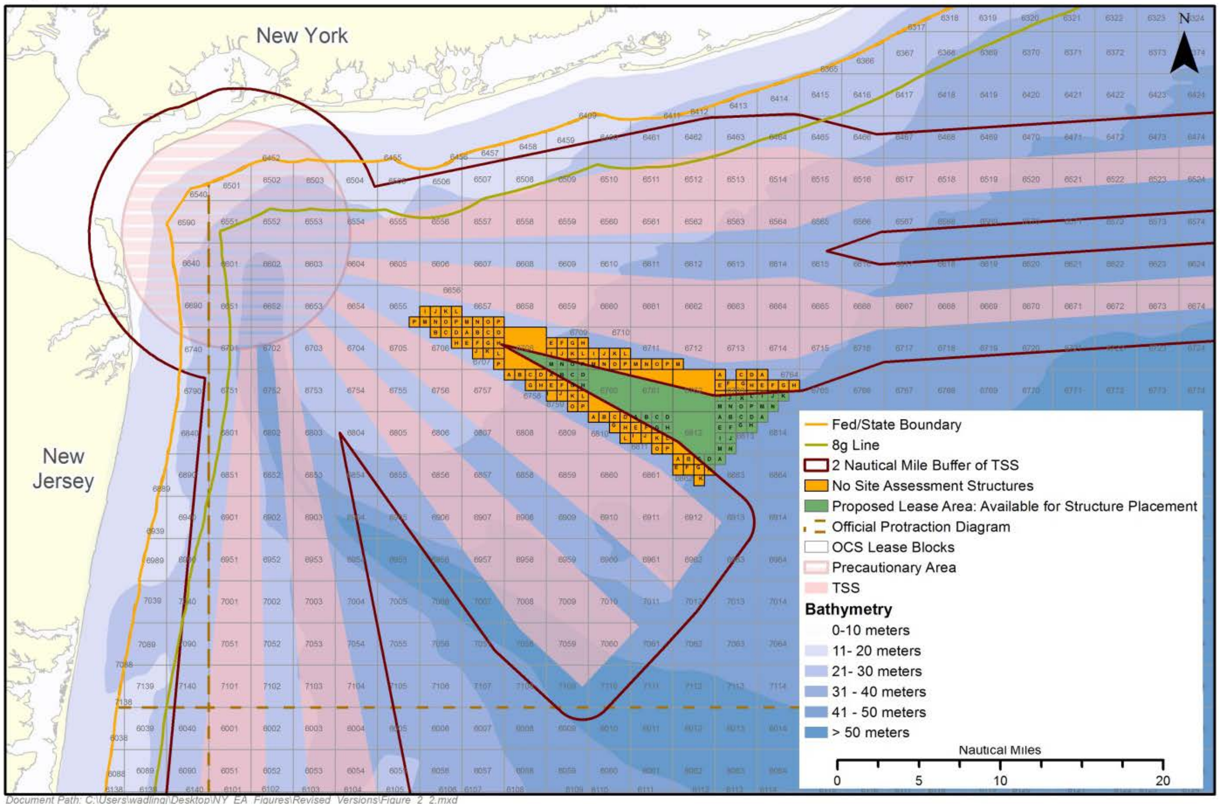

Figure 2-2 Alternative B Proposed Lease Area and No Surface Occupancy Area

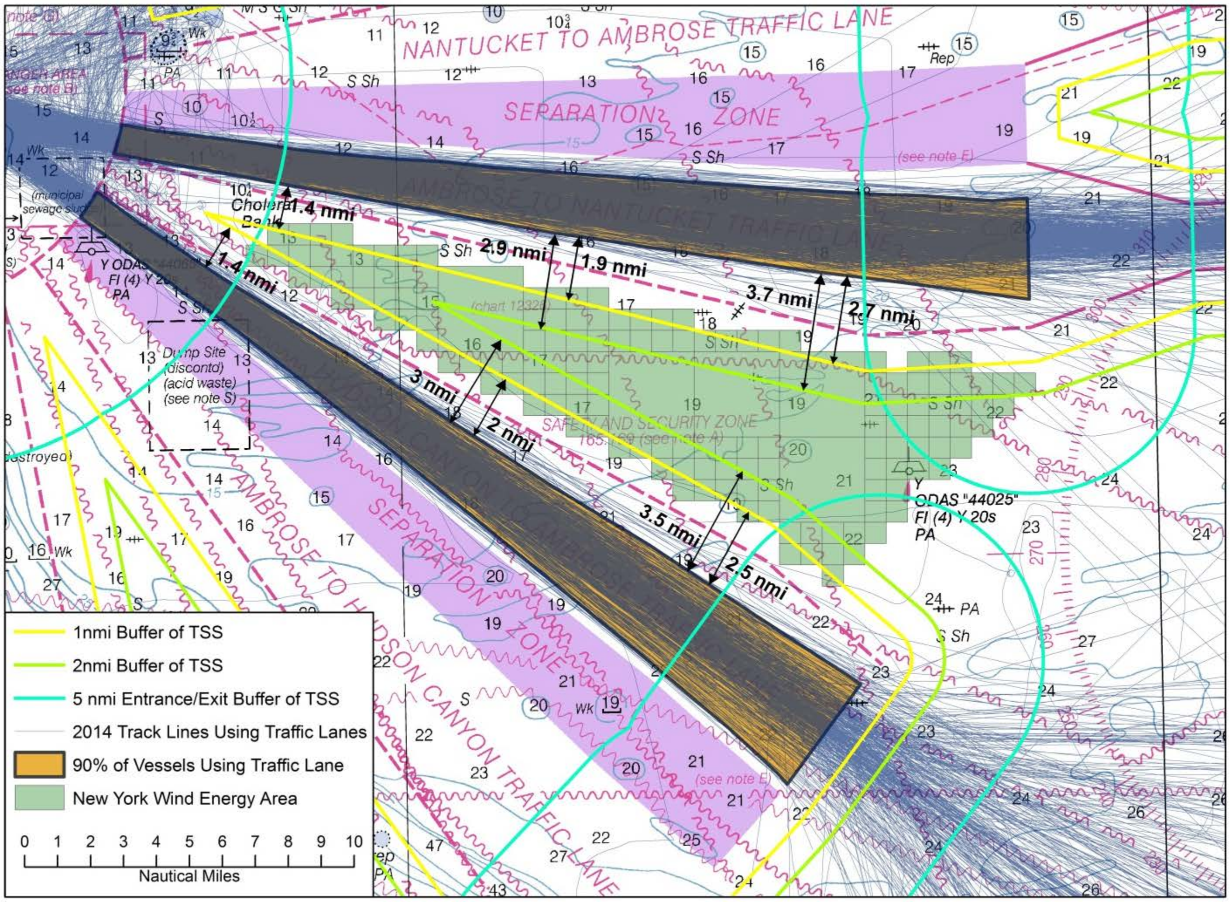

Figure 2-3 Track Lines of Vessels Utilizing Traffic Lanes Adjacent to the New York Proposed Lease Area

Table 2–3 shows the number of whole and partial OCS blocks under Alternative B WEA, as well as the blocks available for placement of site assessment structures.

Table 2–3
Alternative B Number of Whole OCS Blocks and Sub-blocks Available for Leasing, the TSS Buffer Zone, and Available for Placement of Site Assessment Structures

Description	Number
Number of whole OCS blocks available for leasing	5
Total number of sub-blocks available for leasing	143
Sub-blocks overlapping TSS buffer boundary (not available for structure placement)[(1)]	63
Number of sub-blocks available for site assessment structure placement	59

[(1)] For purposes of estimation in this EA, BOEM assumes site assessment structures would not be placed in partial sub-blocks.

Alternative B assumes that the lessee would undertake the maximum amount of site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological, and biological surveys) in the leased area, which would be the same as Alternative A. Under Alternative B, assuming that the lessee chooses to install meteorological facilities, BOEM anticipates that no more than one meteorological tower and/or two meteorological buoys, or some combination of a meteorological tower and buoy(s) would be installed within the WEA. However, those site assessment facilities would not be installed within 2 nm (3.7 km) of a TSS. The total area under Alternative B that would be available for the placement of site assessment facilities is 37 percent of the area under Alternative A. The impacts of Alternative B on environmental and socioeconomic resources are described in Section 4.5 *Alternative B*.

2.3 Alternative C – No Action

Under the No Action Alternative, no wind energy lease would be issued, and no site assessment activities would be approved within the WEA offshore New York. Although site characterization surveys do not require BOEM approval and could still be conducted under Alternative C, these activities would not be likely to occur without a commercial wind energy lease. Alternative C will serve as the baseline against which action alternatives are evaluated.

2.4 Alternatives Considered but Not Analyzed in Detail

The following additional alternatives were identified during the scoping process. However, BOEM eliminated these alternatives from further consideration as they did not meet the purpose and need and/or were not reasonable. Consistent with the CEQ directive at 40 CFR 1502.14(a), they are summarized below. For the reasons identified under each, they are not considered for detailed analysis in this EA.

- *Survey and construction prohibitions to protect squid from potential injurious sound*: BOEM received comments from the squid fishing industry asserting that noise produced during HRG surveys and construction (e.g., pile driving of a meteorological tower foundation) could result in severe acoustic trauma in squid, resulting in direct mortality or disruption of spawning activity of squid in the proposed lease area. BOEM assessed the study cited by industry, André et al. (2011), as well as Mooney et al. (2010), to evaluate if a seasonal prohibition on noise producing activities was a reasonable alternative to consider in this assessment. Mooney et al. establishes that squid are most sensitive to frequencies between 100 and 300 hertz (Hz) and that the sensitivity is from particle motion and not sound pressure levels (SPLs). André et al. (2011), establishes injury to squid when exposed to noise at a frequency of 50 to 400 Hz at 157 ± 5 decibels (dB) re 1 micropascal (μPa) in 20- to 200-liter tanks. More recently, Mooney et al. (2016) conducted additional tank studies on longfin squid to evaluate behavioral reactions to various sound frequencies and acoustic power. The results were presented in both SPLs and particle motion velocity. The only identified sound sources that would be in the hearing range of squid are active sub-bottom profilers (i.e., boomers) (Table 3–3) and pile driving noise from construction of a meteorological tower. Both these activities are anticipated to occur primarily in the summer months when the weather is favorable to conducting these activities. In assessing the potential for impacts to the squid resource from the proposed activity, it is important to understand the environmental baseline. The squid fishery occurs in the proposed lease area between June and September. The squid fishery is prosecuted by between 15 and 50 vessels in each of those peak months in the New York Bight. At the same time, the traffic lanes to and from the Port of New York and New Jersey are heavily trafficked by cargo ships. Both of these activities produce low frequency noise from engine and propeller cavitation. In the case of fishing vessels, pressure fields are also generated from the pulling of trawl nets through the water for the purpose of corralling squid into the nets. Lastly, there is the direct mortality caused by fishing itself. These existing activities have not resulted in spawning failure of longfin squid in the New York Bight, and to the contrary, the proposed lease area supports an active fishery. HRG surveys are mobile and follow a grid pattern that is irrespective of bottom features or depths that may be occupied by squid, and pile driving activity for a meteorological tower would occur in a static location and would last several hours in duration over 1-3 days. Mooney et al. (2016) demonstrate the ability of squid to swim away from sound that is potentially injurious, or otherwise perceived as a threat. Additionally, the study shows that longfin squid habituate to pure tone sounds over repeated exposures. Mooney et al. (2016) also references Niesterok and Hanke (2013) in supporting the conclusion that squid may have evolved behavioral responses to sound pressure/particle motion in order to detect the head wake of a predator. André et al. (2011) did not record the actual sound exposure level (SEL) to better understand the energy and particle motion necessary for the onset of injury. Mooney et al. (2016) also concludes that lower level effects such as masking or behavioral response is more likely than the type of anatomical damage suggested in André et al. (2011). Lastly, Mooney et al. (2016) suggests that population-level impacts remain unclear. However, these impacts need to be evaluated in the full context of the existing soundscape. In the case of New York Bight, the soundscape is very active from anthropogenic noise (vessel engine and propeller cavitation) and particle motion (fishing activity). Given the above evidence, it is not reasonable to assume that the prohibition of sub-bottom surveys and pile driving during the summer months would confer any additional conservation benefit to the squid resource given the magnitude of activity from commercial shipping and fishing that occur in the area. Furthermore, the prohibition of noise producing activities in the summer would not support the purpose and need of the proposed action, as it would effectively prohibit activity at the time of year when a lessee would be most likely to conduct site characterization and install a meteorological tower and/or buoys. Thus, this alternative will not be further considered in this assessment.

- *Exclusion of certain areas from meteorological tower placement due to potential impacts to the Atlantic sea scallop resource*: The scallop industry has submitted comments that scour around offshore wind facility foundations may cause near-field and far-field suspended sediment that could potentially smother valuable scallop resources in the proposed lease area. Commenters also assert the potential for direct mortality of the scallop resource due to the placement of structures on a scallop bed. BOEM has evaluated whether an alternative in this assessment is justified to protect the scallop resources in the proposed lease area. Although some low to medium density scallop beds have been identified in the proposed lease area, BOEM already requires in its regulations that SAPs provide a description of "benthic communities, marine mammals, sea turtles, coastal and marine birds, fish and shellfish, plankton, sea grasses, and other plant life" that could be impacted from the proposed activities (§585.611(b)(3)). BOEM will thus require the identification of scallop beds that could be impacted by the construction of a meteorological tower as a part of its existing process and pursuant to its own regulations.

Furthermore, BOEM requires in §585.610(a)(8) that the SAP includes a description of the measures the lessee will use to avoid or minimize adverse effects and how environmental impacts from the proposed activities will be mitigated. BOEM has made it clear in its SAP guidance that sensitive benthic habitat is a type of feature that should be avoided for locating facilities (BOEM, 2016a). Given the existing requirements for identifying and avoiding sensitive benthic habitats, an additional alternative prohibiting meteorological tower construction on potential scallop beds is not warranted. Such an alternative is effectively part of the proposed action and would not further inform the public or the agency about potential impacts and will thus not be evaluated further in this assessment.

- *Exclusion of certain areas from leasing due to conflicts between commercial scale wind facility and fishing*: While stakeholders expressed concerns over conflicts with fishing during scoping and preparation of this EA, those concerns focused on commercial wind power facilities[8] (the installation and operation of wind turbines) rather than activities associated site characterization (surveys) and site assessment activities (the installation and operation of a meteorological tower and/or two buoys), the subject of this EA. As discussed in Section 1.4.2 of this EA, the installation, construction, and operation of a full-scale wind energy facility are outside the scope of this EA. Should a lessee submit a COP, BOEM would consider its merits, perform the necessary consultations with the appropriate state, federal, local, and tribal entities, solicit input from the public and the Task Force, and perform an independent, comprehensive, site- and project-specific NEPA analysis. 30 CFR 585.627(a)(7) requires that lessees submit with their COPs detailed information on recreational and commercial fishing, including typical fishing seasons, location, and type. Further, BOEM's *Guidelines for Providing Information on Fisheries Social and Economic Conditions for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585* provide additional details about actions the lessee can take to ensure BOEM has the information it needs to undertake a detailed assessment of potential fishing impacts that could result from commercial development in the area. Therefore, BOEM considered, but did not analyze in detail, alternatives that would eliminate areas from leasing due to concerns over conflicts with fishing that are associated with the construction of a commercial-scale offshore wind facility. Such alternatives would be evaluated by BOEM in detail later, if the proposed lease area is leased and the lessee submits a COP.

- *Exclusion of areas from leasing due to visual impacts from a commercial scale wind facility*: While stakeholders expressed concerns over visual impacts to onshore resources during scoping and preparation of this EA, those concerns focused on commercial wind power facilities (the installation and operation of wind turbines) rather than site characterization and site assessment activities (the installation and operation of a

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[8] The exception is the concern expressed by the squid fishing industry with respect to injurious sound, which is addressed earlier in this section. [9] Although this EA assumes site characterization surveys for the lease area are likely to occur during the 5-year site assessment term, a lessee may survey smaller portions of the proposed lease area to prepare a COP; they may also choose to survey the remainder of the proposed lease area after a COP has been submitted. Thus, surveying may occur in phases. [10] This includes pile-driving (construction) activities that BOEM assumes will last from 1 to 3 days.

meteorological tower and/or two buoys), the subject of this EA. As discussed in Section 1.4.2 of this EA, the installation, construction, and operation of a full-scale wind energy facility are outside the scope of this EA. Should a lessee submit a COP, BOEM would consider its merits, perform the necessary consultations with the appropriate state, federal, local, and tribal entities, solicit input from the public and the Task Force, and perform an independent, comprehensive, site- and project-specific NEPA analysis. Therefore, BOEM considered, but did not analyze in detail, alternatives that would eliminate areas from leasing due to concerns regarding visual impacts. Such alternatives would be evaluated by BOEM in detail later, if the proposed lease area is leased and the lessee submits a COP.

- *Geographic and/or additional seasonal restrictions for North Atlantic right whales:* In previous EAs, BOEM has considered alternatives that included seasonal and/or geographic restrictions on activities associated with lease issuance, for endangered North Atlantic right whales (NARW). However, the low, sporadic, and variable distribution of the species within the New York Bight does not delineate any high- density seasonal or geographic patterns to justify seasonal or geographic restrictions. In addition, this area has not been identified as a calving or feeding ground, nor has it been designated as critical habitat. In order to protect any NARWs that may be in the area, BOEM's SOCs include, but are not limited to, restricting nighttime operations, unless an alternative monitoring plan is submitted and approved by BOEM and NMFS, as well as seasonal restrictions for pile driving. BOEM also received recommendations from stakeholders that BOEM require additional mitigation measures during site characterization and site assessment activities in order to provide further protections for NARWs. Additional suggested mitigations included, but were not limited to, seasonal restrictions on sub-bottom profiling activities, a 500-meter (m) exclusion zone during sub-bottom profiler use, site specific risk assessment and marine mammal avoidance plans, and the use of sound reduction devices during pile driving activities. The SOCs in this EA were developed under formal consultation with NMFS under Section 7 of the ESA. Prior to the approval of any activities in a SAP that may affect any ESA-listed species occurring in the New York proposed lease area, BOEM will consult with NMFS pursuant to its obligations under Section 7 of the ESA. BOEM reviewed the recommendations in light of the biological opinion, best available science, and the effectiveness of the proposed lease requirements to minimize or avoid any potential impacts. Given the short duration and limited scope of the proposed action, which includes BOEM's SOCs to minimize any potential impacts to NARWs, BOEM determined that the recommendations for additional mitigations did not support a reasonable alternative. As a result, at this time, a geographic and/or seasonal restriction alternative, based on right whale occurrence, was considered but not analyzed in detail in this assessment. However, as new information becomes available, BOEM will continue to reassess these mitigations with the objective of ensuring sufficient and effective protection of the NARW.

- *Analysis of areas outside of the WEA*: The purpose and need of the proposed action is to issue a lease and approve a SAP that would allow a developer to assess the proposed lease area offshore New York, and determine if all or portions of the area are suitable for commercial wind development. The issuance of a lease and approval of site assessment activities outside of the WEA offshore New York would not achieve the purpose and need of the proposed action. Therefore, it would not be reasonable for BOEM to analyze these activities, and this alternative and was eliminated from further consideration in this EA. The New York WEA was identified after more than four years of review and consideration (Section 1.6.4). There are currently no expressions of commercial interest offshore New York outside of the WEA. It should also be noted, BOEM has no duty under OCSLA or its renewable energy regulations to expand the scope of its analysis beyond areas currently proposed (i.e., the New York WEA). If an area were to be identified or proposed, then BOEM would conduct a planning and leasing process similar to the process now occurring for the New York WEA, including the preparation of a separate EA.

For the reasons described above, it is not reasonable to fully analyze these alternatives in this EA. Further, additional data critical to siting decisions (e.g., results from G&G surveys, environmental surveys, site specific resource assessment data, etc.) will not be gathered until after lease issuance. Such data collection and analysis could demonstrate that conflicts either do not exist or can be resolved, in whole or in part, through mitigation measures.

2.5 Standard Operating Conditions

Utilizing the best available science, and in consultation with NMFS, the agency primarily responsible for overseeing protected species conservation and recovery, BOEM has devised a protective suite of balanced SOCs to minimize the effects of site characterization and site assessment activities associated with offshore wind leasing. Specifically, these conditions are part of the proposed action (Alternative A) and Alternative B in order to mitigate, minimize, or eliminate impacts on protected species of marine mammals, sea turtles, fish, and birds listed as threatened or endangered under the ESA and the Marine Mammal Protection Act (MMPA). Conditions to minimize or eliminate impacts on marine mammals and sea turtles include vessel strike avoidance and marine debris awareness measures; protected species observers (PSOs), monitoring and exclusion zones for protected species; sound source verification, “ramp up”, “soft start” and shutdown procedures; visibility; seasonal and frequency-dependent restrictions for various activities; as well as multiple reporting requirements. Conditions to minimize or eliminate impacts on avian species include the use of red-flashing aviation obstruction lights on a meteorological tower, requiring the use of lights that meet USCG Private Aids to Navigation (PATON) requirements, requiring that additional lights on meteorological towers only be used when necessary and be hooded downward, and requiring that a meteorological tower, if proposed, be designed to avoid using guy wires. Conditions to minimize or eliminate impacts on fish and essential fish habitat (EFH) include “soft start” pile driving measures. Additional conditions and/or revisions to these conditions may be developed as new information becomes available and during future consultation with NMFS.

The SOCs are fully described in Appendix B and are discussed in relevant sections of Chapter 4 of this EA. These SOCs were developed through the analyses presented in Section 4.4 *Alternative A – The Proposed Action* and through consultation with other federal and state agencies.

3 SCENARIO OF REASONABLY FORESEEABLE ACTIVITY AND IMPACT-PRODUCING FACTORS

The purpose of this chapter is to describe the impact-producing factors under the proposed action. Although the geographic area evaluated in the G&G Final PEIS (BOEM, 2014a) does not cover the area proposed for the New York lease area, the PEIS scenario of reasonably foreseeable activities and impact-producing factors for site characterization did include G&G survey activities, namely, multi-beam bathymetry, side-scan sonar survey, magnetometer survey, sub-bottom profiler survey and cone penetrometer testing, boring and/or vibracoring, and other geotechnical exploration methods, which are the types of survey activities evaluated in this EA.

The G&G Final PEIS also describes the activities that would be conducted during buoy installation under the proposed action of this EA. Although the Atlantic OCS varies regionally, the resources evaluated in the G&G Final PEIS would generally be affected in similar ways on the OCS in the vicinity of the New York proposed lease area. Therefore, BOEM has incorporated the G&G Final PEIS into Section 3 of this EA by reference to the extent practicable. Because installation, operation, and decommissioning of meteorological towers are not described in the G&G Final PEIS (BOEM, 2014a), Section 3.2.2.1 of this EA provides a full description of that process.

This EA relies on BOEM's *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585* (BOEM, 2015c) and *Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585* (BOEM, 2015d) to describe the geophysical and geotechnical survey methods for site characterization activities that could occur under the proposed action considered in this EA. Descriptions of the G&G activities specific to the New York WEA are provided below.

3.1 Assumptions for Reasonably Foreseeable Scenario

This EA uses a reasonably foreseeable scenario of site characterization surveys and site assessment activities that could be conducted as a result of the proposed action. Site characterization includes shallow hazards, geological, geotechnical, archaeological, and biological surveys. Site assessment includes the installation, operation, and decommissioning of data collection devices (i.e., a meteorological tower and/or buoys) under an approved SAPs.

BOEM's assumptions for the proposed action scenario (Alternative A) in this EA are described below. These scenarios are based on the requirements of the renewable energy regulations at 30 CFR part 585, BOEM's guidance for lessees, previous lease applications and plans that have been submitted to BOEM, and previous EAs prepared for similar activities (Sections 1.4.1 and 1.5). Unless otherwise noted, assumptions in this section are based on these sources.

Overall Scenario Assumptions

- BOEM would issue one lease in the WEA.
- A lessee would construct no more than one meteorological tower, install one to two buoys, or a combination (e.g., one or two buoys and no meteorological tower *or* one meteorological tower and zero, one or two buoys).

Surveying and Sampling Assumptions

- Site characterization would likely take place in the first three years following execution of lease (based on the fact that a lessee would likely complete the majority of site characterization prior to installing a meteorological tower and/or buoy, which would leave approximately two years for site assessment).
- Lessees would likely survey the entire proposed lease area during the 5-year site assessment term to collect required geophysical information for siting of a meteorological tower and/or two buoys and commercial facilities (wind turbines). The surveys may be completed in phases, with the meteorological tower and buoy areas likely to be surveyed first.[9]
- The lessee would likely survey all OCS blocks in the TSS buffer zone since cable may be buried in the buffer zone area (although no site assessment structure placement would be allowed in the TSS buffer zone).
- Lessee would not use air guns, which are typically used for deep penetration two-dimensional or three-dimensional exploratory seismic surveys to determine the location, extent, and properties of oil and gas resources.

Installation, Decommissioning, and Operations and Maintenance Assumptions

- Meteorological tower installation would likely take approximately 1 to 10 weeks.[10]
- Tower decommissioning would likely take less than one week.
- Buoy installation and decommissioning would likely take approximately one day each.
- Tower and/or buoy installation and decommissioning would likely occur between April and August (due to weather).
- Tower and/or buoy installation would likely occur in Year 2 after lease execution.
- Tower and/or buoy decommissioning would likely occur in Year 6 or Year 7 after lease execution.

Assumptions for Generation of Noise

Under the reasonably foreseeable scenario of the proposed action, the following activities and equipment would generate noise:

- HRG survey equipment,
- Drilling and sediment sample collection as part of G&G surveys,

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[9] Although this EA assumes site characterization surveys for the lease area are likely to occur during the 5-year site assessment term, a lessee may survey smaller portions of the proposed lease area to prepare a COP; they may also choose to survey the remainder of the proposed lease area after a COP has been submitted. Thus, surveying may occur in phases. [10] This includes pile-driving (construction) activities that BOEM assumes will last from 1 to 3 days.

[10] This includes pile-driving (construction) activities that BOEM assumes will last from 1 to 3 days.

- Vessel engines during site characterization surveys and meteorological tower installation, operations and maintenance, and decommissioning,
- Installation of a meteorological tower, including pile driving, and
- Diesel engines on a meteorological tower and/or buoys where solar/wind are not used for power.

Details on the level of noise generated from HRG survey equipment are described in Section 3.2.1.1 *High-Resolution Geophysical Surveys*. Because the effects of pile driving noise can vary depending on the marine species being evaluated, details of pile driving noise are provided separately under *Marine Mammals*, *Sea Turtles*, and *Finfish, Invertebrates, and Essential Fish Habitat* in Section 4.4.

The following sections outline the proposed action scenario (Alternative A).

3.2 Routine Activities

3.2.1 Site Characterization Surveys

BOEM regulations require that the lessee provide the results of a number of surveys with its SAP (30 CFR 585.610–585.611) and COP (30 CFR 585.626(a)(1)). BOEM refers to these surveys as "site characterization" activities. Table 3–1 describes the types of site characterization surveys, the types of equipment and/or method used, and which resources the survey information would be used to inform.

Assumptions from the scenario are based on BOEM guidelines that provide recommendations to lessees for acquiring the information required for a SAP and COP under 30 CFR 585.610–585.611 and 30 CFR 585.626(a). BOEM has also published_*Guidelines for Information Requirements for a Renewable Energy Site Assessment Plan (SAP)* (BOEM, 2016a), which are available at: http://www.boem.gov/Final-SAP-Guidelines/. The survey guidelines are listed below and can be found at: http://www.boem.gov/Survey-Guidelines/.

- *Guidelines for Providing Geophysical, Geotechnical, and Geohazard Information Pursuant to 30 CFR Part 585* (BOEM, 2015c)
- *Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585* (BOEM, 2015d)
- *Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585* (BOEM, 2013b)
- *Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585* (BOEM, 2013c)
- *Guidelines for Providing Information on Marine Mammals and Sea Turtles for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 Subpart F* (BOEM, 2013d)

- *Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585* (BOEM, 2013e)
- *Guidelines for Submission of Spatial Data for Atlantic Offshore Renewable Energy Development Site Characterization Surveys* (BOEM, 2013f)

Table 3–1
Proposed Action Scenario Assumptions

Survey Type	Survey Equipment and/or Method	Resource Surveyed or Information Used to Inform
High-resolution geophysical surveys	Side-scan sonar, sub-bottom profiler, magnetometer, multi-beam echosounder	Shallow hazards,(1) archaeological,(2) bathymetric charting, benthic habitat
Geotechnical/sub-bottom sampling(3)	Vibracores, deep borings, cone penetration tests	Geological(4)
Biological(5)	Grab sampling, benthic sled, underwater imagery/sediment profile imaging	Benthic habitat
	Aerial digital imaging; visual observation from boat or airplane	Avian
	Ultrasonic detectors installed on survey vessels used for other surveys	Bat
	Visual observation from boat or airplane	Marine fauna (marine mammals and sea turtles)
	Direct sampling of fish and invertebrates	Fish

(1)30 CFR 585.610(b)(2) and 30 CFR 585.626(a)(1)
(2)30 CFR 585.626(a) and 30 CFR 585.610–585.611
(3)30 CFR 585.610(b)(1) and 30 CFR 585.626(a)(4)
(4)30 CFR 585.610(b)(4) and 30 CFR 585.616(a)(2)
(5)30 CFR 585.610(b)(5) and 30 CFR 585.626(a)(3)

In these guidelines, BOEM provides recommendations of survey methods that BOEM expects will yield site characterization information sufficient to allow the agency to consider approving a SAP or COP. For the purposes of the proposed action scenario, BOEM assumes that the lessee would employ these methods to acquire the information required under 30 CFR 585.610–585.611 and 30 CFR 585.626(a). To ensure that marine mammal and sea turtle data are appropriately collected, biological surveys for marine mammals and sea turtles will not occur at the same time as HRG surveys, as the noise produced by the HRG surveys may affect sighting rates. BOEM's *Guidelines for Providing Information on Marine Mammals and Sea Turtles for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 Subpart F* are intended to provide Lessees guidance on the type of information that will be needed if inadequate information exists. Lessees are encouraged to coordinate closely with BOEM to ensure appropriate survey design and methods are used.

3.2.1.1 High-Resolution Geophysical Surveys

The purpose of HRG surveys would be to acquire geophysical shallow hazards information, including information to determine whether shallow hazards will impact seabed support of the turbines, to obtain information pertaining to the presence or absence of archaeological resources, and to conduct bathymetric charting. A pre-development assessment of geophysical qualities of the WEA prepared for New York State Energy Research and Development Authority (NYSERDA) in 2010 included a comprehensive analysis of existing geophysical data. This report concluded that offshore wind development appears feasible with no fatal flaws identified. The report did identify a potentially active fault extending through the western portion of the WEA, which would need to be considered in the assessment of geologic shallow hazards once a SAP and/or COP has been submitted, as required by BOEM regulations (NYSERDA, 2010b).

Assuming the lessee would follow BOEM's guidelines to meet the geophysical data requirements at 30 CFR 585.610–585.611 and 30 CFR 585.626(a), BOEM anticipates that the surveys would be undertaken using the equipment to collect the required data as described in Table 3–2 and Table 3–3. Equivalent technologies to those shown in these tables may be used as long as their potential impacts are similar to those analyzed for the equipment described in this EA.

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

- For the collection of geophysical data for shallow hazards assessments, (including magnetometer, side-scan sonar and sub-bottom profiler systems) BOEM recommends survey at a 492-foot (ft) (150 m) line spacing over the proposed lease area;
- For the collection of geophysical data for archaeological resources assessments (including magnetometers, side-scan sonar, and all sub-bottom profiler systems) BOEM recommends survey at a 98 ft (30 m) line spacing over the proposed lease area; and
- For bathymetric charting, the lessee would likely use a multi-beam echosounder at a line spacing appropriate to the range of depths expected in the survey area.

Table 3–2
HRG Survey Equipment and Methods

Equipment Type	Data Collection and/or Survey Types	Description of the Equipment
Bathymetry/depth sounder (multi-beam echosounder)	Bathymetric charting	A depth sounder is a microprocessor-controlled, high-resolution survey-grade system that measures precise water depths in both digital and graphic formats. The system would be used in such a manner as to record with a sweep appropriate to the range of water depths expected in the survey area. This EA assumes the use of multi-beam bathymetry systems, which may be more appropriate than other tools for characterizing those lease areas containing complex bathymetric features or sensitive benthic habitats, such as hardbottom areas.
Magnetometer	Collection of geophysical data for shallow hazards and archaeological resources assessments	Magnetometer surveys would be used to detect and aid in the identification of ferrous or other objects having a distinct magnetic signature. The magnetometer sensor is typically towed as near as possible to the seafloor, and anticipated to be no more than approximately 20 ft (6 m) above the seafloor.
Side-scan sonar	Collection of geophysical data for shallow hazards and archaeological resources assessments	This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (MMS, 2007a). A typical side-scan sonar system consists of a top-side processor, tow cable, and towfish with transducers (or “pingers”) located on the sides, which generate and record the returning sound that travels through the water column at a known speed. BOEM assumes that the lessee would use a digital dual-frequency side-scan sonar system with 300 to 500 kHz frequency ranges or greater to record continuous planimetric images of the seafloor.
Shallow and medium (seismic) penetration sub-bottom profilers:	Collection of geophysical data for shallow hazards and archaeological resources assessments and to characterize subsurface sediments	Typically, a high-resolution CHIRP System sub-bottom profiler is used to generate a profile view below the bottom of the seabed, which is interpreted to develop a geologic cross-section of subsurface sediment conditions under the track line surveyed. Another type of sub-bottom profiler that may be employed is a medium penetration system such as a boomer, bubble pulser or impulse-type system. Sub-bottom profilers are capable of penetrating sediment depth ranges of 10 ft (3 m) to greater than 328 ft (100 m), depending on frequency and bottom composition.

CHIRP = Compressed High Intensity Radar Pulse kHz = kilohertz

Table 3–3
HRG Survey Equipment and Their Acoustic Characteristics

HRG Source	Source Level (dB re 1 µPa at 1m)			Main Pulse Frequency (kHz)	Pulse Duration (seconds)	Pulses per Second (PPS)
	PK-PK	RMS	SEL			
Boomers	219	207	176	4.3	.0008	1
S-Boom	213	203	172	3.8	.0009	3
Bubble Gun	207	198	173	1.1	.0033	8
Sparkers	229	214	188	2.7	.0022	6
Mini-Generator-Injector airgun	235	223	201	.26	.0052	4
EdgeTech sub-bottom profiler	191	180	159	6.3	.0087	8
Knudsen 3202 sub-bottom profiler	220	209	193	3.3	.0217	4
Reson Seabat 7111 multibeam echosounder	233	224	185	100	.00015	20
Reson Seabat T20P multibeam echosounder	226	218	182	>200	.00025	50
Echotrac CV100 single-beam echosounder	202	193	159	>200	.00036	20
Klein 3900 side-scan sonar	232	220	179	>200	.000084	unreported

Source: Highest reported source levels reported in Crocker & Fratantonio (2016) for sources that may be used for offshore wind site characterization surveys.

Table 3–3 provides a list of typical equipment used in HRG surveys and their acoustic intensity. This table is representative of the types of equipment for which sound characteristics are known from field measurements (Crocker & Fratantonio, 2016). Although we have based these representative sources on the highest reported power settings and source levels reported, actual equipment used could have frequencies and source levels below or above those indicated in Table 3–3.

3.2.1.2 Geotechnical/Sub-bottom Sampling

The G&G Final PEIS (BOEM, 2014a), which is hereby incorporated by reference, provides an overview of the geotechnical sampling techniques and devices (such as bottom-sampling devices, vibracores, deep borings, and cone penetration tests [CPTs]) that would be used to assess the suitability of shallow sediments to support a structure foundation (i.e. gather information to determine whether the seabed can support foundation structures) or transmission cable under operational and environmental conditions that could potentially be encountered (including extreme weather events), as well as to document the sediment characteristics necessary for design and installation of all structures and cables. The information obtained from these samplings will be used inform the lessee in preparation of the COP, and subsequent facility design and installation plans that are submitted to BOEM. The information from the G&G Final PEIS is summarized below.

Samples for geotechnical evaluation are typically collected using shallow-bottom coring and surface sediment sampling devices taken from a small marine drilling vessel. Likely methods to obtain samples to analyze physical and chemical properties of surface sediments are described in Table 3–4.

CPTs and bore holes are often used together because they provide different data on sediment characteristics. A CPT provides a fairly precise stratigraphy of the sampled interval, plus other geotechnical data, but does not allow for capture of an undisturbed soil sample. Bore holes can provide undisturbed samples, but are most effectively used in conjunction with CPT-based stratigraphy so that sample depths can be pre-determined. A CPT is suitable for use in clay, silt, sand, and granule-sized sediments as well as some consolidated sediment and colluvium. Bore hole methods can be used in any sediment type and in bedrock. Vibracores are suitable for extracting continuous sediment samples from unconsolidated sand, silt, and clay-sized sediment up to 33 ft (10 m) below the seafloor.

The U.S. Army Corps of Engineers (USACE) Nationwide Permit (NWP) Program (USACE, 2012) was developed to streamline the evaluation and approval process for certain types of activities that have only minimal impacts on the aquatic environment.[11] NWP 6 addresses survey activities such as core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, and historic resources surveys. Most site characterization surveys that require seafloor disturbance would be authorized by a NWP 6. The discharge of drilling mud, which could result from core sampling or geological borings, may require a permit under Section 402 of the Clean Water Act (USACE, 2012). An individual permit may be required from USACE if the proposed survey activities do not meet the terms and conditions of the NWP or if USACE determines that the survey activities will result in more than minimal adverse effects on the aquatic environment.

[11] USACE jurisdiction of the OCS pertains to structures or activities that could disturb the seabed.

Table 3–4
Geotechnical/Sub-bottom Sampling Survey Methods and Equipment

Survey Method	Use	Description of the Equipment and Methods
Bottom-sampling devices	Penetrating depths from a few centimeters (cm) to several meters (m)	A piston core or gravity core is often used to obtain samples of soft surficial sediments. Unlike a gravity core, which is essentially a weighted core barrel that is allowed to free-fall into the water, piston cores have a “piston” mechanism that triggers when the corer hits the seafloor. The main advantage of a piston core over a gravity core is that the piston allows the best possible sediment sample to be obtained by avoiding disturbance of the sample (MMS, 2007a). Shallow-bottom coring employs a rotary drill that penetrates through several feet (ft) of consolidated rock. The above sampling methods do not use high-energy sound sources (MMS, 2004; MMS, 2007a).
Vibracores	Obtaining samples of unconsolidated sediment; may, in some cases, also be used to gather information to inform the archaeological interpretation of features identified through the HRG survey (BOEM, 2015d)	Vibracore samplers typically consist of a core barrel and an oscillating driving mechanism that propels the core barrel into the sub-bottom. Once the core barrel is driven to its full length, the core barrel is retracted from the sediment and returned to the deck of the vessel. Typically, cores up to 20 ft (6 m) long with 3 inch (in.) (8 cm) diameters are obtained, although some devices have been modified to obtain samples up to 40 ft (12 m) long (MMS, 2007a; USACE, 1987).
Deep borings	Sampling and characterizing the geological properties of sediments at the maximum expected depths of the structure foundations (MMS, 2007a)	A drill rig is used to obtain deep borings. The drill rig is mounted on a jack-up barge supported by four “spuds” that are lowered to the seafloor. Geologic borings can generally reach depths of 100 to 200 ft (30–61 m) within a few days (based on weather conditions). The acoustic levels from deep borings can be expected to be in the range of 118 to 145 dB at a frequency of 120 hertz (Hz), which would be below the 160 dB threshold established by NMFS to protect marine mammals.
Cone penetration test (CPT)	Supplement or use in place of deep borings (BOEM, 2015c)	A CPT rig would be mounted on a jack-up barge similar to that used for the deep borings. The top of a CPT drill probe is typically up to 3 in. (8 cm) in diameter, with connecting rods less than 6 in. (15 cm) in diameter.

dB = decibels
Hz = hertz

Sub-bottom sampling of the WEA would require a sub-bottom sample at every potential wind turbine location (which would only occur in the portion of the WEA where structural placement is allowed) and one sample per nautical mile of transmission cable corridor (which could occur in the TSS buffer zone area of the WEA, where no site assessment structures would be allowed). The amount of effort and vessel trips required to collect the geotechnical samples varies greatly by the type of technology used to retrieve the sample:

- Vibracore samples would most likely be advanced from a single small vessel (approximately 45 ft [14 m]).
- CPT sampling would depend on the size of the CPT; it could be advanced from a medium vessel (approximately 65 ft [20 m]), a jack-up barge, a barge with a four-point anchoring system, or a vessel with a dynamic positioning system. Each barge scenario would include a support vessel.
- Geologic borings would be advanced from a jack-up barge, a barge with a four-point anchoring system, or a vessel with a dynamic positioning system. Each barge scenario would include a support vessel.

3.2.1.3 Biological Surveys

Under BOEM's regulations, the SAP, COP, and General Activities Plan (GAP) must describe biological resources that could be affected by the activities proposed in the plans, or that could affect the activities proposed in the plans (see 30 CFR 585.611(a)(3); 30 CFR 585.626(a)(3); and 30 CFR 585.645(a)(5)).

To support development of these plans, three primary categories of biological resources would need to be characterized using appropriate vessel and/or aerial surveys of the proposed lease area: (1) benthic habitats, (2) avian and bat resources, and (3) marine fauna. Likely survey methods and timing are listed in Table 3–5 and further described below.

Table 3–5
Biological Survey Types and Methods

Biological Survey Type	Survey Method	Timing
Benthic habitat	Bottom sediment/fauna sampling and underwater imagery/sediment profile imaging (sampling methods described above under geotechnical surveys)	Concurrent with geotechnical/sub-bottom sampling
Avian	Visual surveys from a boat	10 OCS blocks per day; monthly for 2 to 3 years
	Plane-based aerial surveys	2 days per month for 2 to 3 years
Bats	Ultrasonic detectors installed on survey vessels being used for other biological surveys	Monthly for 3 months per year between March and November
Marine fauna (marine mammals, fish and sea turtles)	Plane-based and/or vessel surveys – may be concurrent with other biological surveys, but will not be concurrent with any geophysical or geotechnical survey work	2 years of survey to cover spatial, temporal and inter-annual variance in the area of potential effect

For biological surveys, BOEM assumes that:

- All vessels associated with the proposed action would be required to abide by the SOCs detailed in Appendix B, and
- NMFS may require additional measures from the lessee to comply with the MMPA.

Benthic Habitat Surveys

Samples collected from the geotechnical sampling of shallow sediments and information from geophysical surveys would help identify sensitive benthic habitats. These surveys would acquire information suggesting the presence or absence of exposed hardbottoms of high, moderate, or low relief; hardbottoms covered by thin, ephemeral sand layers; and submerged aquatic vegetation or macro-algae, all of which are key characteristics of sensitive benthic habitat. There are two protocol surveys emphasized within the BOEM *Benthic Habitat Survey Guidelines* (BOEM, 2013b): a Sediment Scour and/or Deposition Survey and a Benthic Community Composition Survey. The first involves particle size analysis or sediment-profile imaging and multibeam/interferometric bathymetry (with the collection of backscatter data). The second requires benthic imagery (i.e., underwater video or still imagery of sediment bottom type) as well as physical sampling using one of the following methods:

- Hamon grab (hardbottom),
- Van Veen grab (soft sediment), and/or
- Benthic sled.

BOEM believes that these surveys may be conducted concurrently with other geophysical sampling and/or biological surveys and that the lessee would not need to conduct separate biological surveys to delineate benthic habitats. However, if the benthic surveys, G&G surveys, or other information identify the presence of sensitive benthic habitats on the leasehold, then further investigations would likely be necessary.

Avian Surveys

If avian surveys are required, BOEM anticipates that two to three years of surveys would be necessary to document the distribution and abundance of bird species within the WEA. This survey timeframe is based on the *Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585* (BOEM, 2013c), which indicate that the lessee must document the spatial distribution of avian resources in the areas proposed for development, incorporating both seasonal and inter-annual variation. Historically, avian data have been collected using a combination of boat and aerial surveys. Boat surveys could be completed in a single day for approximately 10 OCS blocks when subsampling 10 percent of the area, which is standard practice (Thaxter & Burton, 2009). A monthly sampling interval for boat-based surveys represents an upper limit of survey frequency; therefore, two to three years of surveying at monthly intervals would be anticipated using one or a combination of methods.

Although both boat-based and aerial surveys using visual observers have been used in the past, including for offshore wind baseline studies in the United States (NJDEP, 2010; Paton et al., 2010), these methodologies have been largely replaced by aerial digital imaging surveys in

Europe because of reduced observer effects, higher statistical and scientific validity of the data, and the ability to conduct surveys at altitudes above the rotor swept zone of commercial marine wind turbine rotors (Rexstad & Buckland, 2009; Thaxter & Burton, 2009) and are less likely to flush birds than in traditional low flying aerial surveys.

Bat Resource Surveys

Bats use echolocation with species-specific characteristics when orienting through space, and ultrasonic detectors are a cost-effective method for monitoring multiple bat species on a large spatial scale. Ultrasonic detectors are portable and can be easily installed on survey vessels being used for other biological surveys, and/or onto a meteorological tower. BOEM assumes that bat acoustic surveys would be conducted during the fall migration period and, if necessary, during the spring migration.

Marine Fauna Surveys

The lessee is required to characterize the marine fauna (i.e., marine mammals, sea turtles, and fish species) occurring within its lease area, and include this information in its plan submissions (30 CFR 585.610(a)(8)). The lessee may use existing information, if the information meets plan requirements. If biological information is not available or does not meet plan requirements for the lease area, data gaps or special circumstances may need to be addressed and filled by survey work (BOEM, 2013e) over a period of two years, but perhaps more depending upon data needs in the area of potential effect. BOEM, the U.S. Department of Energy (DOE), and state governments are in the process of collecting biological information in several of the Atlantic WEAs. Regional-scale efforts, including the National Oceanic and Atmospheric Administration (NOAA)/BOEM Atlantic Marine Assessment Program for Protected Species, will also aid in providing data to support site characterization. The results of these studies could be used to determine whether additional surveys would be necessary to document marine mammal, fish, or sea turtle resources in the WEA prior to submitting a plan. BOEM anticipates that any vessel or aerial traffic associated with marine fauna surveys would not markedly add to current levels of traffic within the WEA.

3.2.1.4 Surveying of Potential Cable Route

BOEM assumes that during site characterization, a lessee would survey a potential transmission cable route (for connecting future wind turbines to an onshore power substation) from the WEA to shore using HRG survey methods. BOEM assumes that the HRG survey grids for a proposed transmission cable route to shore would likely occur over a 984-ft-wide (300-m-wide) corridor centered on the potential transmission cable location to allow for all anticipated physical disturbances and movement of the proposed cable, if necessary.

Because it is not yet possible to predict precisely where an onshore power substation may ultimately be installed or the route that any potential future transmission line would take across the seafloor from the WEA to shore, this EA uses a direct route from the middle of the WEA and a hypothetical potential interconnection point onshore in southern Manhattan—a distance of 44 nm (74 km)—to conservatively approximate the level of surveys that may be conducted to characterize a transmission cable route. The hypothetical line used to approximate the level of surveys in no way represents a proposed cable route. A lessee would be required to submit detailed information on the proposed cable route(s) and wind turbine locations within their COP;

per COP guidelines (BOEM, 2016b; available at: http://www.boem.gov/COP-Guidelines/), BOEM encourages lessees to coordinate with other subsea cable operators when planning cable routes. BOEM would then analyze the proposed route(s) and location(s) in a project-/site-specific environmental document.

3.2.1.5 Operational Waste Associated with Site Characterization

Operational wastes would be generated from all vessels associated with the proposed action. Requirements for management and disposal of bilge and ballast waters, solid waste (trash and debris), and sanitary/domestic wastes are described in the 2012 Mid-Atlantic EA (BOEM, 2012b). BOEM assumes that these requirements would be followed and hereby incorporates them by reference.

The U.S. Environmental Protection Agency (EPA) regulates discharges incidental to the normal operation of all non-recreational, non-military vessels greater than 79 ft (24 m) in length into U.S. waters, under Section 402 of the Clean Water Act. EPA requires that eligible vessels obtain coverage under the National Pollutant Discharge Elimination System Vessel General Permit (VPG). A separate, streamlined permit is available for vessels less than 79 ft (24 m) (Small Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels Less than 79 Ft). Typical discharges eligible for coverage under the VPG include deck runoff, graywater (from showers, sinks, laundry facilities, etc.), bilgewater, and ballast water. The discharge of any oil or oily mixtures within bilgewater is prohibited under 33 CFR 151.10; however, discharges may occur in waters greater than 12 nm (22 km) from shore if the oil concentration is less than 100 parts per million and bilge/oily water separator effluent is covered for discharge under the final 2013 EPA VPG. Although ballast water is less likely to contain oil, it is subject to the same discharge limits as bilgewater (33 CFR 151.10). Ballast water, which is used to maintain stability of the vessel, may be pumped from coastal or marine waters when necessary and is usually stored in separate compartments not contaminated with oil. Ballast water is subject to USCG Ballast Water Management Program to prevent the spread of aquatic nuisance species. New York state regulations for bilge and ballast water are more stringent than EPA VPG regulations. New York and New Jersey have several no discharge areas where bilge and ballast water discharges are prohibited (NYSDEC, 2016; EPA, 2016a).

The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEM (30 CFR 250.300) and USCG (International Convention for the Prevention of Pollution from Ships [MARPOL], Annex V, Public Law 100–220 [101 Stat. 1458]). The Act to Prevent Pollution from Ships (APPS) is a U. S. federal law that allows USCG to implement the provisions of MARPOL (33 U.S.C. §§ 1901–1915). The APPS applies to all U. S. flagged ships in U.S. and international waters and to all foreign flagged vessels operating in navigable waters of the United States, or while at port under U. S. jurisdiction.

3.2.2 Site Assessment Activities and Data Collection Structures

No site assessment activities could take place on a lease until BOEM has approved a lessee's SAP, which would most likely include installation of a meteorological tower and/or buoys (30 CFR 585.600(a)). Through lease stipulations and terms and conditions of SAP approval, the lessee will be required to submit a SAP survey plan that includes contacting the First Coast Guard District regarding issuance of a local notice to mariners and obtaining a PATON permit for any metrological tower and/or buoy installed, which will trigger notification of NOAA to update nautical charts with these new offshore objects. Once approved, site assessment activities could occur over a 5-year period from the date of the lease. This EA assumes that a lessee would install some type of data collection device (i.e., meteorological tower, buoy, or both) within its lease area to assess the wind resources and ocean conditions.

The following scenario is broad enough to address the range of data collection devices that may be installed under an approved SAP. The actual tower and foundation type and/or buoy type and anchoring system would be included in a detailed SAP submitted to BOEM, along with the results of site characterization surveys, prior to installation of any device(s).

3.2.2.1 Meteorological Towers and Foundations

One of the traditional instruments used for characterizing wind conditions is the meteorological tower. 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 type (similar to a radio tower) (Figure 3-1 and Figure 3-2, respectively). Mast and data collection devices can be mounted on a fixed or pile-supported platform (monopile, jackets, or gravity bases) or on a floating platform (spar, semi-submersible, or tension-leg). Different types of foundations include tripod, monopile, or steel jacket. The mast, platform, and foundation types are described in further detail (including images and measurement specifications) in the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Final Environmental Assessment* (BOEM, 2014b) and hereby incorporated by reference and summarized below.

Figure 3-1 Example of Monopole Mast Meteorological Tower with a Tripod Foundation

Source: BOEM, 2011a (Note: the third leg of the tripod

Figure 3-2 Example of a Lattice Mast Meteorological Tower with a Monopile Foundation

Source: GL Garrad Hassan, 2012 as cited in BOEM, 2014b *is not seen in this photo)*

BOEM has not yet received a request to install a meteorological tower mounted on a floating platform in the Atlantic. Given that a fixed foundation is likely to be installed, a floating platform meteorological tower is not evaluated in this EA. However, should BOEM receive an application for a floating platform meteorological tower structure for the New York WEA, BOEM would consider whether such a platform would lead to environmental consequences not considered in this EA. Similarly, if foundation selection by the lease holder is different from the meteorological tower specifications presented in this EA, BOEM would determine the adequacy of the analysis of environmental consequences provided in this EA. If the proposed foundation is different than described in this EA, the specifications for the selected tower would be included in a detailed project plan submitted to BOEM after site characterization surveys are conducted and prior to construction.

Types of foundations include tripod (Figure 3-1), monopile (Figure 3-2 and Figure 3-3(a)), or steel jacket (Figure 3-3(b)). Characteristics of these foundation types are summarized in Table 3–6. The proposed foundation type for a given project would be identified in a lessee's SAP.

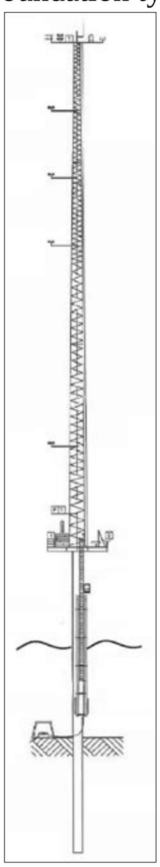

Figure 3-3(a) Lattice-Type Mast-Mounted Meteorological Tower on a Monopile Foundation

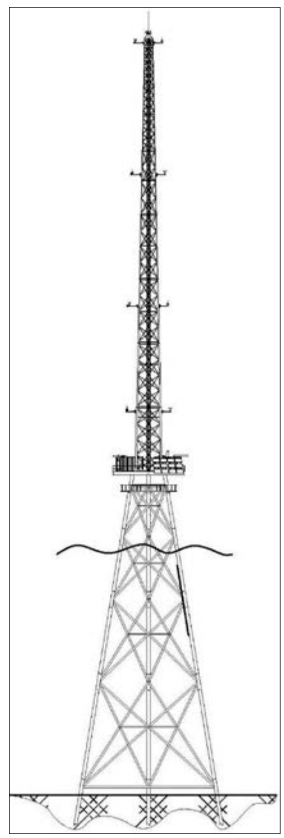

Figure 3-3(b) Lattice-Type Mast-Mounted Meteorological Tower on a Steel Jacket Foundation

Source: Deepwater Wind, LLC, as cited in BOEM, 2012b

Table 3–6
Meteorological Tower Foundations

Type of Foundation	Foundation Piles		Area of Bottom Covered[(1)] (ft^2)	Depth Driven below Seafloor (ft)	Height above Mean Sea Level (ft)[(2)]
	Number	Diameter (ft)			
Tripod	3	10	1,500	25 to 100	295 to 393
Monopile	1	10	200	25 to 100	295 to 393
Steel jacket	3 to 4	3	2,000	25 to 100	295 to 393

[(1)] Foundations may be surrounded by a scour system placed at the base of the structure that would cover up to 2 ac (0.81 ha) of ocean bottom.

[(2)] Height range based on the tallest commercially available meteorological tower.

SAP Requirements for the Meteorological Tower

After a lease is issued and initial survey activities are conducted, the lessee may not install a meteorological tower until a SAP is submitted for review and approved by BOEM. A SAP for a meteorological tower should describe any activities that disturb the seafloor during site assessment activities, including: (1) the nature, intensity, and duration of disturbances to the seafloor, such as pile driving, vessel anchoring, and decommissioning; (2) the nature, intensity, and duration of local and global scour, wave strike and overtopping, and slope instability and seismic events; (3) geology and geomorphology, sediment conditions and sediment transport processes; and (4) physiographic conditions having the potential to destabilize planned activities or facilities (BOEM, 2016a).

Site characterization activities, as described in this EA, are covered under the Biological Opinion for *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* (NER-2012-9211) issued by NMFS as part of the ESA Section 7 consultation for the area of Atlantic OCS offshore New York (NMFS, 2013a). Site assessment activities for the New York WEA were not addressed in that Biological Opinion; therefore, BOEM will consult with NMFS under Section 7 of the ESA for installation of a meteorological tower and/or buoys in the WEA, as appropriate. See Section 5.3.1 of this EA, *Endangered Species Act*, for further information regarding ESA consultation.

Installation

Total installation time for one meteorological tower would likely take between 1 and 10 weeks, depending on the type of structure installed, the weather, and the sea state conditions (MMS, 2009b). Because of delays caused by weather and sea conditions, acquisition of permits, and availability of vessels, workers, and tower components, installation may not occur during the first year of a lease and may be spread over more than one construction season. If installation occurs over two construction seasons, the foundation would likely be installed first with limited meteorological equipment mounted on the platform deck, and the mast and remaining equipment would be installed the following year (MMS, 2009b).

A USACE NWP 5 for Scientific Measurement Devices is required for devices and scientific equipment whose purpose is to record scientific data. Examples of these devices include meteorological stations (which would include a meteorological tower and/or buoys), water recording and biological observation devices, water quality testing and improvement devices, and similar structures. Per NWP 5, "*upon completion of the use of the device to measure and record scientific data, the measuring device and any other structures or fills associated with that device (e.g., foundations, anchors, buoys, lines, etc.) must be removed to the maximum extent practicable and the site restored to preconstruction elevations,*" as prescribed by Section 404 of the Clean Water Act (CWA) and Section 10 of the River and Harbors Act of 1899 (USACE, 2012). Activities described within this EA may require USACE NWPs (NWP 5 for a meteorological tower and/or buoys and NWP 6 for survey activities) for the prevention of water pollution, including approval of water discharge permits and water quality certifications, as well as the development and retention of risk management plans and records. A future lessee of the proposed lease area must contact the appropriate USACE district office to determine if regional conditions warrant application for a NWP. Although the requirement of a NWP by USACE is coordinated with EPA, EPA and the respective state(s) ultimately authorize a water quality certification. Other federal, state, and local permits, approvals, or authorizations may also be required. The USACE District Engineer, state, or tribe may require additional water quality management measures to ensure that the authorized activity, such as site characterization, does not result in more than minimal degradation to water quality.

Installation – Onshore Activity

The meteorological tower platform would be fabricated onshore at an existing fabrication yard. Production operations would include cutting, welding, and assembling steel components. These yards occupy large areas with equipment, including lifts and cranes, welding equipment, rolling mills, and sandblasting machinery. The locations of these fabrication yards are directly tied to the availability of a large enough channel that would allow the towing of these structures. The average bulkhead depth needed for water access to fabrications yards is 15 to 20 ft (5 to 6 m). Therefore, platform fabrication yards must be located at deep-draft seaports or along the wider and deeper of the inland channels. Section 3.2.3 *Port Facilities* identifies the ports that could support the fabrication of a meteorological tower.

The meteorological tower could also be fabricated at various facilities or at inland facilities in sections and then shipped by truck or rail to the port staging area. The meteorological tower would then be partially assembled and loaded onto a barge for transport to the offshore site. Final assembly of the tower itself would be completed offshore (MMS, 2009b).

Installation – Offshore Activity

During installation, a radius of approximately 1,500 ft (457 m) around the site would be needed for the movement and anchoring of support vessels. The following sections describe the installation of a foundation structure and tower. Several vessels would be involved with construction of a meteorological tower (Table 3-7).

Installation of the Foundation Structure and Mast

A jacket or monopile foundation and deck would be fabricated onshore, then transferred to a barge(s) and carried or towed to the offshore site.

The foundation piles would be driven anywhere from 25 to 200 ft (8-61 m) below the seafloor with a pile driving hammer typically used in marine construction operations. Pile driving typically lasts up to 3 to 8 hours per pile, potentially occurring over a period of three days for each tower (BOEM, 2014a). A jack-up barge equipped with a crane would be used to assist in the mounting of the platform decking, tower, and instrumentation onto the foundation. Depending on the type of structure installed and the weather and sea conditions, the in-water construction of the foundation pilings and platform would take a few days (monopile in good weather) to 6 weeks (jacket foundation in bad weather) (MMS, 2009b).

The mast sections would be raised using a separate barge-mounted crane; installation would likely be complete within a few weeks. The installation barges would be tended by appropriate tugs and workboats as needed. The types of vessels and number of trips to install one meteorological tower are listed in Table 3–7.

Table 3–7
Projected Vessel Usage and Specifications for the Construction of One Meteorological Tower

Vessel Type	Round Trips	Hours on Site	Length ft (m)	Displacement (tons)	Engines (horsepower)	Fuel Capacity (gallons)
Crane barge	2	232	150–250 (46–76)	1,150	0	500
Deck cargo	2	232	150–270 (46–82)	750	0	0
Small cargo barge	2	232	90 (27)	154	0	0
Crew boat	21	54	51–57 (16–17)	100	1,000	1,800
Small tug boat	4	54	65 (20)	300	2,000	14,000
Large tug boat	8	108	95 (29)	1,300	4,200	20,000

Source: MMS, 2009b

Scour Control System

BOEM assumes that scour control systems would be installed if required to prevent seabed scour at the site. If the lessee proposes a meteorological tower, BOEM will likely require inspections of the foundation and submittal of scour monitoring reports at prescribed intervals and after a major storm event. There are several types of scour control systems, including placement of rock armoring and mattresses of artificial (polypropylene) seagrass around foundation structures or underwater cabling. The type of scour control system used may vary depending on the seabed at a specific site and the meteorological tower foundation used.

A rock-armor scour protection system may be used to stabilize a structure's foundation area. In water depths greater than 15 ft (5 m), the median stone size would likely be about 50 pounds (lbs) (22 kilograms [kg]) with a stone layer thickness of about 3 ft (1 m). If there is a potential for seabed scour at the site, the foundation structure and a scour control system would occupy less than 1 ac (0.4 ha). Rock armor for a wind turbine monopile foundation typically occupies 16,000 square feet (ft^2) (1,486 square meters [m^2]) or 0.37 ac (0.15 ha) of the seabed (ESS Group, 2004). The piles for a meteorological tower would be smaller than those for a wind turbine and could require less scour protection than a monopile for a wind turbine. However, a meteorological tower may be supported by up to four piles if a jacket foundation is used; in this case, the amount of rock-armor scour protection required is expected to be similar to that of a wind turbine monopile. Therefore, assuming a seafloor area approximating that of a monopile foundation, the maximum area of the seabed affected by rock armor for a single meteorological tower is estimated to be 16,000 ft^2 (1486 m^2). 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.

Artificial seagrass mats are made of synthetic fronds that mimic seafloor vegetation to trap sediment. The mats become buried over time and have been effective for controlling scour in both shallow and deep waters (ESS Group, 2004). Scour monitoring conducted over a 3-year timeframe at the Cape Wind meteorological tower indicated that a net increase of 12 inches (in.) (30 cm) of sand occurred where artificial seagrass scour mats were installed around one pile, and there was a net scour depth of 7 in. (18 cm) at another pile with artificial seagrass scour mats (Ocean and Coastal Consultants, 2006). If used, these mats would be installed by a diver or remotely operated underwater vehicle (ROV). Each mat would be anchored at 8 to 16 locations to a depth of about 1 ft (0.3 m) into the sand. Although mats can be fabricated to any shape or size, BOEM estimates that four mats, each about 8.2 ft by 16.4 ft (2.5 m by 5 m), would be placed around each pile. Including the extending sediment bank, BOEM estimates a total disturbance area of about 5,200 to 5,900 ft^2 (483-548 m^2) for a three-pile structure and 5,900 to 7,800 ft^2 (548-725 m^2) for a four-pile structure. For a monopile foundation, BOEM estimates that eight mats, about 16.4 by 16.4 ft (5 by 5 m), would be used; the total disturbance area would be about 3,700 to 4,000 ft^2 (344-372 m^2).

Operation and Maintenance

BOEM anticipates that a meteorological tower would be present for approximately 5 years before BOEM decides whether to allow the tower to remain in place for some or all of the operations term of a lease (25 years) or require that it be decommissioned immediately after the 5-year site assessment term. The meteorological tower could also remain in place during the time period that BOEM reviews the COP (i.e., the tower may remain for a number of years following the 5-year site assessment period).

While the meteorological tower is in place, data would be collected and processed remotely; as a result, data cables to shore would not be necessary. The structure and instrumentation would be accessible by boat for routine maintenance. As indicated in previous SAPs submitted to BOEM (MMS, 2009b), as well as in US Wind Inc.'s SAP (ESS Group, 2016a), lessees proposing meteorological towers could power equipment by solar panels, small wind turbines, and/or diesel generators. According to US Wind Inc.'s SAP, planned maintenance and operations could require two visits by the operations and maintenance vessel each quarter over the course of a year. Previous SAPs included monthly or quarterly vessel trips for operation and maintenance activity over the 5-year life of a meteorological tower. However, if a diesel generator is used to power the meteorological tower's lighting and equipment, a maintenance vessel could make a trip at least once every other week, if not weekly, to provide fuel, change oil, and perform maintenance on the generator (MMS, 2009b).

No additional or expansion of onshore facilities would be required to conduct these tasks. BOEM projects that crew or supply boats would be used for routine maintenance and generator refueling, if diesel generators are used. The relatively close distance of proposed lease area from shore would make vessels more economical than helicopters, so the use of helicopters to transport personnel or supplies during operation and maintenance is not anticipated.

Lighting and Marking

USCG administers the permits for PATONs, which are buoys, lights, or day beacons owned and maintained by any individual or organization other than USCG. These aids to navigation are designed to allow individuals or organizations to mark privately owned marine obstructions or other similar hazards. However, before certifying a navigational aid and obtaining a PATON permit, a project must have approval from USACE, which regulates structures, moorings, buoys, and markers on the OCS pursuant to the Rivers and Harbors Act (33 U.S.C. 403) and OCSLA (43 U.S.C. 1333(e)). BOEM will require the lessee to apply to USCG to have its meteorological tower and/or buoys in the proposed lease area classified as PATON, which will trigger USCG's lighting and marking requirements (33 CFR Part 66). USCG has informed BOEM that it will require a meteorological tower and/or buoys to be displayed on NOAA nautical charts.

For a meteorological tower taller than 200 ft (61 m) and within 12 nm (22 km) from shore, the lessee would be required to file a Notice of Proposed Construction or Alteration with the FAA per federal aviation regulations (14 CFR 77.7 and 14 CFR 77.9). This would also be necessary if it exceeds any other obstruction standard contained in 14 CFR Part 77. The FAA would then conduct an obstruction evaluation analysis to determine whether a meteorological tower would pose a hazard to air traffic, and would issue a Determination of Hazard/No Hazard. The FAA's current guidance on obstruction marking and lighting (FAA, 2015) does not specifically mention regulations for lighting and marking of ocean-based towers. In their current guidance, the FAA recommends voluntary marking and/or lighting of a meteorological evaluation tower less than 200 ft (61 m) in height above ground level to address safety impacts to low-level agricultural flight operations to enhance the conspicuity of these towers in remote and rural areas; therefore, this voluntary marking and lighting in accordance with FAA regulations may not apply to meteorological towers in the proposed lease area.

The closest location to land that a meteorological tower could likely be installed under the proposed action is approximately 13.5 nm (25 km) from the shoreline, given the 1 nm (1.9 km) buffer from the edge of the TSSs—the western-most tip of the WEA. Therefore, a meteorological tower would not likely be installed within the FAA's 12 nm (22 km) jurisdiction for which an FAA Notice of Proposed Construction or Alteration would be required. However, if a meteorological tower was to be placed within 12 nm (22 km) of the shoreline, and because BOEM anticipates that a tower would be greater than 200 ft (61 m) tall, the lessee would be required to file an FAA Notice of Proposed Construction or Alteration.

Other Uses

The meteorological tower and platform could be used to gather other information in addition to meteorological information, such as data regarding birds, bats, and marine mammals in the proposed lease area.

Decommissioning

As late as two years after the cancellation, expiration, relinquishment, or other termination of the lease, the lessee would be required to remove all devices, works, and structures from the site, and restore the leased area to its original condition before issuance of the lease (30 CFR 585, Subpart I). Lessees are required to submit a decommissioning application to BOEM for approval prior to starting decommissioning activities (30 CFR 585.902(b)).

BOEM estimates that the entire removal process for a meteorological tower would take one week or less (BOEM, 2012b). Decommissioning activities would begin with removal of all meteorological instrumentation from the tower, typically requiring a single vessel. A derrick barge would be transported to the offshore site and anchored adjacent to the structure. The mast would be removed from the deck and loaded onto the transport barge. The deck would be cut from the foundation structure. The same number of vessels necessary for installation would most likely be required for decommissioning. The sea bottom beneath installed structures would be cleared of all materials that have been introduced to the area in support of the lessee's project.

Cutting and Removing

As required by BOEM, the lessee would sever bottom-founded structures and their related components to at least 15 ft (5 m) below the mudline to ensure that nothing would be exposed that could interfere with future leases and other activities in the area (30 CFR 585.910(a)). Which severing tool the lessee would use depends on the target size and type, water depth, economics, environmental concerns, tool availability, and weather conditions (MMS, 2005). Because of their type and size, piles for the meteorological tower in the WEA would be removed using non-explosive severing methods.

Common non-explosive severing tools and methods that might be used consist of abrasive cutters (e.g., sand cutters, abrasive water jets), mechanical (carbide) cutters, diver cutting (e.g., underwater arc cutters, oxyacetylene/oxyhydrogen torches), and diamond wire cutters. Of these, the most likely tools to be employed would be an internal cutting tool, such as a high-pressure water jet-cutting tool that would not require the use of divers to set up the system or jetting operations to access the required mudline (Kaiser et al., 2005). To cut a pile internally, the sand that had been forced into the hollow pile during installation would be removed by hydraulic dredging/pumping and stored on a barge. Once cut, the steel pile would then be lifted onto a barge and transported to shore. Following the removal of the cut pile and the adjacent scour control system, the sediments would be returned to the excavated pile site using a vacuum pump and diver-assisted hoses. As a result, no excavation around the outside of the monopile or piles prior to the cutting is anticipated. Cutting and removing piles would take anywhere from several hours to one day per pile. After the foundation is severed, it would be lifted on the transport barge and towed to a decommissioning site onshore (MMS, 2009b).

Removal of the Scour Control System

Any scour control system would also be removed during the decommissioning process. Scour mats would be removed by divers or ROV and a support vessel in a similar manner to installation. Removal is expected to result in the suspension of sediments that were trapped in the mats. If rock armoring is used, armor stones would be removed using a clamshell dredge or similar equipment and placed on a barge. BOEM estimates that the removal of the scour control system would take a half day per pile. Therefore, depending on the foundation structure, removal of the scour control system would take a total of one-half to two days to complete (MMS, 2009b).

Disposal

Unless portions of the meteorological tower are approved for use as artificial reefs (30 CFR 585.909(d)), all materials would be removed by barge and transported to shore. The steel would be recycled and remaining materials would be disposed of in existing landfills in accordance with applicable laws. Obsolete materials have been used as artificial reefs along the coastline of the United States to provide valuable habitat for numerous species of fish in areas devoid of natural hardbottom. The meteorological tower structures may also have the potential to serve as artificial reefs. However, the structure must not pose an unreasonable impediment to future development. If the lessee ultimately proposes to use the structure as an artificial reef, its plan must comply with the artificial reef permitting requirements of the USACE and the criteria in the National Artificial Reef Plan of 1985 (33 CFR 35.2103). The New York State Department of Environmental Conservation (NYSDEC) manages New York's artificial reef program and must accept liability for the structure before BOEM would release the federal lessee from the obligation to decommission and remove all structures from the lease area.

3.2.2.2 Meteorological Buoy and Anchor System

Although a meteorological tower has been the traditional device for characterizing wind conditions, the lessee could install meteorological buoys instead or in addition to the meteorological tower. Should a lessee choose to employ buoys instead of a meteorological tower, this EA assumes that it would install a maximum of two buoys over the proposed lease area. These meteorological buoys would be anchored at fixed locations and regularly collect observations from many different atmospheric and oceanographic sensors. Buoys may be equipped with generators holding approximately 250 gallons of fuel. The *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment* (BOEM, 2014b) evaluated various meteorological buoy and anchor systems, including hull type, height, and anchoring methods. NOAA has successfully used boat-shaped hull buoys (known as Naval Oceanographic and Meteorological Automated Devices [NOMAD]) and the newer Coastal Buoy and Coastal Oceanographic Line-of-Sight (COLOS) buoys, for weather data collection for many years (Figure 3-4).

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

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

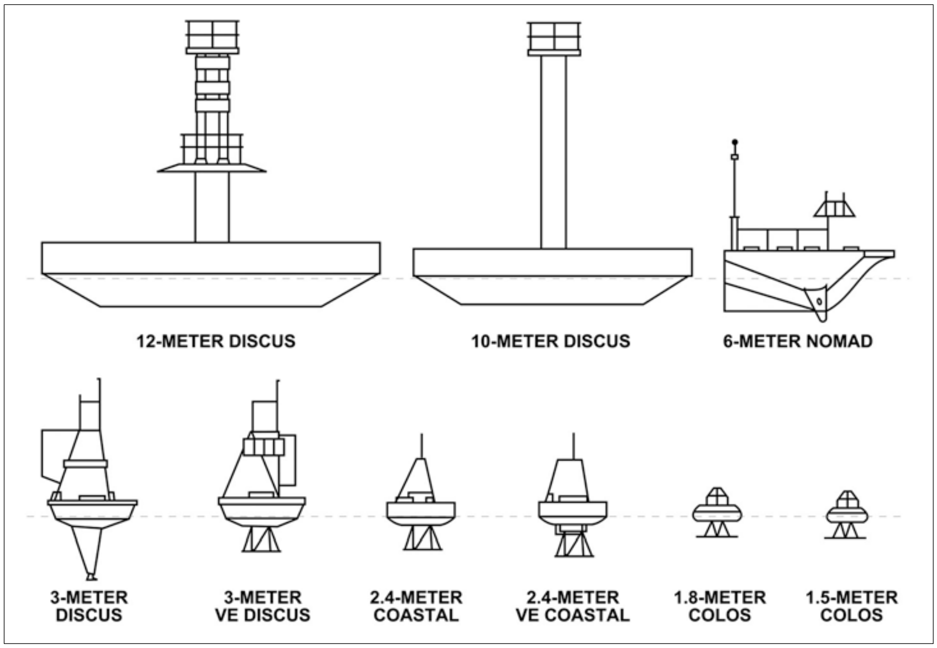

Figure 3-4 Buoy Schematic

Source: National Data Buoy Center, 2008

Figure 3-5(a) 10-Meter Discus-Shaped Hull Buoy

Source: National Data Buoy Center, 2012

Figure 3-5(b) 6-Meter Boat-Shaped Hull Buoy

Source: National Data Buoy Center, 2012

Figure 3-5(c) Spar Buoy

Source: Australian Maritime Systems, 2016

Some deep ocean moorings have operated without failure for more than 10 years (National Data Buoy Center, 2012). The spar-type buoy can be stabilized through an on-board ballasting mechanism approximately 60 ft (18 m) below the sea surface. Approximately 30 to 40 ft (9 to 12 m) of the spar-type buoy would be above the ocean surface, where meteorological and other equipment would be located. Tension legs attached to a mooring by cables have been implemented for one spar-type buoy in federal waters offshore New Jersey.

In addition to the meteorological buoys described above, a small tethered buoy (typically 10 ft [3 m] in diameter or less) and/or other instrumentation could be installed on or tethered to a meteorological tower to monitor oceanographic parameters and collect baseline information on the presence of certain marine life.

If a proposed buoy is found to have no individually or cumulatively significant effect on the human environment, and BOEM determines that no extraordinary circumstances exist under which the buoy may have a significant environmental impact, BOEM reserves the right to comply with its NEPA obligations through the use of a categorical exclusion applicable to the action being evaluated.

Installation

Buoys would typically take approximately one day to install (Table 3–8).

Table 3–8
Spar-Type Buoy Installation Process

Installation Phases	Maximum Area of Disturbance	Transport Method	Total Time of Installation
Phase 1 – Deployment of clump anchor	484 ft^2	barge	1 day
Phase 2 – Deployment of the spar buoy and connection to the clump anchor with mooring chain	784 ft^2	barge	2 days

Source: Tetra Tech EC, Inc., 2010

Installation – Onshore Activity

Onshore activity (fabrication, staging, or launching of crew/cargo vessels) related to the installation of buoys is expected to use existing ports that are capable of supporting this activity. Refer to Section 3.2.3 *Port Facilities* for information pertaining to existing ports and industrial areas that would likely be used for meteorological buoys. No expansion of existing facilities would be necessary for the same reasons provided in the onshore activity section for a meteorological tower, above.

Installation – Offshore Activity

Boat-shaped and discus-shaped buoys are typically towed or carried aboard a vessel to the installation location. Once at the location site, the buoy would be either lowered to the surface from the deck of the transport vessel or placed over the final location, and then the mooring anchor dropped. A boat-shaped buoy in shallower waters of the WEA may be moored using an all-chain mooring, while a larger discus-type buoy would use a combination of chain, nylon, and buoyant polypropylene materials (National Data Buoy Center, 2012). Based on previous proposals, anchors for boat-shaped or discus-shaped buoys would weigh about 6,000 to 8,000 lbs (2721-3628 kg) with a footprint of about 6 ft^2 (0.5 m^2) and an anchor sweep of about 370,260 ft^2 (34398 m^2). After installation, the transport vessel would likely remain in the area for several hours while technicians configure proper operation of all systems. Transport and installation vessel anchoring for one day is anticipated for these types of buoys (Fishermen's Energy of New Jersey, LLC, 2011).

For the Garden State Offshore Energy project, a spar-type buoy equipped with light detection and ranging (LiDAR) was towed 23 mi (37 km) offshore New Jersey to the installation location by a transport vessel after assembly at a land-based facility. A barge-based crane lifted the buoy into the water where divers secured it to a 230-ton clump anchor by four tethers made of steel cables (Deepwater Wind, 2016a). Approximately 40 ft (12 m) of the buoy was visible above the water line. The maximum area of disturbance to benthic sediments occurs during anchor deployment and removal (e.g., sediment resettlement or sediment extrusion) for this type of buoy.

Operation and Maintenance

Monitoring information transmitted to shore would include systems performance information, such as battery levels and charging systems output, the operational status of navigation lighting, and buoy positions. Additionally, all data gathered via sensors would be fed to an on-board radio system that transmits the data string to a receiver onshore (Tetra Tech EC, Inc., 2010). On-site inspections and preventative maintenance (i.e., marine fouling, wear, or lens cleaning) are expected to occur on a monthly or quarterly basis. Periodic inspections for specialized components (i.e., buoy, hull, anchor chain, or anchor scour) would occur at different intervals, but would likely coincide with the monthly or quarterly inspection to minimize the need for additional boat trips to the site.

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

Decommissioning

Decommissioning is basically the reverse of the installation process. Equipment recovery would be performed with the support of a vessel(s) equivalent in size and capability to that used for installation (*Installation* section above). For small buoys, a crane-lifting hook would be secured to the buoy. A water/air pump system would de-ballast the buoy into the horizontal position. The mooring chain and anchor would be recovered to the deck using a winching system. The buoy would then be transported to shore by a barge.

Buoy decommissioning is expected to be completed within one day. Buoys would be returned to shore and disassembled or reused in other applications. BOEM anticipates that the mooring devices and hardware would be re-used or recycled as scrap iron (Fishermen's Energy of New Jersey, LLC, 2011).

3.2.2.3 Meteorological Tower and Buoy Equipment

Meteorological Data Collection

To obtain meteorological data, scientific measurement devices consisting of anemometers, vanes, barometers, and temperature transmitters would be mounted either directly on the tower or buoy or on instrument support arms. In addition to conventional anemometers, LiDAR, sonic detection and ranging (SODAR), and coastal ocean dynamic applications radar (CODAR) devices may be used to obtain meteorological data. LiDAR is a ground-based remote sensing technology that operates via the transmission and detection of light, and recently, floating LiDAR (FLiDAR) is being used to collect meteorological data offshore of Europe. SODAR is also a ground-based remote sensing technology; however, it operates via the transmission and detection of sound. CODAR devices use high-frequency surface wave propagation to remotely measure ocean surface waves and currents.

Ocean Monitoring Equipment

To measure the speed and direction of ocean currents, Acoustic Doppler Current Profilers (ADCPs) would most likely be installed on each meteorological tower or buoy. An ADCP is a remote sensing technology that transmits sound waves at a constant frequency and measures the ricochet of the sound wave off fine particles or zooplankton suspended in the water column. The ADCPs may be mounted independently on the seafloor or to the legs of the tower platform or attached to a buoy. A seafloor-mounted ADCP would most likely be located near the meteorological tower (within approximately 500 ft [152 m]) and would be connected by a wire that is hand-buried within the seafloor.

A typical ADCP has three to four acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300 to 600 kHz (kilohertz), with a sampling rate of 1 to 60 minutes. A typical ADCP is about 1 to 2 ft (0.3-0.6 m) tall and 1 to 2 ft (0.3-0.6 m) wide. Its mooring, base, or cage (surrounding frame) would be several ft wider.

Other Equipment

A meteorological tower or buoy could also accommodate environmental monitoring equipment, such as bird and bat monitoring equipment (e.g., radar units, thermal imaging cameras), acoustic monitoring equipment for marine mammals, data logging computers, power supplies, visibility sensors, water measurement equipment (e.g., temperature, salinity), communications equipment, material hoist, and storage containers.

3.2.3 Port Facilities

Specific ports that would be used by the lessee 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 the lessee.

3.2.3.1 Staging Ports

Installation of a meteorological tower would likely require port facilities with the following requirements:

- Deep-water vessel access (greater than 15 ft [4.6 m]) to accommodate large vessels.
- Landing and unloading facilities in close proximity to fabrication yards for staging, assembly, and temporary materials storage.
- Located within a reasonable travel distance to the WEA, which BOEM assumes to be less than 50 nm from the center of the proposed lease area to the port.

BOEM has identified the following ports as potential staging ports for the New York WEA (ESS Group, 2016b):

- Staten Island, New York
- Erie Basin, New York

- Brooklyn, New York
- Bayonne, New Jersey
- Newark, New Jersey
- Elizabeth, New Jersey
- Perth Amboy, New Jersey

3.2.3.2 Survey, Operations and Maintenance Ports

Installation of a meteorological buoy could be supported by smaller ports. Surveying and operations and maintenance activities could also be supported by smaller ports because these types of activities can use smaller vessels and do not need access to fabrication and storage yards for large infrastructure that would be required for installation of a meteorological tower. Vessels used for these activities are anticipated to be approximately 65 to 100 ft (20-30 m) in length. These smaller ports would serve as staging areas and crew/cargo launch sites for the survey and operations and maintenance vessels. While a variety of ports could be used for the installation of buoys, survey, operations and maintenance activities, including some of the staging ports listed above, BOEM has identified the following ports as likely to support these activities associated with the proposed lease area (ESS Group, 2016b):

- Staten Island, New York
- Kismet Harbor, New York
- Ocean Beach Harbor, New York
- Perth Amboy, New Jersey
- Shark River, New Jersey
- Manasquan, New Jersey

3.2.4 Vessel Traffic

This EA assumes that vessels associated with site assessment (e.g., installation of a meteorological tower and/or two buoys) would strongly trend to larger staging ports, while vessels associated with site characterization activities (e.g., surveys) would use whatever port is convenient.

3.2.4.1 Vessel Traffic Associated with Site Characterization

Appendix C contains detailed vessel trip assumptions and calculations associated with site characterization; the primary assumptions are described below.

BOEM assumes that lessees would conduct surveys in the most efficient manner, which may involve 24-hour surveying; however, because inclement weather and equipment failure can result in delays, BOEM is also estimating the number of vessel round trips based on a conservative scenario of a 10-hour survey day (daylight hours minus transit time to and from the site) resulting in a single round trip per day. Therefore, the number of vessel round trips the lessee may undertake would likely fall within the range of the fewest estimated trips associated with 24-hour surveying and the maximum estimated trips associated with 10-hour survey days.

Table 3–9
Total Number of Maximum Vessel Trips for Site Characterization Activities under Alternative A

Survey Task	Number of Survey Days/Round Trips[1]	
	Based on 24-hour Surveying	**Based on 10-hour Days**
HRG surveys of all OCS blocks within WEA under Alternative A	64	153
HRG surveys of cable routes	4	10
Geotechnical sampling	18	247
Avian surveys	24–36	24–36
Fish surveys	38-92	92
Marine Mammal and Sea Turtle surveys	40-60	40-60
Total	188–274	566–598

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

HRG = high-resolution geophysical

As shown in Table 3–9, the maximum number of vessel trips associated with site characterization under the proposed action would likely be 274 with 24-hour surveying, or 598 with 10-hour survey days. BOEM anticipates that vessel trips for site characterization would primarily occur between the months of April and August over a 5-year period.

The different types of surveys require data to be collected at varying line spacings. However, the same vessel (or group of vessels) following the smallest line spacing could conduct many of the surveys necessary to acquire relevant data at the same time. Therefore, BOEM assumes that the lessee would use the smallest line spacing, which is 98 ft (30 m) for the archaeological resource survey, and acquire relevant data for most surveys at once.

Assumptions specific to the different survey types are listed below.

- For HRG surveys:
  - A vessel speed of 4.5 knots (MMS, 2004).
  - Length of surveys per OCS block is 500 nm (926 km).
  - Length of survey per partial OCS block is 250 nm (463 km).

- Survey time for one OCS block, based on a 10-hour survey day and a single round trip, would be 11 days.
- Proposed action survey area encompasses 13.94 whole OCS blocks.[12]
- Although no site assessment structure placement would be allowed in the OCS blocks within the TSS buffer zone, a lessee would survey all OCS blocks in the TSS buffer zone since cable may be placed in the buffer zone area.
- Line spacing for surveying of the cable route would be 98 ft (30 m) for longitudinal lines and 1,640 ft (500 m) for perpendicular tie lines.
- Width of survey corridor for the cable route would be 984 ft (300 m); hypothetical length of cable survey corridor would be 44 nm (81 km).

- For geotechnical sampling:
    - Maximum of 20 wind turbines per whole OCS block with one sample (vibracore, CPT, and/or deep boring) taken at each potential turbine location and one sample conducted per work day.
    - One sub-bottom sample every nautical mile of transmission cable corridor and one at a potential meteorological tower site and/or buoy site.
- For biological surveys:
    - Avian surveys would be conducted by boat, and 10 whole OCS blocks could be surveyed per day (one round trip); because Alternative A contains the equivalent of 10 whole OCS blocks available for site assessment structure placement,[13] an avian survey would take approximately 1 day.
    - Fish surveys would be conducted from a vessel, but can vary greatly depending on the gear and methodology used. The 24-hour low-end estimate is based upon approximately 40 percent less trips if distributed over 24 hours. However some type of fish sampling may only occur at night. Thus, the high end of 92 trips is retained under both scenarios.
    - Marine mammal and sea turtle surveys may or may not be conducted, depending on the data available. Thus, survey vessel trips may range from 0 to 60 trips. Vessel trip calculations are based in part on BOEM's recommended survey guidelines of a 10-knot survey speed, a two to three year multi-season survey period, and 10 percent survey area buffer. Vessel trip calculations also assume 10 hour survey days with a 1 nm transect line spacing, which are both appropriate for large whale surveys. The calculations also conservatively double the number of vessel trips required for each

[12] Value of 13.94 whole OCS blocks was calculated by dividing the total number of sub-blocks (223) by the number of sub-blocks in a single OCS block (16).

[13] Value of the equivalent of 10 whole OCS blocks in the WEA available for structure placement was calculated using the total number of sub-blocks available for structure placement (160) divided by the number of sub-blocks in a single OCS block (16).

survey, in order to factor in the potential for aborted vessel trips due to inclement weather during surveys.

3.2.4.2 Vessel Traffic Associated with Site Assessment

Vessel trips would be required during installation, decommissioning, and routine maintenance of a tower and/or buoys. These vessel trips may be spread over multiple construction seasons as a result of 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. BOEM anticipates that tower and/or buoy installation would likely occur in Year 2 after lease execution, would likely remain in place during the 5-year site assessment term (Years 2 through 6 after lease execution), and would likely be decommissioned the year after the end of the 5-year site assessment term (Year 7 after lease execution).

Based on previous SAPs submitted to BOEM, up to about 40 round trips by various vessels are expected during construction of the meteorological tower (Table 3–7 for details). 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 40 round trips are estimated for decommissioning of a tower. Meteorological buoys would typically take one to two days for one vessel to install and one to two days for one vessel to decommission.

Maintenance trips to a meteorological tower may occur weekly (for a tower with diesel generators) to monthly or quarterly (for a tower powered by solar or wind), 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 a tower and monthly trips for buoys over the entire 5-year site assessment period (Year 2 after lease execution and going through Year 6 after lease execution; Table 3–10). BOEM anticipates that crew boats used for operations and maintenance activities would be approximately 51 to 57 ft (16-17 m) long with 400- to 1,000-horsepower engines and 1,800-gallon fuel capacity.

BOEM estimates that the total vessel traffic as a result of the installation, routine operations and maintenance, and decommissioning of a meteorological tower under the proposed action would be between 100 and 340 round trips over a 6-year period (Table 3–10). Installation, routine operations and maintenance, and decommissioning of two buoys are anticipated to result in between 44 and 128 round trips over approximately six to seven years. If a tower and two buoy(s) are installed, BOEM anticipates up to approximately 468 trips would be needed for installation, operations and maintenance, and decommissioning. BOEM assumes round trips from port will travel an average of approximately 92 nm.

Table 3–10
Projected Maximum Vessel Trips for the Proposed Action (Alternative A) Site Assessment Activities

Buoy/Tower	Site Assessment Activity	Round Trips	Formula
Meteorological buoys	Meteorological buoy installation	2–4	1–2 round trips x 2 buoys
	Meteorological buoy quarterly–monthly maintenance trips	40–120	4 quarters x 2 buoys x 5 years – 12 months x 2 buoys x 5 years
	Meteorological buoy decommission	2 –4	1–2 round trips x 2 buoys
	Total buoy trips over 5-year period	44–128	N/A
Meteorological tower	Meteorological tower construction	40	40 round trips x 1 tower
	Meteorological tower quarterly–weekly maintenance trips(1)	20–260	4 quarters x 1 tower x 5 years – 52 weeks x 1 tower x 5 years
	Meteorological tower decommission	40	40 round trips x 1 tower
	Total tower trips over 5-year period	100–340	N/A
	Total trips for a tower and two buoys	**144–468**	**N/A**

(1) Although construction and decommissioning would occur during some of the weeks and, therefore, not all weeks would require maintenance trips for a tower, all weeks were included for maintenance to be conservative in the trip calculations.

N/A = not applicable

3.2.4.3 Vessel Traffic Summary

As described in Section 3.2.4.1 *Vessel Traffic Associated with Site Characterization*, for surveying, BOEM estimated the number of round trips based on both 24-hour surveying and a 10-hour survey day (and thus one vessel round trip per day). BOEM assumes that the actual number of vessel trips would fall within the range of the fewest estimated trips associated with 24-hour surveying and the maximum estimated trips associated with 10-hour survey days.

Based on the reasonably foreseeable scenario presented throughout Section 3 of this EA, BOEM estimates that the amount of vessel round trips associated with Alternative A for site characterization surveys and the installation of one meteorological tower and/or two buoys would range from approximately 350 to 1,000 (Table 3–11). The vessel round trips would occur from various ports to the WEA spread over approximately seven years.[14]

[14] For trip calculations, BOEM assumes that site characterization would occur in Years 1 to 5 after lease execution, and site assessment would be spread across Years 2 to 7 after lease execution as follows: Year 2 for construction and operation, Years 3 to 6 for operation, and decommissioning to occur in Year 7 (although a tower may remain in place for a number of years following the 5-year site assessment period).

Table 3–11
Range of Estimated Vessel Round Trips for Alternative A
Assuming Installation of One Tower and Two Buoys

Type of Activity	**Number of Round Trips Based on 24-hour Surveying**	**Number of Round Trips Based on a 10-hour-long Survey Day**
Site characterization	188–274	566–598
Site assessment (one tower and two buoys)	144–468	144–468
Total	**332–742**	**710–1066**

3.3 Non-Routine Events

BOEM believes the following are the most reasonably foreseeable non-routine events and hazards that could occur during data collection activities: (1) severe storms such as hurricanes and extratropical cyclones; (2) allisions and collisions between the site assessment structure[15] or associated vessels and other marine vessels or marine life; and (3) spills from collisions or during generator refueling. These events and hazards are summarized in the sections that follow.

3.3.1 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 regularly, 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.

In the vicinity of the WEA, data collected between 1975 and 2008 from a National Data Buoy Center buoy located offshore New York City (Buoy 44025, located at 40°15'3" N 73°9'52" W) (National Buoy Data Center, 2015a) showed that average wind speeds are typically lowest in July and August, at approximately 9 to 10 knots, and highest in December and January, at approximately 24 knots (National Data Buoy Center, 2015b). Peak winds of 75 knots over the period of record (1996–2008) were recorded in the month of September at Buoy 44025 (National Data Buoy Center, 2015c). The highest winds are associated with tropical cyclones (i.e., hurricanes) which are relatively rare in the vicinity of the WEA. More often, high-wind events are associated with extratropical cyclones, including the occasional nor'easter in the winter season.

The Atlantic Ocean hurricane season is June 1 to November 30 with a peak in September when hurricanes would be most likely to impact the WEA at some time during the proposed action (NOAA NHC, 2016). Historically, hurricane threats exist in the region of the WEA. From 1851 to 2010, a reported 12 hurricanes struck the New York coast and two hurricanes struck the

[15] Also referred to as a "meteorological structure."

New Jersey coastline, five and zero of which, respectively, were major (Blake et al., 2011). Blake et al. (2011) estimated the return period, in years, of all hurricanes (winds greater than or equal to 64 knots) passing within 50 nm (92.6 km) of various locations along the U.S. coast. In the region of the WEA, the return period for such an event is listed as 19 years, while the return period for a major (Category 3 or greater) hurricane, in the same location, is 74 years. Nor'easters are also cyclonic storms, but they come with winds from the northeast direction. Nor'easters primarily affect New England and the Canadian Maritime Provinces, but the region of the WEA can experience effects from them as well (NOAA NWS, 2016).

3.3.2 Allisions and Collisions

An allision occurs when a moving object (i.e., a vessel) strikes a stationary object (e.g., meteorological tower or buoy); a collision occurs when two moving objects strike each other. A meteorological tower and/or buoys in the WEA could pose a risk to both vessel and aviation navigation. An allision between a ship or an airplane and a meteorological structure (e.g., meteorological tower or buoy) could result in the loss of the entire facility and/or the vessel/airplane, as well as loss of life and spillage of petroleum product. The vessel damage to the buoy hull could cause it to lose its buoyancy and sink, or could damage the equipment or its supporting structure. Because a buoy would protrude from the ocean surface only 30 to 40 ft (9-12 m), an airplane striking a buoy is unlikely.

Vessels associated with site characterization and assessment activities could collide with other vessels, resulting in damages, petroleum product spills, or capsizing. Vessel collisions and allisions are unlikely assuming vessel operator adherence to the Coast Guard Navigation Rules and Regulations (i.e., Rules of the Road).[16] Additional routing measures, such as safety fairways and TSSs control traffic also help minimize risk. Airplane collisions and allisions are also considered unlikely. BOEM anticipates that aerial surveys would not be conducted during periods of storm activity because the reduced visibility conditions would not meet visibility requirements for conducting the surveys, and flying at low elevations would pose a safety risk during storms and times of low visibility. Risk of allisions with a meteorological tower and/or buoys for both vessels and airplanes would be further reduced by USCG-required marking and FAA-required lighting.

Historical data support the conclusion that the number of potential allisions and collisions resulting in damage (greater than $25,000) to property and equipment would be small. Allision and collision incident data were reviewed for the years 1996 through 2010 for the Gulf of Mexico and Pacific regions (BOEM, 2011b), which contain many fixed structures on the OCS, such as oil and gas platforms. The vessel traffic associated with operations and maintenance activities for fixed structures in the Gulf of Mexico and Pacific regions would likely be more than what is needed for a meteorological tower in the WEA, but provides a basis for comparison of the potential occurrence of allisions/collisions. The allision/collision data, which were recorded over a 15-year period on over 4,000 structures, reported 197 allisions and collisions in the Gulf of Mexico and Pacific regions; this number includes reports of all major damages and

[16] More information available at www.navcen.uscg.gov/?pageName=navRulesContent.

some, but not all, minor damages (less than $25,000 in damages). For those data (BOEM, 2011b), the most commonly reported causes of the allisions and collisions include human error, weather-related causes, equipment failure on the vessels, and navigational aids not working on the structures; BOEM would anticipate similar causes for allisions/collisions on the Atlantic OCS.

3.3.3 Spills

A spill of petroleum product could occur as a result of hull damage from allisions, collisions between vessels, accidents during the maintenance or transfer of offshore equipment and/or crew, or due to natural events (i.e., strong waves or storms). The amount of petroleum product that could be released by a marine vessel involved in a collision would depend on (1) the type of vessel, (2) the vessel size, (3) construction of the vessel (e.g., double-hulled cargo and/or bunker tanks), (4) the severity of the collision, and (5) the velocity of the vessel and angle of approach at the time of the impact (Bejarano et al., 2013). From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88 gallons (333 liters) (USCG, 2011b); should a spill from a vessel associated with the proposed action occur, BOEM anticipates that the average volume would be similar. Diesel generators may be used to power the equipment on a meteorological tower and/or buoys; minor diesel fuel spills could occur during refueling of generators. Diesel fuel is lighter than water and may float on the water's surface or be dispersed into the water column by waves. Diesel would be expected to dissipate very rapidly, evaporate and biodegrade within a few days (MMS, 2007b). For its Port Ambrose Project application, Liberty Natural Gas used NOAA's Automated Data Inquiry for Oil Spills (ADIOS) (an oil weathering model) to verify this potential impact (USCG, 2015a). Based on the NOAA ADIOS model, predicted dissipation of a maximum spill of 2,500 barrels (105,000 gallons) is rapid, and the amount of time it took to reach concentrations of less than 0.05 percent varied between 0.5 and 2.5 days, depending on ambient wind (USCG, 2015a). Depending on the amount of diesel contained within generators on a meteorological tower and/or buoys, BSEE may require lessees to prepare and implement a spill response plan.

Model results of a 2013 study on the potential environmental consequences of hazardous material spills from wind energy facilities,[17] estimated that the spills most likely to occur would release a volume of up to several hundred gallons (Bejarano et al. 2013). The consequence analysis of the study predicted that small spills releasing up to several hundred gallons could occur once per month from vessel allisions, but the probability of a catastrophic spill[18] would be very low (occurring approximately once in over 1,000 years) (Bejarano et al., 2013). The most likely types of releases from vessel allisions near wind energy facilities are anticipated to result in minimal, temporary environmental consequences limited to the vicinity of the point of release, and the probability of these types of releases is very small (Bejarano et al., 2013). These results reflect spill scenarios for activities related to full-scale wind energy facilities, not the site

[17] The study focused on the installation and operation of hypothetical wind energy facilities within of a Call Area in North Carolina and two WEAs (Maryland and Rhode Island/Massachusetts).

[18] A catastrophic spill is categorized as a spill involving oil totaling 129,000 gallons or more or a chemical release totaling 29,000 gallons or more (Bejarano et al., 2013).

characterization and assessment activities addressed by this EA; the activities associated with the proposed action of this EA would entail much lower spill volumes than estimated by the 2013 study. However, the minimal, temporary environmental consequences predicted for wind energy facility spills illustrates the low probability and anticipated impact of spills from activities associated with site characterization and assessment.

The extent, duration and potential effects of a spill would depend on the severity of the accident, the amount of corrosion or structural failure during a collision, the degree and rate of outflow of pollutant, the type of material spilled, meteorological conditions, and the length of time before a spill is noticed, equipment is repaired, and the speed with which cleanup occurred. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills (Title I of the Oil Pollution Act of 1990 [OPA] and Title VI of the Coast Guard and Maritime Transportation Act of 2006). Additionally, the National Oil and Hazardous Substance Pollution Contingency Plan (1994), or National Contingency Plan (NCP), provides the Federal government with a template for responding to discharges of oil and releases of hazardous substances. The NCP has resulted in the development of a national response capability to promote coordination among the hierarchy of responders, and contingency plans implemented across the nation. The NCP, required by the CWA Section 311(d), with the latest revisions finalized by section 4201 of the OPA, establishes federal on-scene coordinators within USCG and the EPA. The NCP also establishes the National Response Team, chaired by an EPA representative and vice-chaired by a representative from USCG.

4 ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES

4.1 Definitions of Impact Levels

The conclusions for most analyses in this EA use a four-level classification scheme (negligible, minor, moderate, and major) to characterize the environmental impacts predicted if the proposed action or an alternative is implemented. Definitions of impacts are presented in two separate groups: one for biological and physical resources and one for socioeconomic resources. The CEQ interprets the human environment "to include the natural and physical environment and the relationship of people with that environment" (40 CFR 1508.14).

The impact level definitions below were originally developed for BOEM's *PEIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf* (MMS, 2007a), and are used in this EA to provide consistency in BOEM's discussion of impacts. BOEM continues to refine these definitions as part of its NEPA decision-making process.

4.1.1 Impact Levels for Biological and Physical Resources

The following impact levels definitions are used for biological and physical resources. For biota, these levels are based on population-level impacts rather than impacts on individuals.

Negligible

- No measurable impacts.

Minor

- Most impacts on the affected resource could be avoided with proper mitigation.
- If impacts occur, the affected resource would recover completely without any mitigation once the impacting agent is eliminated.

Moderate

- Impacts on the affected resource are unavoidable.
- 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 project or proper remedial action is taken once the impacting agent is eliminated.

Major

- Impacts on the affected resource are unavoidable.
- The viability of the affected resource may be threatened, and the affected resource would not fully recover even if proper mitigation is applied during the life of the project or remedial action is taken once the impacting agent is eliminated.

4.1.2 Impact Levels for Socioeconomic Issues

The following impact levels are used for the analysis of socioeconomic resources.

Negligible

- No measurable impacts.

Minor

- 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 activity or community are unavoidable.
- Proper mitigation would reduce impacts substantially during the life of the project.
- The affected activity or community would have to adjust somewhat to account for disruptions due to impacts of the project, 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 activity or community are unavoidable.
- Proper mitigation would reduce impacts somewhat during the life of the project.
- 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.

4.2 Other NEPA Reviews Incorporated by Reference

As discussed in Section 1.4.1 *Information Considered* and Section 1.5 *Supporting NEPA Evaluations*, BOEM has completed other NEPA reviews for the same types of resources. Although the geographic area evaluated in the G&G Final PEIS (BOEM, 2014a) does not cover the area proposed for the New York WEA, the proposed action included similar survey activities, impact-producing factors, and types of impacts from G&G surveys that may be conducted in the New York WEA. Therefore, BOEM has incorporated the G&G Final PEIS, BOEM's *PEIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (MMS, 2007a) and other relevant NEPA documents into this EA by reference. See Section 1.5 *Supporting NEPA Evaluations* for a list of the supporting NEPA evaluations referenced and summarized as appropriate in the following impact analyses.

4.3 Resources Eliminated from Further Consideration

NEPA requires issues (resource areas) that are significant to the action be the focus of the analysis. Because many of the activities described in this EA have been previously analyzed, the potential for impacts are well documented. The *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts* (BOEM, 2014b), the *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina* (BOEM, 2015a), the G&G Final PEIS (BOEM, 2014a), and other relevant EAs (Section 1.5 *Supporting NEPA Evaluations*) address the three resource areas listed below. Although these previous documents do not specifically address the New York area, the same types of activities described in this EA are addressed in those documents. The evaluations and conclusions in those documents are consistent with BOEM's determination that the following resource areas will not be carried forward for analysis in this EA because impacts to those resources are anticipated to be negligible.

4.3.1 Geology and Soils

The potential impacts on sediments, geology, and soils from deep stratigraphic and shallow test drilling and bottom sampling off the coast of New York would be negligible. This is consistent with the analysis of the G&G Final PEIS (BOEM, 2014a). Although the G&G Final PEIS (BOEM, 2014a) addresses the Mid-Atlantic and South Atlantic planning areas and, therefore, does not address New York specifically, it does address impacts from similar activities. The installation of a meteorological tower would result in more impacts to the seafloor than disturbance from bottom sampling (approximately 10 m^2 per sample) or disturbance from installation of a meteorological buoy (approximately 8.5 ac with anchor sweep) (BOEM, 2014a). Disturbance associated with the installation of a meteorological tower would affect the sediments on the seafloor at a maximum radius of 1,500 ft (~450 m), or 162 ac (66 ha) around the bottom-founded structure, including all anchorages and appurtenances of the support vessels. The resulting 162 ac (66 ha) of affected seafloor is about 0.2 percent of the total 79,350 ac (32,112 ha) of the proposed lease area, if the meteorological tower is installed and disturbs the maximum foreseeable area of seafloor. Thus, the installation of a meteorological tower would create negligible impacts on the geology and soil of the seafloor.

4.3.2 Physical Oceanography

Physical oceanography would not be affected by survey vessels, or by the installation of a meteorological tower or buoys off the coast of New York. Ocean current characteristics, water column density stratification, and vertical current structure, among other factors, would be considered by the lessee during the planning, operation, and data post-processing activities as part of the SAP. Although the water column would be disrupted by the installation and operation of a meteorological tower and/or buoys, effects to physical properties of the water column and ocean currents would be negligible, and the majority of effects would occur to the seafloor. Installation of a meteorological tower would affect a small portion of the seafloor at a maximum radius of 1,500 ft (~450 m) or 162 ac (66 ha) around each bottom-founded structure, including all anchorages and appurtenances of the support vessels. With the exception of the meteorological tower foundations, these would be temporary seafloor impacts. Only small areas within each radius would be affected by vessel anchorages and appurtenances at one time. Seafloor disturbances would also occur from installation of scour prevention methods such as rock armoring or artificial seagrass. If a scour control system were installed, the maximum seafloor disturbance would be approximately 0.6 ac (0.37 ac [0.15 ha] or less for rock armor, 0.18 ac [0.07 ha] or less for artificial seagrass, and 0.05 ac [0.02 ha] or less for the foundation, as discussed in Section 3.2.2.1 *Meteorological Towers and Foundations*). Impacts to ocean currents, water column density, or other physical oceanographic characteristics would be negligible.

4.3.3 Coastal Infrastructure

Vessel and crew usage of onshore facilities associated with site characterization have been analyzed in previous EAs (hereby incorporated by reference; see Section 1.5 *Supporting NEPA Evaluations* for a complete list) and are not discussed here, because these activities would be the same. Existing commercial ports (listed in Section 3.2.3 *Port Facilities*), harbors, or industrial areas composing the coastal infrastructure could be used when implementing the proposed action.

Activities associated with the proposed action would not require additional coastal infrastructure to be constructed, nor would they require expansion of port areas, even if smaller ports are used, and would be smaller in scale than ongoing activities at existing ports. Activities associated with site characterization and site assessment have been analyzed previously by BOEM in the North Carolina EA (BOEM, 2015a), the Rhode Island/Massachusetts EA (BOEM, 2013a), and the Mid-Atlantic EA (BOEM, 2012d; covering New Jersey, Maryland, Delaware, and Virginia), which are incorporated by reference. In those EAs, BOEM determined that there would be no impacts on coastal infrastructure from site characterization and assessment because the existing infrastructure and facilities would be adequate to accommodate proposed action activities. Therefore, there would be no impacts on coastal infrastructure in the vicinity of the WEA.

Since the use of existing ports and marinas for site characterization and site assessment activities would be consistent with existing uses, and no additional infrastructure would be required for site characterization and assessment activities, there would be **no impacts** to coastal infrastructure as a result of the proposed action.

4.4 Alternative A – The Proposed Action

4.4.1 Physical Resources

4.4.1.1 Air Quality

Description of the Affected Environment

Potential air quality impacts from site characterization activities and meteorological buoys were evaluated in the G&G Final PEIS (BOEM, 2014a), and were found to be negligible. The following sections present an area-specific evaluation of air quality impacts associated with G&G activities under Alternative A, along with an evaluation of air impacts associated with site assessment activities and the construction, operation, and decommissioning of a meteorological tower and/or two buoys.

Air Quality Standards and Regulations

The Clean Air Act of 1970 (42 U.S.C. § 7401 et seq., as amended) directed EPA to establish National Ambient Air Quality Standards (NAAQS) for air pollutants listed as "criteria" pollutants because there was adequate reason to believe that their presence in the ambient air "may reasonably be anticipated to endanger public health and welfare." The NAAQS apply to:

- 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 aerodynamic diameters of 10 microns or less and 2.5 microns or less, respectively]), and
- Lead (Pb).

EPA sets the primary NAAQS at levels to protect public health with an adequate margin of safety, and the secondary NAAQS at levels to protect public welfare (40 CFR 50). All of the standards are expressed as concentrations in air and duration of exposure. Many standards address both short- and long-term exposures. When the monitored pollutant levels in an area of a state are within the NAAQS for any pollutant, EPA classifies that area as "attainment" for that pollutant. When monitored pollutant levels exceed the NAAQS, the area is classified as "nonattainment." Former nonattainment areas that have achieved attainment are classified as "maintenance" areas. EPA assigns an air quality rating for each area ranging from marginal to extreme.

A review of New Jersey and New York land areas that may be affected by emissions associated with Alternative A (i.e., the coastal counties nearest the WEA) revealed that O_3 is in moderate non-attainment in all of the reviewed counties. These counties include: Monmouth, Ocean, and Hudson in New Jersey and Suffolk, Queens, Kings, Nassau, and Richmond in New York. All of the areas are maintenance areas for $PM_{2.5}$. All of the areas, except Suffolk County, are maintenance areas for CO. All other criteria pollutants are in attainment in the coastal counties nearest the WEA (EPA, 2016c). Local and state air quality regulations are to be complied with during onshore fabrication. For example, if onshore fabrication takes place in New York, a heavy duty diesel vehicle's engine should not remain idle for more than five consecutive minutes to be in accordance with state regulations (6 CRR-NY 217-3.2). If onshore fabrication takes place in New Jersey, a heavy duty diesel vehicle's engine should not remain idle for more than three consecutive minutes to be in accordance with state regulations (N.J.A.C. 7:27-14 and N.J.A.C. 7:27-15). It is possible that fabrication could occur at a fabrication yard outside of New York, along the Atlantic Coast and the Gulf of Mexico.

The "Visibility Protection" and "Prevention of Significant Deterioration" provisions of the Clean Air Act (Sections 169A and 162, respectively) protect certain lands designated as mandatory federal Class I areas (e.g., national parks and wilderness areas) because air quality is a special feature of the area. Very little degradation of air quality, including air quality-related values such as visibility, is allowed in Class I areas. In general, if a project is located within 62 mi (100 km) of a Class I area, its impacts on concentrations of criteria pollutants in the Class I area should be determined (EPA, 1992). The closest Class I area to the project is the Brigantine Wilderness Area in New Jersey (40 CFR 81), which is approximately 75 mi (121 km) southwest of the WEA, and is therefore not considered in this evaluation.

Meteorology

There are two dominant seasonal wind directions: spring and summer winds (March through September) are generally from the south-southwest, while fall and winter winds (September through March) are generally from the west-northwest (BOEM, 2014e). The frequency that the wind is blowing in a given compass direction at any given time of year can be shown by using wind roses. In the wind rose, the longer the bar, the more frequent the winds in that direction. Typical wind speeds are also shown within the bars. Figure 4-1 and Figure 4-2 show modeled wind roses in the spring-summer season and winter-fall season, respectively, in the WEA.

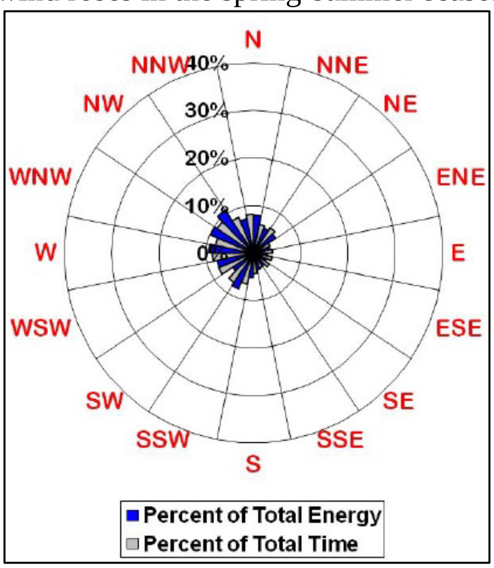

Figure 4-1 Wind Rose for September to March for a Modeled Monitoring Location in the WEA

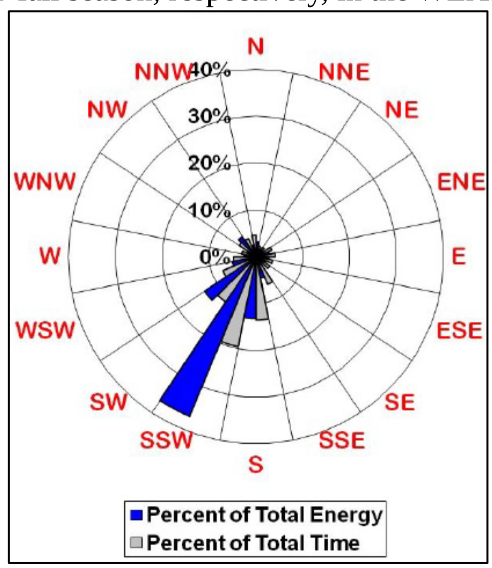

Figure 4-2 Wind Rose for April to August for a Modeled Monitoring Location in the WEA

Source: NYSERDA, 2010a

The highest wind speeds tend to occur during winter storms, while lower wind speeds are more common in the milder spring-summer season (BOEM, 2014e). Wind speeds offshore New York and New Jersey average about 29 ft (8.8 m) per second, with the average wind speed decreasing near the shore (NYSERDA, 2010a). Extreme weather conditions such as Nor'easters and hurricanes, which can affect the WEA and onshore areas of New York and New Jersey, are described in Section 3.3.1 *Storms*.

A common meteorological feature along coastal areas is the "sea breeze" and "land breeze." During the day, the land tends to heat up faster than the water, leading to higher air temperatures over the land surface than over the water surface, causing a circulation system in which the air nearest the surface flows onshore (sea breeze). During the night, the land cools faster than the water, leading to lower air temperatures over the land surface than over the water surface, causing a circulation system in which the air nearest the surface flows offshore (land breeze) (NOAA, 2010). The sea/land breeze circulation can affect air quality because it can cause recirculation of pollutants. Emissions generated early in the day may be carried offshore and then may be carried back onshore in the evening (BOEM, 2014e). This circulation can contribute to increased O_3 concentrations onshore because emissions of precursor pollutants (primarily nitrogen oxides [NO_x] and volatile organic compounds [VOCs]) can be transported offshore in the morning and can form O_3 while over the ocean, and then the afternoon breeze can transport the O_3 back over land.

Air Quality Measurements

State air quality agencies maintain networks of monitoring sites to measure ambient air pollutant concentrations and evaluate compliance with NAAQS.

In New Jersey coastal areas closest to the WEA, monitoring sites maintained by the New Jersey Department of Environmental Protection (NJDEP) are located in:

- Monmouth University in Monmouth County,
- Toms River in Ocean County,
- Bayonne in Hudson County, and
- Jersey City in Hudson County.

According to 2013 data, O_3 was found to be in exceedance of the NAAQS 1 day of the year at Bayonne and 3 days of the year at Monmouth University. All other criteria pollutants were found to be below the NAAQS at these monitoring sites (NJDEP, 2013).

In New York coastal areas closest to the WEA, monitoring sites maintained by NYSDEC are located in:[19]

- Eisenhower Park in Nassau County,
- Babylon in Suffolk County,
- Holtsville in Suffolk County,
- Queens College in Queens County,
- Maspeth Library in Queens County,
- Brooklyn, and

[19] No monitoring stations are located in Kings County, NY or Richmond County, NY.

- South Wagner High School on Staten Island.

According to 2014 data, all criteria pollutants were found to be below the NAAQS at these monitoring sites (NYSDEC, 2014).

Regulatory Controls on OCS Activities that Affect Air Quality

OCS sources that may affect the air quality of any state are regulated by EPA under Section 328 of the Clean Air Act Amendments of 1990 (40 CFR 55). For the proposed action, OCS sources would include a meteorological tower and/or buoy, any vessels used to construct, service, or decommission that tower or buoy, and seafloor boring activities. Under the EPA rules, for all OCS sources within 25 nm (46 km) of the states' seaward boundaries,[20] the requirements are the same as would be otherwise applicable if the sources were located in the corresponding onshore area (40 CFR 55.3). With respect to calculations of a facility's Potential to Emit, EPA considers emissions from vessels that are servicing or associated with the operations of OCS sources as direct emissions from the OCS source when those vessels are at the source or en route to or from the source as long as they are within 25 nm (46 km) of the shoreline (40 CFR 55.2).

Impact Analysis of Alternative A

Both routine activities and non-routine events were considered in the analysis below to determine impacts.

Routine Activities

Routine activities include site characterization surveys and site assessment activities. Emission sources considered for these activities are identified below.

Emissions Sources

Air emissions sources potentially associated with Alternative A include:

- Emissions from vessels used for:
    - Site characterization surveys
    - Site assessment activities (i.e., construction, operations and maintenance, and decommissioning of metrological tower/buoys)
- Emissions from onshore vehicles and equipment, such as:
    - Heavy duty trucks
    - Personal vehicles from commuting workers
    - Construction equipment used in construction of a meteorological tower
- Diesel engines used to operate the meteorological tower and/or buoys.

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[20] As specified in 43 U.S.C. § 1312, in the states potentially affected by Alternative A, the state seaward boundaries extend 3 nm from the coastline.

Assumptions

Emissions of criteria pollutants from site characterization surveys and site assessment activities were calculated to estimate the reasonably foreseeable scenario for emissions in any given year of the lease period (Appendix C).

The following assumptions were made to provide a representative evaluation of potential air impacts:

- Round-trip vessel mileage is based on the distance from representative ports to the mid-point of the WEA.
- Total number of vessel round trips is based on 10-hour survey days. Lessees would conduct surveys in the most efficient manner, which may involve 24-hour surveying; however, because inclement weather and equipment failure can result in delays, BOEM is basing emissions calculations on a conservative scenario of a 10-hour survey day resulting in a single round trip per day.
- Site characterization activities would take place over five years. Total round-trip travel was divided equally over a 5-year period.
- Although the tower and buoys could be decommissioned a number of years following the 5-year site assessment period, BOEM assumes that decommissioning would occur in Year 7 after lease execution (1 year after the end of the 5-year site assessment period, which would likely start in Year 2 after lease execution).
- Boats (rather than aircraft) would be used for avian surveys.
- Power to operate a meteorological tower and/or buoys would be provided by diesel engines. Diesel engines would be permitted to operate, as needed.
- Fabrication of materials may occur at a fabrication yard anywhere along the Atlantic Coast and the Gulf of Mexico, and then be transported to the staging area.
- The meteorological tower and/or buoys would be installed in the same year.
- Activities under Alternative A would occur simultaneously with other navigation/vessel traffic that frequents the same water and airways.
- The impacts of miscellaneous activities onshore would be considered **negligible** because of the temporary nature and nearly undetectable impact of the activities when compared to the existing industrial activities/production operations already occurring at the fabrication yards.

Site Characterization and Site Assessment Activities

Vessel traffic due to site characterization surveys and site assessment activities would add to current vessel traffic levels in the WEA and to the ports used by the survey vessels. As described in Section 4.4.3.2 *Navigation/Vessel Traffic*, the additional vessel activity would be temporary and minor when compared with existing vessel traffic levels (Table 3–11) for a summary of vessel trips associated with Alternative A). Impacts from air pollutant emissions associated with these vessels would be localized within the WEA and in the vicinity of vessel activity.

The onshore areas that are closest to the WEA are classified as non-attainment areas for O_3. Hudson, Queens, Kings, Nassau, and Richmond Counties are classified as maintenance areas for CO and $PM_{2.5}$ (Table 4–1). Nonattainment and maintenance areas are subject to the EPA General Conformity Rule (40 CFR 93, Subpart B). The rule establishes emissions thresholds, or *de minimis* levels, for use in evaluating a project's conformity with the applicable State Implementation Plan. If the net air pollutant emissions exceed these thresholds, a formal conformity determination may be required. If a submitted SAP indicates that project-related activities in the non-attainment and maintenance areas would emit more than the thresholds, then a General Conformity analysis would be performed. The *de minimis* levels for consideration in the project's conformity analysis are:

- 100 tons/year (90.7 metric tons/year) of NO_x (O_3 precursor)
- 50 tons/year (45.5 metric tons/year) VOCs (O_3 precursor)
- 100 tons/year (90.7 metric tons/year) CO

Table 4–1
Summary of Annual Criteria Emissions by Activity for Alternative A

Activity and Year after Lease Execution	Emissions (tons/year)						Emissions (metric tons/year)		
	CO	NO_x	VOCs	$PM_{2.5}$	PM_{10}	SO_x	CO_2[1]	N_2O	CH_4
Year 1 – Site characterization	1.99	22.36	1.17	1.22	1.22	2.20	1070.73	0.03	0.14
Year 2 – Site characterization and site assessment (construction and operation)[2]	7.63	52.70	3.95	3.25	3.25	4.44	2266.37	0.04	0.19
Year 3 – Site characterization and site assessment (operation)	7.06	46.88	3.39	2.93	2.93	3.88	1,952.98	0.03	0.15
Year 4 – Site characterization and site assessment (operation)	7.06	46.88	3.39	2.93	2.93	3.88	1,952.98	0.03	0.15
Year 5 – Site characterization and site assessment (operation)	7.06	46.88	3.39	2.93	2.93	3.88	1,952.98	0.03	0.15
Year 6 – Site assessment (operation)	5.07	24.52	2.23	1.71	1.71	1.68	882.26	0.00	0.01
Year 7 – Site assessment (decommissioning)	0.28	2.65	0.42	0.15	0.15	0.26	135.51	0.00	0.02

[1] The CO_2 value for generators (included in the Operation) is in CO_2e (carbon dioxide equivalent), which provides an expression of CO_2, N_2O, and CH_4 emissions combined.
[2] Year 2 emissions include transporting fabricated structures from the Gulf of Mexico.

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
N_2O = nitrous oxide
NO_x = nitrogen oxides
PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less
$PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less
SO_x = sulphur oxides
VOC = volatile organic compound

If the project results in net increases in emissions that are lower than the *de minimis* levels, the project is presumed to conform, and no further conformity evaluation is necessary. Based on the emissions sources and assumptions listed above, estimated annual emissions associated with

Alternative A for NO_x, VOCs, and CO were below *de minimis* levels; therefore, no further conformity evaluation is needed.

Emissions associated with buoy deployment would be less than those associated with tower installation because buoys would be towed or carried aboard a vessel and then anchored to the seafloor. No drilling equipment would be required to install meteorological buoys. Installation and decommissioning of a meteorological buoy can likely be completed in two days (and thus a maximum of two vessel round trips), which BOEM anticipates would involve up to eight round trips combined (two round trips for two buoys for installation and the same for decommissioning) (Table 3–10). This is well below the 80 trips estimated for tower installation and decommissioning combined, therefore, projected emissions associated with construction and decommissioning of meteorological buoys would be lower than for a tower.

Estimated Emissions

Table 4–1 shows estimated emissions for site characterization surveys and site assessment activities, using recognized emission factors and conservative assumptions. The numbers of vessel trips and associated emission calculations, along with the assumptions used to complete the calculations, are provided in Appendix C. The estimated emissions have been updated to reflect changes in the size of the area available for lease due to the removal of the five aliquots designated by BOEM as Cholera Bank sensitive habitat, including a more representative round trip distance between potential staging ports and the proposed lease area.

Non-Routine Events

Non-routine events include fuel spills, collisions, and allisions. Although spills are unlikely, vapors from fuel spills resulting either from vessel collisions/allisions or from servicing or refueling generators on the meteorological tower and/or buoys may result in impacts on air quality in the proposed lease area or along the cable survey route. The estimated spill size is assumed to be approximately 88 gallons (333 liters) (Section 3.3.3 *Spills*). If such a spill were to occur, it would be expected to dissipate rapidly and then evaporate and biodegrade within a few days (MMS, 2007b). A petroleum product spill in the proposed lease area would not be expected to have impacts on onshore air quality because of the estimated size of the spill, prevailing atmospheric conditions over the proposed lease area, and distance from shore.

A spill could occur in the event of vessel collision while on the way to and from the proposed lease area or during surveys. Spills occurring in the proposed lease area, along the cable route, in harbors and along coastal areas are not anticipated to have significant impacts on onshore air quality because of the small estimated size and short duration of the spill.

Conclusion

Although the emissions estimates from site characterization and site assessment activities are measurable, they would not be distinguishable from other air emissions onshore or offshore; therefore, air pollutant and greenhouse gas (GHG) emissions associated with the proposed action would be **negligible**. As shown in Table 4–1, air pollutant concentrations due to emissions from the proposed action are not expected to lead to any violation of the NAAQS.

4.4.1.2 Water Quality

Description of the Affected Environment

The affected environment for water quality includes waters within the OCS in the proposed lease area and navigation routes between the lease area and the specific primary ports that have been identified as likely to be used by a lessee.

New York/New Jersey Coastal Waters

In the *National Coastal Condition Report IV* (EPA, 2012), EPA assessed the overall water quality and sediment quality of Northeast coastal waters, with sampling inclusive of coastal waters of New York and New Jersey. Based on an index derived from water quality parameters of nutrient concentrations, dissolved oxygen, water clarity, and chlorophyll *a* concentration, EPA rated the overall water quality for the Northeast coast, including the portions of the New York and New Jersey coasts within the affected environment for this EA, as "fair" (EPA, 2012). However, monitoring conducted primarily during the summer months of 2000 to 2006 within the New York/New Jersey Harbor area indicated consistently elevated nutrient levels. Areas of high human population densities are more susceptible to eutrophication, or elevated nutrient concentrations. The New York/New Jersey region is the most densely populated portion of the Northeast coast, with a population density exceeding 6,000 people per mi^2 throughout much of the metropolitan area and 20,645 people per mi^2 within New York City itself (EPA, 2012). EPA characterized sediment quality using an index based on sediment toxicity, sediment contaminants, and sediment total organic carbon (EPA, 2012). Overall sediment quality for the Northeast coast was rated as "fair" based on data from 1,024 sediment-monitoring sites in the region. While the distribution of sites in each rating category is relatively uniform along the Northeast coast, the New York/New Jersey Harbor area stands out as having an unusually high density of sites with "poor" sediment quality.

Marine Waters

No data specific to water quality or sediment quality within the proposed lease area are available at this time, though limited data are available for waters in the vicinity of the proposed lease area (Balthis et al., 2009; USCG, 2015a). The majority of pollutants to marine water quality originate onshore; these onshore sources include discharges from point sources such as wastewater treatment facilities, non-point sources such as storm water runoff, and agricultural runoff. Surface currents in the vicinity of the WEA reflect the complex interaction between shelf circulation, wind-driven circulation, and freshwater discharge from the Hudson River (Chant et al., 2008). As referenced in the Final Environmental Impact Statement for the Port Ambrose Project Deepwater Port Application (USCG, 2015a), the state of New York (NYDOS 2013) mapped seasonal stratification trends in the New York Bight using average monthly sea surface temperature, satellite imagery, historical radiometer data and conductivity-temperature-depth data collected during various marine surveys. The results of this analysis indicate a seasonal pattern of well-mixed, relatively uniform conditions during the fall and winter, development of stratified conditions during the spring and more substantial stratification during the summer (USCG, 2015a). The proposed lease area is far enough from shore that oceanic circulation and water volume would disperse, dilute, and biodegrade many contaminants that originate from shore (BOEM, 2012b). This assertion is consistent with maps of seasonally averaged chlorophyll *a* and turbidity derived from satellite imagery, which show that values of these parameters within the proposed lease area are significantly lower than values found near shore (Kinlan et al., 2012). Offshore sources of pollutants would be potential discharges from ships. Ocean-going vessels sometimes discharge bilge and ballast water and sanitary waste prior to entering state waters due to state restrictions on discharges in their waters (MMS 2007a); New York and New Jersey have several no discharge areas where bilge and ballast water discharges are prohibited (NYSDEC, 2016; EPA, 2016a). Vessel discharges would be subject to regulation under 33 CFR 151.10 (bilge and ballast water) and 33 CFR 159 (sanitary waste) (Section 3.2.1.5 *Operational Waste Associated with Site Characterization*).

Impact Analysis of Alternative A

Activities associated with Alternative A that may result in impacts to water quality include routine activities such as mechanical disturbance of the seafloor and discharge of bilge water, ballast water, or sanitary/domestic wastewater, as well as non-routine events such as accidental spills of fuel and maintenance materials, such as lubricants and solid debris.

Routine Activities

Routine activities that have the potential to adversely affect water quality include discharges from survey vessels and vessels servicing the tower and/or buoys (i.e., bilge water, ballast water, sanitary waste, and debris). Bilge and ballast water discharges may contain small amounts of petroleum-based products and metals, and as such are prohibited within 12 nm (24 km) of the shore. Any vessels conducting surveys or servicing a tower and/or buoys are likely to be equipped with holding tanks for sanitary waste and would not discharge untreated sanitary waste within state or federal waters. The regulations governing the relevant discharges are discussed in Section 3.2.1.5 *Operational Waste Associated with Site Characterization*. The instrumentation used for site characterization is self-contained, so there should be no discharges from instruments aboard the survey vessels that would impact water quality.

Impacts to water quality would occur during installation and decommissioning, with water quality returning to its original state during operation of the tower and/or buoys and after decommissioning. If a meteorological tower is proposed by the lessee, BOEM will require inspections of the foundation and submittal of scour monitoring reports at prescribed intervals and after a major storm event. The seabed would be disturbed locally during installation of a meteorological tower and/or buoys as a byproduct of anchoring, pile driving, and placement of scour protection devices. The resulting mobilization of sediments would produce **minor**, transient impacts to water quality in the immediate vicinity of the disturbance in the form of increased turbidity. These changes would likely be small in magnitude and limited in spatial scale, since the displaced sediments are rapidly diluted as they spread within the water column. Assuming mobilized sediments spread radially within a confined layer at the bottom of the water column (i.e., cylindrical spreading), the concentration of these disturbed sediments in the water column will decrease as the inverse square of the distance from the boundary of the original disturbance due to dilution alone. For example, if disturbance of a circular patch of sediments with a radius of 3 ft (1 m) initially produces an increase in total suspended solids of 100 milligrams per liter (mg/L) directly above the patch, that excess concentration will have decreased to 25 mg/L when it has spread to a radius of 6 ft (2 m) and to 11 mg/L when it has spread out over a radius of 9 ft (3 m). The example used here is meant to illustrate the effects of dilution on suspended sediment concentrations and provide a simplified, conservative estimate of suspended sediment concentrations in the water column based on the physical principle of conservation of mass. This example is not meant to provide a definitive, quantitative assessment of suspended sediment concentrations in the vicinity of a disturbance.

Most site characterization and assessment activities would be covered by USACE NWP Numbers 5 and 6, which were developed under Section 404 of the CWA and Section 10 of the River and Harbors Act to provide a streamlined evaluation and approval process for certain activities that have minimal adverse impact, both individually and cumulatively, on the environment. NWP 5 covers the placement of scientific measurement devices, including tide gages, water recording devices, water quality testing and improvement devices, meteorological stations and similar structures. NWP 6 covers a variety of survey activities including core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, and historic resources surveys.

Non-Routine Events

Storms would be the primary non-routine event that would affect water quality. Large storm events, including both tropical storms/hurricanes and nor'easters, are capable of producing large waves and strong currents that can potentially mobilize sediments from the seabed, resulting in erosion as well as suspension, transport, and deposition of sediments. This can result in temporary increases in water turbidity during and immediately after storm events. The activities associated with Alternative A would not appreciably add to these natural changes in water quality during storm events.

Accidental spills of petroleum products or lubricants or releases of solid debris are possible during installation, maintenance, and decommissioning of the tower and/or buoys. The discharge and disposal of garbage and other solid debris, including plastics, from vessels into the sea or navigable waters of the United States is prohibited (MARPOL Annex V, Public Law 100-220 [Statute 1458]). According to 33 CFR §§ 151.51 through 151.77, all trash and debris must be returned to shore for proper disposal with municipal and solid waste unless it can pass through a comminutor and a 25-millimeter (mm) mesh screen onboard ship. The combination of crew training on avoiding accidental discharge and on existing regulations will minimize the risk of solid debris entering the water.

The meteorological tower and/or buoys may include a diesel generator for powering equipment, and small diesel spills could occur during refueling. Vessel collisions/allisions are also a potential source of small petroleum product spills, if they were to involve major hull damage. Accidental spills of petroleum product from vessels would likely be small in volume; as described in Section 3.3.3 *Spills*, between 2000 and 2009, the average spill size for vessels other than tank ships and tank barges was 88 gallons (333 liters). Diesel fuel, which is lighter than water, would float on the water surface as a sheen that is readily dispersed by wave action into the water column. Dispersion down to the seafloor would be extremely unlikely. Because diesel oil does not contain the heavier, more persistent components found in crude oil, it would be expected to dissipate rapidly in the environment (MMS, 2007a). The likelihood of a diesel spill would be greatest during installation and decommissioning; the potential for impacts would be reduced substantially during operation of the tower and/or buoys because vessels would be needed only for periodic maintenance. BOEM expects that each of the vessels involved with the installation and operation of a tower and/or buoys will minimize the potential for a release of oils and/or chemicals to the Atlantic Ocean, 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. Impacts from a small petroleum product spill are anticipated to be **minor** and localized.

Overall, releases/spills (petroleum products, lubricants, trash, or debris) due to non-routine events are likely to be small and result in **minor**, transient impacts on water quality over a localized area in the immediate vicinity of the release/spill.

Conclusion

Overall, activities associated with Alternative A would have a **minor** impact on water quality, with any changes being small in magnitude, highly localized, and transient. Any operational discharges from vessels during surveying or servicing of buoys and a tower would be small and have a **minor** adverse effect. Seabed disturbances during installation, and decommissioning of buoys or a tower would result in **minor**, localized impacts on water quality in the area immediately adjacent to the meteorological structure or disturbance.

4.4.2 Biological Resources

4.4.2.1 Birds

Bird species that are likely to occur in the proposed lease area are generally found in other nearshore areas of the Atlantic Ocean from North Carolina to Massachusetts. Birds found in these areas have been described in several recent environmental reviews by BOEM (BOEM, 2014a; BOEM, 2015a; BOEM, 2015b) and others (e.g., USCG, 2015a). These descriptions of the affected environment for birds are incorporated herein by reference.

Description of the Affected Environment

<u>Bird Species Likely to Use the Proposed Lease Area Offshore New York</u>

Compared to other areas of the Atlantic OCS, relatively low numbers of nearshore bird species, pelagic bird species, and gull-like species are predicted to occur within the New York proposed lease area (Figure 4–3 to Figure 4–5). Bird species that would be expected to forage or rest in the proposed lease area were identified from the FWS's Information for Planning and Consultation (IPaC) system. Table 4–2 lists 29 bird species that are most likely to occur in the proposed lease area. Past offshore surveys (O'Connell et al., 2009) identified 11 seabird species in the proposed lease area.

Table 4–2
Bird Species Most Likely to Use the Proposed Lease Area[1]

Group[2]	Common Name	Scientific Name
Gull-like	Black-legged Kittiwake[3]	*Rissa tridactyla*
	Bonaparte's Gull	*Chroicocephalus philadelphia*
	Great Black-backed Gull[3]	*Larus marinus*
	Herring Gull[3]	*Larus argentatus*
	Laughing Gull	*Leucophaeus atricilla*
	Northern Gannet[3]	*Morus bassanus*
	Ring-billed Gull	*Larus delawarensis*
Nearshore	Black Scoter	*Melanitta americana*
	Common Eider	*Somateria mollissima*
	Common Loon[3]	*Gavia immer*
	Common Tern[3]	*Sterna hirundo*
	Double-crested Cormorant[3]	*Phalacrocorax auritus*
	Horned Grebe	*Podiceps auritus*
	Least Tern	*Sternula antillarum*
	Long-tailed Duck	*Clangula hyemalis*
	Razorbill[3]	*Alca torda*
	Red-throated Loon	*Gavia stellata*
	Roseate Tern	*Sterna dougallii*
	Surf Scoter	*Melanitta perspicillata*
	White-winged Scoter	*Melanitta fusca*
Pelagic	Atlantic Puffin	*Fratercula arctica*
	Common Murre[3]	*Uria aalge*

Group[2]	**Common Name**	**Scientific Name**
Pelagic	Cory's Shearwater	*Calonectris diomedea*
	Dovekie	*Alle alle*
	Manx Shearwater	*Puffinus puffinus*
	Pomarine Jaeger	*Stercorarius pomarinus*
	Red-necked Phalarope	*Phalaropus lobatus*
	Sooty Shearwater[3]	*Puffinus griseus*
	Wilson's Storm-Petrel[3]	*Oceanites oceanicus*

(1) Species list obtained from https://ecos.fws.gov/ipac/project/YKD7HMJG65GCFECAAWHHWU5YEA
(2) Based on Table 12 from Kinlan et al., (2016).
(3) Detected in the proposed lease area during previous surveys (O'Connell et al., 2009)

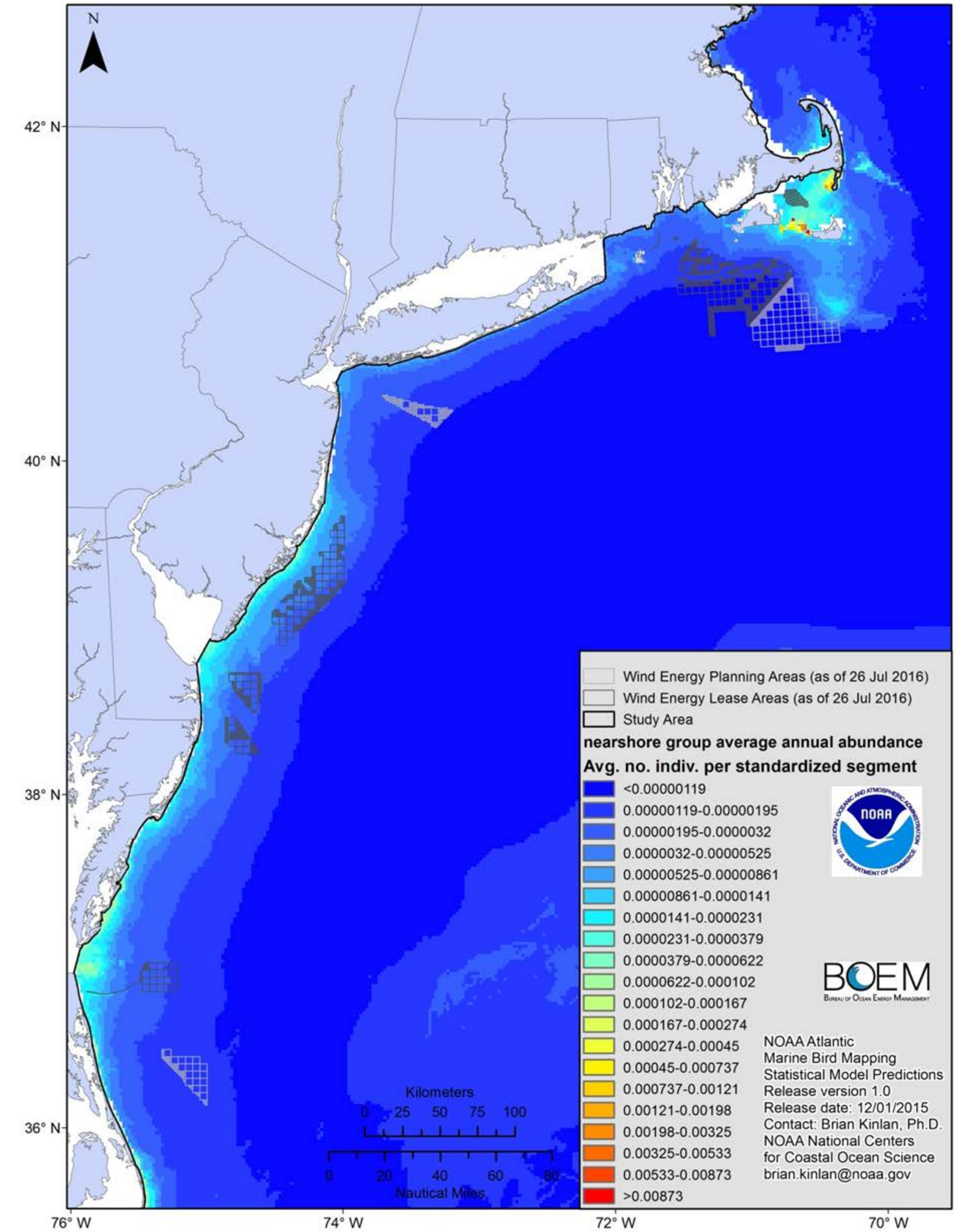


Figure 4-3 **Predicted Average Annual Distribution of Nearshore Bird Species (Brown Pelican, Common Eider, Double-crested Cormorant, Horned Grebe, Long-tailed Duck, Loons [Common & Red-throated], Scoters [Black, Surf, & White-winged], and Terns [Artic, Common, Least, Roseate, & Royal]). Adapted from Appendix M, Kinlan et al., 2016.**

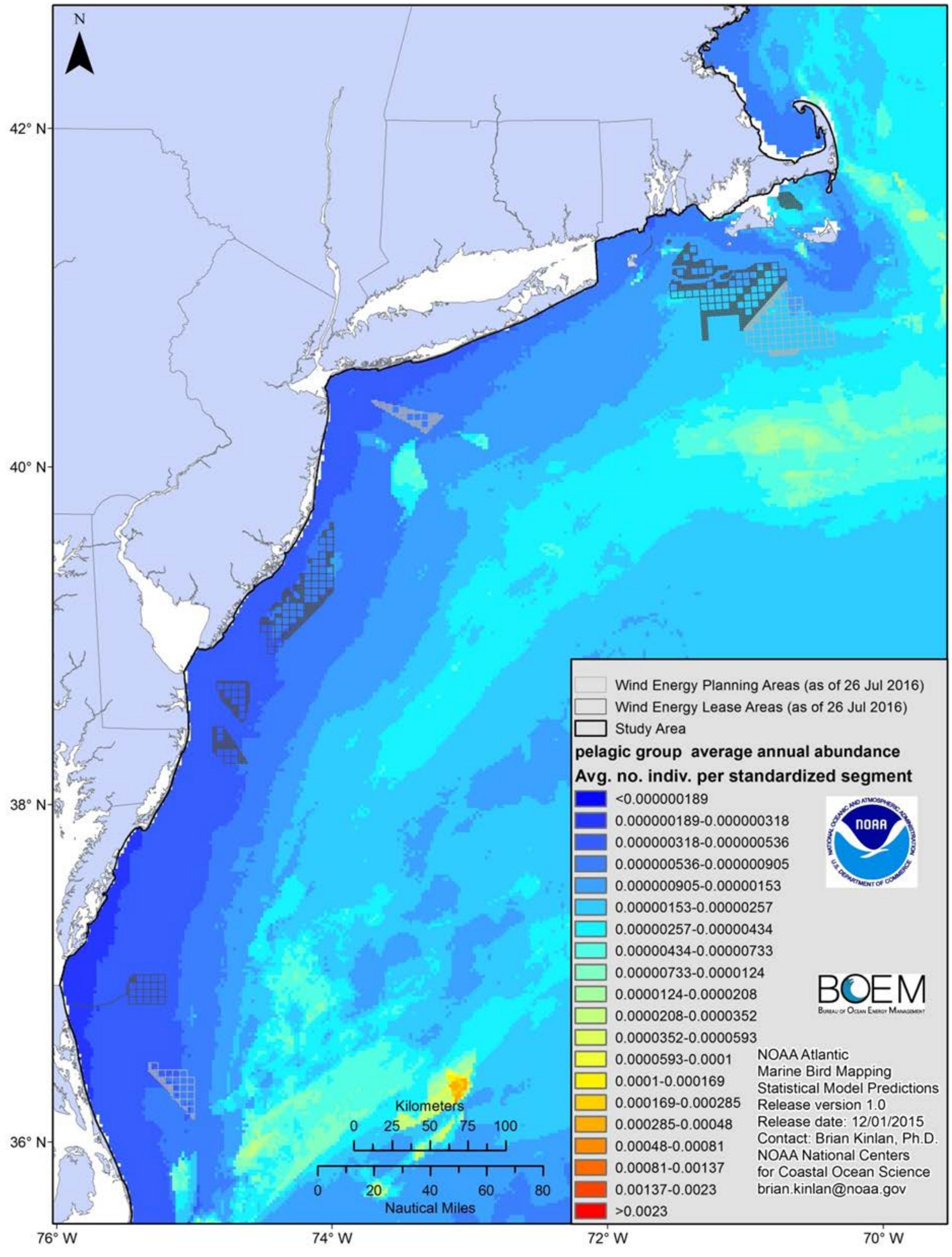


Figure 4-4 Predicted Average Annual Distribution of Pelagic Bird Species (Alcids [Atlantic Puffin, Black Guillemot, Common Murre, Dovekie, & Razorbill], Petrels [Band-rumped, Black-capped, Leach's, & Wilson's], Northern Fulmar, Pomarine Jaeger, Red Phalarope, and Shearwaters [Audubon's, Cory's, Manx, Greater, & Sooty]). Adapted from Appendix M, Kinlan et al., 2016.

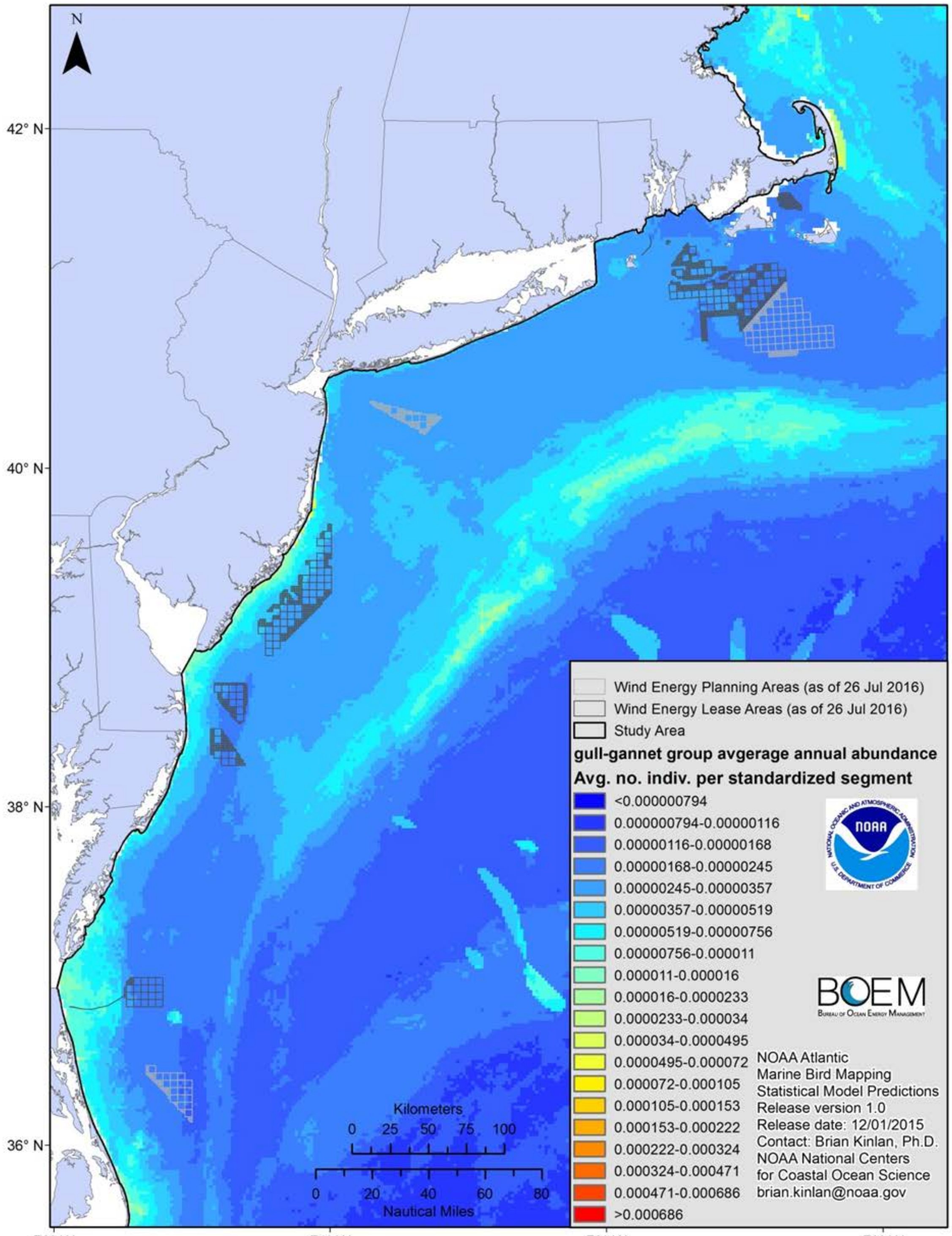


Figure 4-5 Predicted Average Annual Distribution of Gull-like Bird Species (Black-legged Kittiwake, Gulls [Bonaparte's, Great Black-backed, Herring, Laughing, & Ring-billed], and Northern Gannet). Adapted from Appendix M, Kinlan et al., 2016.

Threatened and Endangered Species

Four federally listed birds may be found within the proposed lease area: Piping Plover (*Charadrius melodus*); Red Knot (*Calidris canutus rufa*); Roseate Tern (*Sterna dougallii dougallii*); and Bermuda Petrel (*Pterodroma cahow*). Outside of the breeding season, the Bermuda Petrel is likely widespread in the North Atlantic, following the warm waters on the western edges of the Gulf Stream and feeding on squid near the surface at night. Although it is possible for the Bermuda Petrel to be less than 100 mi (161 km) offshore of New York, it is unlikely to use the proposed lease area because the core of its range is farther east (Figures 16 & 17 in Madeiros et al., 2014).

The three other ESA-listed bird species may be found in nearshore waters of New York. There are sightings of piping plovers and red knots along the shores of Long Island, New York (eBird, 2016). However, no Piping Plovers or Red Knots were detected in the proposed lease area during previous offshore efforts (O'Connell et al., 2009). Given that Piping Plover and Red Knot are both terrestrial shorebirds and would not use the proposed lease area for foraging or roosting, it is possible that these birds may fly over the proposed lease area during migration.

Most Roseate Terns (1,524 pairs in 2009) nest on Great Gull Island in the eastern most part of Long Island Sound, approximately 60 nm (111 km) from the proposed lease area (Figure 1–5 and Table 2b in FWS, 2010). During the breeding season, terns from Great Gull Island travel long distance to foraging sites at Napatree Point, Rode Island (25 km away); Montauk Point, New York (25 km away); Block Island, Rhode Island (50 km away) and Trustom Pond NWR, Rhode Island (50 km away) (Loring et al., 2016). Although there are sightings of roseate terns along the shores of Long Island, New York (eBird, 2016), no Roseate Terns were detected in the proposed lease area during previous offshore survey efforts (O'Connell et al., 2009). In addition, very little Roseate Tern activity is expected to occur within marine waters in and around the proposed lease area (Figure 4–6) (Appendix L in Kinlan et al., 2016). This prediction is based on a statistical model that used 328 Roseate Tern sightings throughout the Atlantic during the spring, summer, and fall months to predict Roseate Tern presence. The modeled results are based on the relationship between Roseate Terns and surface chlorophyll *a*, distance from shore, turbidity, and other factors (Appendix H in Kinlan et al., 2016). As shown in blue in Figure 4–6, the model predicts that Roseate Terns are virtually absent from the marine portion of the project area. However, given that Roseate Terns migrate mainly offshore during spring and fall (Nisbet et al., 2014), it is possible some birds may pass through the proposed lease area during migration.

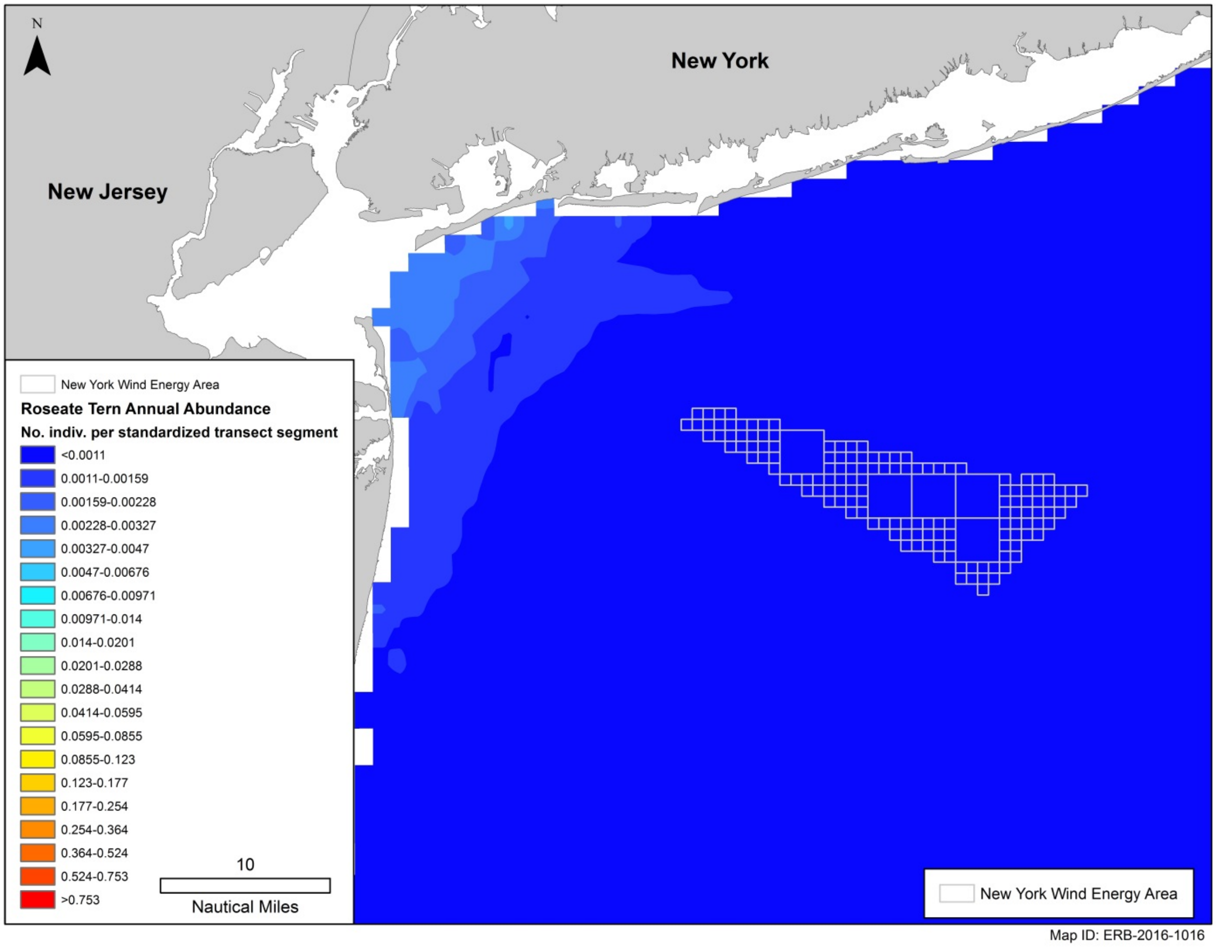


Figure 4-6 Modeled Roseate Tern Distribution in Mid-Atlantic during Spring, Summer, and Fall (from Kinlan et al., 2016)

Migratory Birds

Despite the level of human development and activity present, the mid-Atlantic coast plays an important role in the ecology of many bird species. The broadly defined Atlantic Flyway, which encompasses the proposed lease area, is a major route for migratory birds that are protected under the Migratory Bird Treaty Act of 1918 (MBTA).

The official list of migratory birds protected under the MBTA, as well as the international treaties that the MBTA implements, is found at 50 CFR 10.13. The MBTA makes it illegal to "take" migratory birds, their eggs, feathers, or nests, except as permitted by regulations. Under Section 3 of Executive Order (EO) 13186, BOEM and USFWS established a Memorandum of Understanding (MOU) on June 4, 2009, which identifies specific areas where cooperation between the agencies would substantially contribute to the conservation and management of migratory birds (BOEM, 2009). The purpose of the MOU is to strengthen migratory bird conservation through enhanced collaboration between the agencies (MOU, Section A). One of the underlying tenets identified in the MOU is to evaluate potential impacts on migratory birds and design or implement measures to avoid, minimize, or mitigate such impacts as appropriate (MOU, Sections C, D, E(1), F(1-3, 5), G(6)).

Birds from a wide variety of taxonomic groups migrate. Bird species that could be expected to forage or rest in the proposed lease area (during or outside of migration periods) are discussed above. This section specifically addresses migratory land birds, including songbirds, shorebirds (apart from phalaropes), and other species that do not land on the water but will pass over the proposed lease area.

Data from weather surveillance radars have been used to describe nocturnal migration of birds, including passerines (e.g., Farnsworth et al., 2016). In the northeastern United States, the greatest densities of nocturnally migrating birds occurred during the middle of the fall season at altitudes from 500 to 2000 m above sea level, with very few occurring below 300 m (Figure 3a in La Sorte et al., 2015). Birds flying over the weather surveillance radar located in Brookhaven, New York, move in a southwesterly overland and parallel with the coastline; these birds, like those detected further inland, are likely short distance migrants that move overland within the US, or toward Central America (Farnsworth et al., 2016). When winds are blowing eastward towards the ocean, migrating birds flying along the coast will strongly compensate against wind drift so they are not blown out to sea (Horton et al., 2016). Therefore, relatively fewer birds (including passerines) are expected to fly over the proposed lease area compared to those flying overland; those that do fly over the area will be flying hundreds of meters (m) above the proposed lease area. One exception to this is the Peregrine Falcon (*Falco peregrinus*), which are known to fly offshore, often for days at a time (Desorbo et al., 2015), and can eat on the wing (White et al., 2002). Peregrine Falcons may opportunistically hunt in the proposed lease area and could potentially perch on boats or anchored structures in the area.

Bald and Golden Eagles

The Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668–668d), prohibits the "take" and trade of Bald Eagles (*Haliaeetus leucocephalus*) and Golden Eagles (*Aquila chrysaetos*). Neither Bald Eagles nor Golden Eagles regularly migrate offshore (Buehler, 2000; Kochert et al., 2002). Golden Eagles are mainly found in the western United States, much less frequently in the eastern mountains, and only very rarely on the east coast (Kochert et al., 2002) and would not likely occur in the proposed lease area or associated ports. Bald Eagles occur near wetlands such as seacoasts, rivers, large lakes, and marshes. The closest nesting Bald Eagles to the ports of New York and New Jersey are more than 20 mi (32 km) to the north (Town, 2015). Bald Eagles rarely travel over the open ocean, and the proposed lease area is located outside of Bald Eagle high-use migration corridors (Mojica et al., 2016). Therefore, Bald Eagles are not expected to occur regularly in the proposed lease area.

Impact Analysis of Alternative A

BOEM has recently conducted several NEPA reviews (e.g., BOEM, 2012b, 2013c, 2014b, 2015a) that evaluate impacts to birds that could occur as a result of the proposed action. These impacts include the effects associated with light, noise, vessel traffic, trash and debris release, and accidental fuel spills. A review of the avifauna in the vicinity of the proposed lease area was also discussed in the *Final Environmental Impact Statement for the Port Ambrose Project Deepwater Port Application* (USCG, 2015a). The impacts to bird species considered in this EA would be similar to those considered in these recent reviews due to the similarity of impact-causing factors and of bird species composition. Thus, the impacts from those recent reviews that were determined to be negligible are summarized here and will not be further discussed in this EA.

The following conclusions for site characterization that were made in the recent reviews are expected to be the same in the New York proposed lease area:

- Impacts from active acoustic sound sources used in renewable energy surveys are expected to be **negligible**.
- Impacts from vessel and equipment noise are expected to be **negligible**.
- Impacts from vessel traffic are expected to be **negligible**.
- Impacts from trash or debris releases are expected to be **negligible**.
- Impacts from accidental fuel spills are expected to be **negligible**.
- This project would *not likely adversely* affect federally listed bird species.

Meteorological Tower and Buoys

Other activities covered in this EA that could affect bird species are those associated with the meteorological tower and buoys, such as pile driving noise, lighting, collisions, loss of habitat, and decommissioning.

Noise and other disturbance generated by the installation or decommissioning of meteorological buoys are expected to be short-term and localized, resulting in negligible impacts to birds. Because buoys height is anticipated to be up to approximately 40 ft (12 m) above the ocean surface, collisions with buoys are unlikely. Although seabirds, including terns, gulls, cormorants, and boobies may roost on the buoys, roosting on the buoys does not pose a threat to these birds. Thus, overall impacts to birds from meteorological buoys are expected to be **negligible**.

The construction of a meteorological tower would produce noise, primarily from pile driving activities, but also from other construction activities. The type and intensity of the sounds and the distance these sounds travel depends on multiple factors (e.g., size of the impact hammer, depth, sediment type, atmospheric conditions). Birds that forage in or migrate through the area where the meteorological tower is being constructed would be exposed to noise during construction. The reaction of birds to these sounds could range from ignoring the sound to avoiding the source of the sound. Such impacts from noise would be temporary and would last only for the duration of the pile driving activity. Noises generated from tower construction activities are not anticipated to affect the migratory movement or migratory behavior of birds through the area and are expected to have minimal impacts on migratory species that use the area for foraging. Therefore, construction noise from pile driving may adversely affect these bird species, but the effect would be localized, short-term and **minor**. Tower decommissioning could generate noise, but those levels are anticipated to be less than construction (e.g., no pile driving would be required during tower removal) and would, therefore, be **negligible**.

Due to their excellent vision, birds flying during daytime hours are unlikely to collide with a meteorological tower. However night-flying or flying under other conditions that would impair their vision, birds could potentially collide with a meteorological tower, leading to injury or death. The annual mortality rate of birds due to collisions with the ~84,000 land-based communications towers ≥ 60 m in the United States and Canada was estimated to be 6.8 million birds per year (Longcore et al., 2012). In the New England/Mid-Atlantic coastal region, the annual mortality rate is estimated at 96,197 birds per year, or 1.14 to 1.41 birds per km^2 (Longcore et al., 2012). The mortality at land-based communications towers is lower with the presence of the following features (Longcore et al., 2012):

- Red flashing aviation obstruction lights;
- Absence of floodlights and other light sources at the base of the tower, especially those left on all night; and
- Absence of guy wires.

In fact, the removal of steady-burning lights from 4,500 towers that are ≥150 m tall in the United States and Canada would reduce overall avian mortality due to collision by approximately 45 percent (Longcore et al., 2012).

The meteorological tower on the OCS would not require guy wires for support. Although seabirds such as terns, gulls, cormorants, and boobies may perch on the tower's lattice-type mast, handrails, and equipment sheds, perching on the tower would not pose a threat to the birds. Although it is possible that Peregrine Falcons could use a tower as a perch to opportunistically prey on seabirds, this predation would be expected to have a **negligible** impact on birds overall.

The proposed lease area is located near the nation's largest city, New York City, which presently contains 113 skyscrapers that are >600 ft (Emporis, 2016). Under poor visibility conditions (fog and rain), some migrating birds may become disoriented and circle lighted communication towers, instead of continuing on their migratory path, greatly increasing their risk of collision (Huppop et al., 2006). Meteorological tower lighting would have the greatest impact on bird species during evening hours, when nocturnal migration occurs. However, red flashing aviation obstruction lights are commonly used at land-based wind facilities, without any observed increase in avian mortality compared with unlit turbine towers (Kerlinger et al., 2010). Thus, to decrease the likelihood of attracting migratory bird species to the meteorological tower, it is anticipated that red flashing lights would be used on the tower to reduce the risk of bird collisions. Further, it is anticipated that any additional lights (e.g., work lights) on the tower and support vessels will be used only when necessary, and will be hooded downward and directed when possible to reduce upward illumination and illumination of adjacent waters. Therefore, the potential impacts on birds from the artificial lighting of a 300 to 400 ft tower would be **negligible**. Because the meteorological tower would be more than 10 nm (19 km) from the shoreline, the likelihood of birds colliding with the meteorological tower would be small, resulting in **minor** impacts on marine and coastal bird populations. Because the meteorological tower would be removed after the site assessment activities are concluded or at the end of the lease, any impacts on birds from the tower would be temporary.

Bald and Golden Eagles

Site assessment activities would not require expansion of existing onshore facilities, and as a result, no impacts on Bald and Golden Eagles would be expected onshore. Offshore impacts to Bald or Golden Eagles would be expected to be **negligible** because neither species occurs regularly offshore.

Standard Operating Conditions for Birds

To minimize the potential for adverse impacts on birds, BOEM has developed SOCs that would be required during activities conducted by a lessee. These SOCs include lighting restrictions on vessels, the meteorological tower, and buoys, and a prohibition on guy wires. SOCs for birds are described in detail in Appendix B, Section B.6.

Conclusion

Overall, impacts to birds would be **minor**. The construction, presence, and decommissioning of a meteorological tower and/or buoys would pose minimal threats to birds. Loss of water column habitat, benthic habitat, and associated prey abundance are expected to have negligible impacts because of the small area affected by a tower and/or buoys. Impacts to birds in coastal waters from vessel traffic are expected to be negligible due to the amount of existing vessel traffic. Impacts on birds from site characterization surveys are expected to be negligible. Impacts to birds from trash or debris releases and from accidental fuel spills are expected to be negligible. Potential noise impacts from meteorological tower construction could have localized, short-term minor impacts on birds foraging near or migrating through the construction site, and noise impacts from decommissioning are expected to be negligible. The risk of collision with the meteorological tower would be minor because of lighting requirements, the lack of guy wires, and its distance from shore. For ESA-listed bird species, the USFWS has concurred with BOEM's *not likely to adversely affect* determinations for similar projects (e.g., BOEM, 2012b, 2013a, 2014b, 2015a) for all activities that would occur under this proposed action. Additionally, the proposed action includes SOCs for birds (Appendix B, Section B.6) to reduce the potential for the proposed action to adversely impact birds.

4.4.2.2 Bats

Description of the Affected Environment

Nine species of bat occur in New York and New Jersey. Of these, two non-migratory species are ESA-listed: the Indiana bat is endangered and the northern long-eared bat is threatened (Table 4–3). The northern long-eared bat is a cave dweller that occurs in Queens, Nassau, and Suffolk counties (FWS, 2016). Unlike tree bats, who migrate long distances to warmer climates in the winter, northern long-eared bats do not migrate long distances, especially over open water. Instead, colonies of northern long-eared bats hibernate in caves for the winter, and individuals roost in trees during the summer so that they can forage primarily in wooded habitat within a kilometer of their roost (80 FR 17974). There are no records of northern long-eared bats on the OCS (Pelletier et al., 2013; Peterson & Pelletier, 2016). Given the rarity of the bat in the region, its ecology, and its habitat requirements, it is extremely unlikely that any northern long-eared bats would venture into the proposed lease area.

Table 4–3
Bat Species Occurring in New York and New Jersey Listed with Federal Conservation Status and Migratory Habits

Common Name	Scientific Name	Federal Status	Migratory Pattern
Indiana bat	*Myotis sodalis*	Endangered	Sub-continental
Northern long-eared bat	*Myotis septentrionalis*	Threatened	Unknown
Little brown bat	*Myotis lucifugus*	Not listed	Mostly philopatric-some latitudinal migration
Tri-colored bat	*Perimyotis subflavus*	Not listed	Mostly philopatric-some latitudinal migration
Big brown bat	*Eptesicus fuscus*	Not listed	None
Eastern small-footed bat	*Myotis leibii*	Not listed	None
Eastern red bat	*Lasiurus borealis*	Not listed	Continental
Hoary bat	*Lasiurus cinereus*	Not listed	Continental
Silver-haired bat	*Lasionycterius noctivagans*	Not listed	Continental

Source: Cryan, 2003; Fraser et al., 2012; NatureServe, 2015; Norquay et al., 2013; Stegemann & Hicks, 2008; USFWS, 2015a; USFWS, 2015b

Generally, it is unlikely that any bats would travel 11 nm from land over open water to forage exclusively at the proposed lease area, due to the fact that bat activity in the Atlantic has been found to decline dramatically 20 km from shore (Sjollema et al., 2014). However, it is possible that some tree bats may pass through the proposed lease area during migration. Of the tree bat species, only the silver-haired bat, eastern red bat, and hoary bat are considered migratory due to their seasonal migrations over several degrees of latitude (Cryan, 2003), and they could be present in the proposed lease area (Table 4–3). Although migratory bats, like the eastern red bat, could pass through the proposed lease area during spring and fall migration, it would likely be a rare event.

Although the migration patterns of bats are not well-documented, many bats species make extensive use of linear features in the landscape, such as ridges of rivers, while commuting and migrating suggesting a preference for overland migration routes (MMS, 2007a). It is also known that they fly along the coast (Johnson et al., 2011). Bats are known to fly over the open ocean during migration (Cryan & Brown, 2007; Ahlén et al., 2009; NJDEP, 2010). Similar to the area surveyed off New Jersey in the NJDEP (2010) study, the offshore project area is not located between any islands and the mainland or within a bay that might be traversed by bats.

In September 2012, single eastern red bats were photographed during the day near the Virginia WEA flying at an altitude >100 m (Hatch et al., 2013). The timing is consistent with acoustic detections of bats on the Atlantic OCS. Boat-based surveys conducted from March to June, and August to October 2009 made only one bat detection in May, and a further 53 detections over eight nights in August. Similarly, acoustic data from offshore sites located between 9 to 15 nm (17-28 km) from any land mass also show nearly all activity occurring in August (Peterson & Pelletier, 2016). Three years of acoustic data at the Chesapeake Light Tower (13.4 nm from shore) revealed that bat activity was relatively low, irregular, and comprised mostly of eastern red bats and some hoary bats (Peterson & Pelletier, 2016). There are no records of bat species in the proposed lease area (Pelletier et al., 2013).

Impact Analysis of Alternative A

While bats are rare in the proposed lease area, bats could have avoidance or attraction responses to the tower or buoys due to noise, lighting, and the possible presence of insects. While bats do not typically collide with stationary structures, dead bats have been found at the base of communication towers and large buildings during migratory periods after nights of inclement weather with low visibility (Crawford & Baker, 1981). Therefore, it is possible for a few bats to be blown off course by storms and high winds during the fall migration period and collide with an offshore tower.

Routine Activities

Site Characterization Activities

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

Site Assessment Activities

Lights and noise from the vessels associated with construction, operation, and decommissioning of a meteorological tower and/or buoys (e.g., pile driving) could affect a bat's ability to forage, navigate, and communicate easily and influence the behavior of migrating or feeding bats (Schaub et al., 2008; Stone et al., 2009).

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

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

Some species of bats, particularly passive listening bats such as *Myotis*, can be repelled from areas with constant broadband noise (Schaub et al., 2008). Species using passive listening (using prey generated sound to detect prey) continue to emit echolocation calls while approaching prey (Russo et al., 2006), which suggests that, although foraging success in *Myotis* species could be affected by noise, there is no reason that navigation and communication will be affected. A study by Bunkley et al. (2015) concluded that *Myotis* species were not affected by compressor noise, which is broadband in nature and may be assumed similar to generator and pile driving noise. Acoustic deterrent research has inferred through collision mortality comparisons that broadband ultrasonic broadcasts can reduce bat activity, with silver-haired bats and hoary bats avoiding areas with such broadcasts (Arnett et al., 2013). Broadband ultrasonic noise is dissimilar from any noise anticipated from vessels associated with construction, operation, and decommissioning of a meteorological tower and/or buoys.

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

A meteorological tower or a buoy could potentially provide a roosting opportunity not only for bats, but also for birds that prey on bats such as Herring Gull and Peregrine Falcon (Speakman, 1991). If bats were active during daylight and early dusk hours near the tower or buoys, there would be an opportunity for predation on bats while they forage or migrate offshore. Given the scarcity and distribution of both bats and predatory birds in the proposed lease area, predation on bats is remote and unlikely, and impacts are expected to be **negligible**.

Non-Routine Events

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

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

Conclusion

There may be temporary impacts to bats from onshore operational noise and human activity during construction and decommissioning. The likelihood of collision between bats and boats, buoys, or a meteorological tower, however, would be remote. Instances of bat collisions with towers are reported infrequently at terrestrial sites, and distribution and scarcity of bats in the offshore environment further reduce the potential for a collision with a comparatively small and isolated tower or buoy offshore. It is possible that migratory tree bats may, on occasion, be driven to the offshore project area by prevailing winds and weather, resulting in possible, but unlikely, collisions with a tower. The SOCs for birds (Appendix B, Section B.6), including lighting restrictions and prohibition on guy wires and the installation of anti-perching devices, may also reduce potential impacts on bats. To the extent that there would be any impacts to individuals, the overall impact of Alternative A on bats would be **negligible**.

4.4.2.3 Benthic Resources

Description of the Affected Environment

Bathymetry, Geology, and Sediments

Depths within the proposed lease area range from 66 ft (20 m) in the northwest corner to 138 ft (42 m) in the southeast (Poti et al., 2012a). Depths generally increase moving offshore from northwest to southeast. Seafloor topography is characterized by flat expanses marked by occasional depressions (Greene et al., 2010) (Figure 4-7, 4-9, and 4-10). The Cholera Bank sensitive habitat area that was removed from the proposed action was the contiguous area around the 19 m depth contour sloping down to 24 m at approximately 1 percent grade (Figure 4–9). Other areas do not contain similar depth strata and slope within the 24 m depth stratum defining Cholera Bank (Byrnes et. al. 2004).

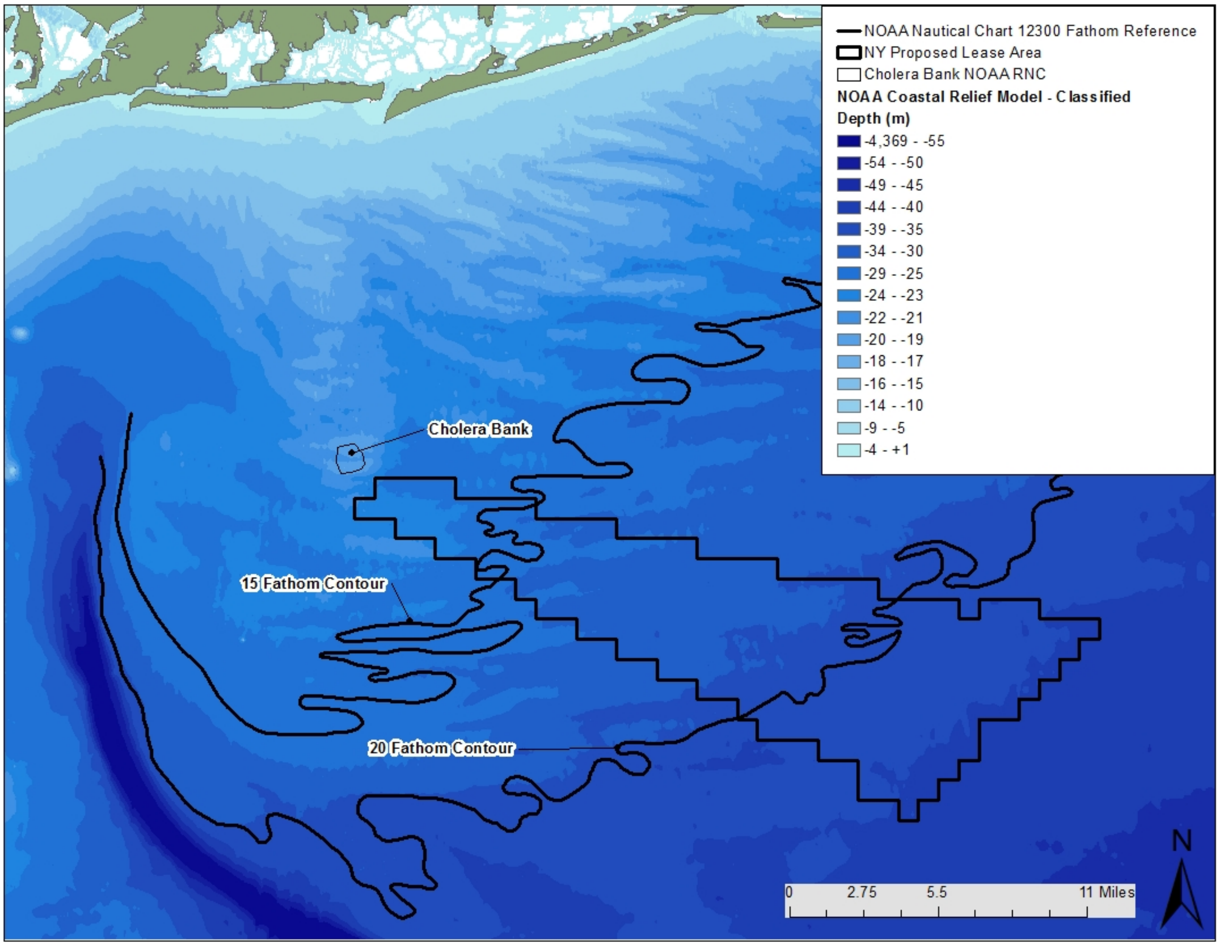


Figure 4-7 Five meter bathymetry from NOAA Coastal Relief Model with 15 and 20 Fathom Reference Contours

Source: NOAA Coastal Relief Model

Within the proposed lease area, sediments are predominantly sand and gravel (Poppe et al., 2014; Reid et al., 2005), although isolated areas of gravelly, muddy sand may exist (Poti et al., 2012b). These characterizations are based on records from physical sampling equipment (e.g., sediment grabs, cores) and virtual samples, such as seafloor photographs and videos. These point-based methods are limited in their spatial coverage. Thus, one alternative is to predict the composition and topography of the seafloor at unsampled locations using statistical models. Figure 4-8 through 4-10 include the results of modelled seafloor topography and sediment composition based on point samples from various databases (e.g., Poti et al., 2012b, USGS US SEABED). These models indicate medium-grained sand predominantly throughout the proposed lease area, with pockets of coarse sand and gravel. In response to comments from NMFS, the undersea feature known to fishers as the Cholera Bank (Figure 4-9) on the northwest end of the WEA was removed from consideration for leasing. According to NMFS, Cholera Bank is a structurally complex habitat that provides important functional value to fish as shelter and refuge from predators. NMFS further considers this type of complex habitat to be a sensitive habitat, as "complex benthic substrates are vulnerable to disturbance, particularly due to extended recovery times (Collie et al. 2005; Bradshaw et al. 2000). During the development of any SAP, impacts to these sensitive areas should be avoided" (NMFS, 2016a). It should be noted that over time the reference to Cholera Bank has changed. Originally (circa 1832), Cholera Bank was the area labeled “Cholera Bank” in Figure 4–9. However, more recently another part of the reef, five mi to the northeast, is referred to as Cholera Bank (labeled “Cholera” in Figure 4–9. Located on the same submarine reef are two grounds west of Cholera, Middle Ground, and Angler Bank, and one to the east, appropriately called East of Cholera (Freeman & Walford, 1974).

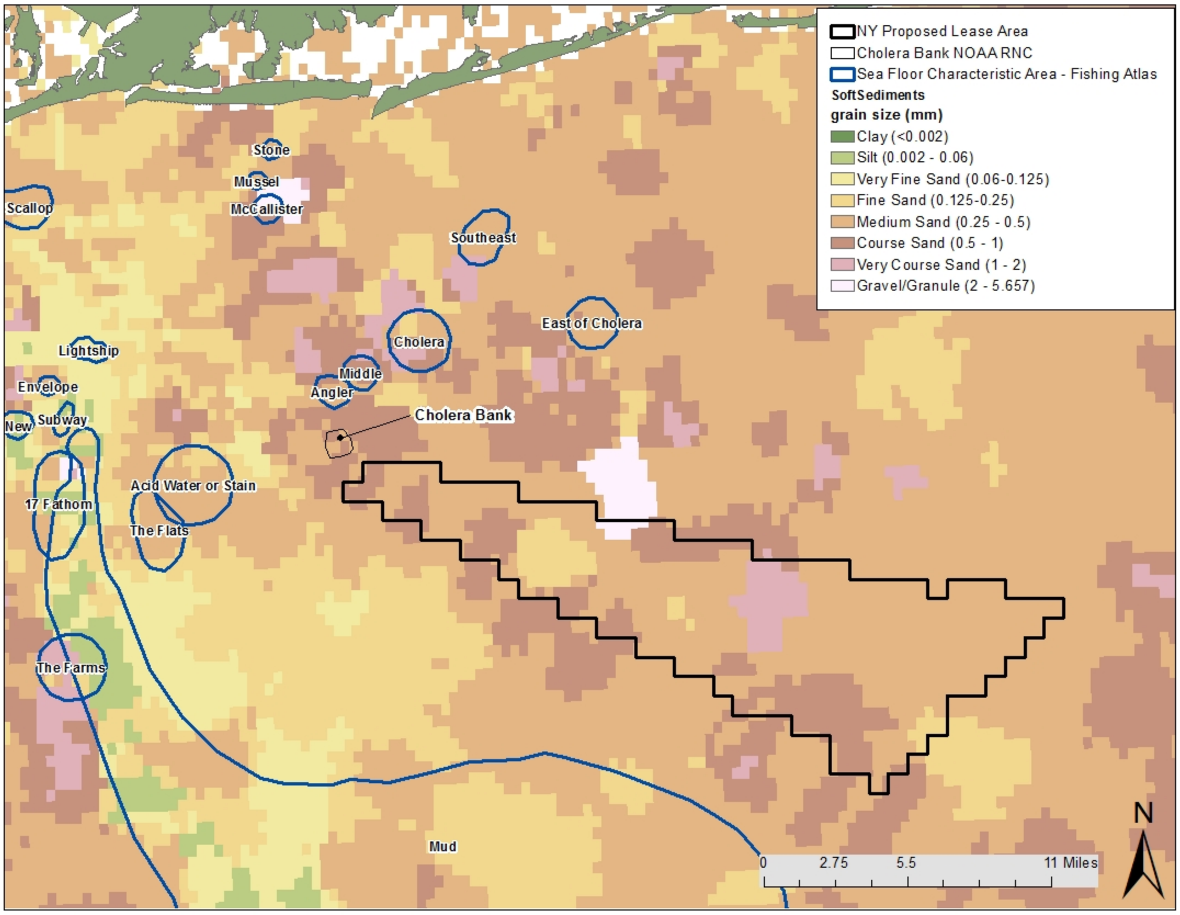


Figure 4-8 Sediment Type and Other Seafloor Characteristics

Source: Northeast Ocean Data Portal/The Nature Conservancy (2016) and BOEM

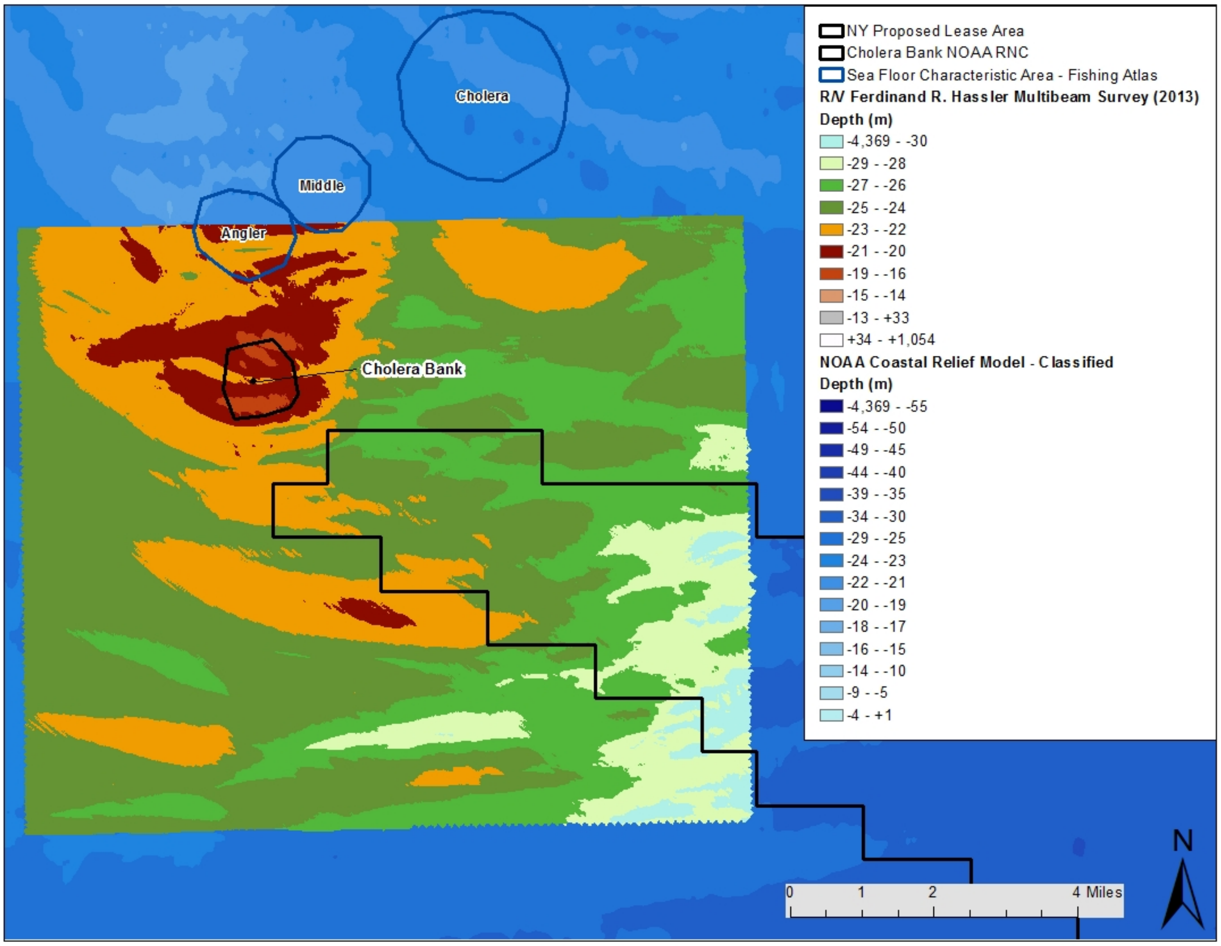
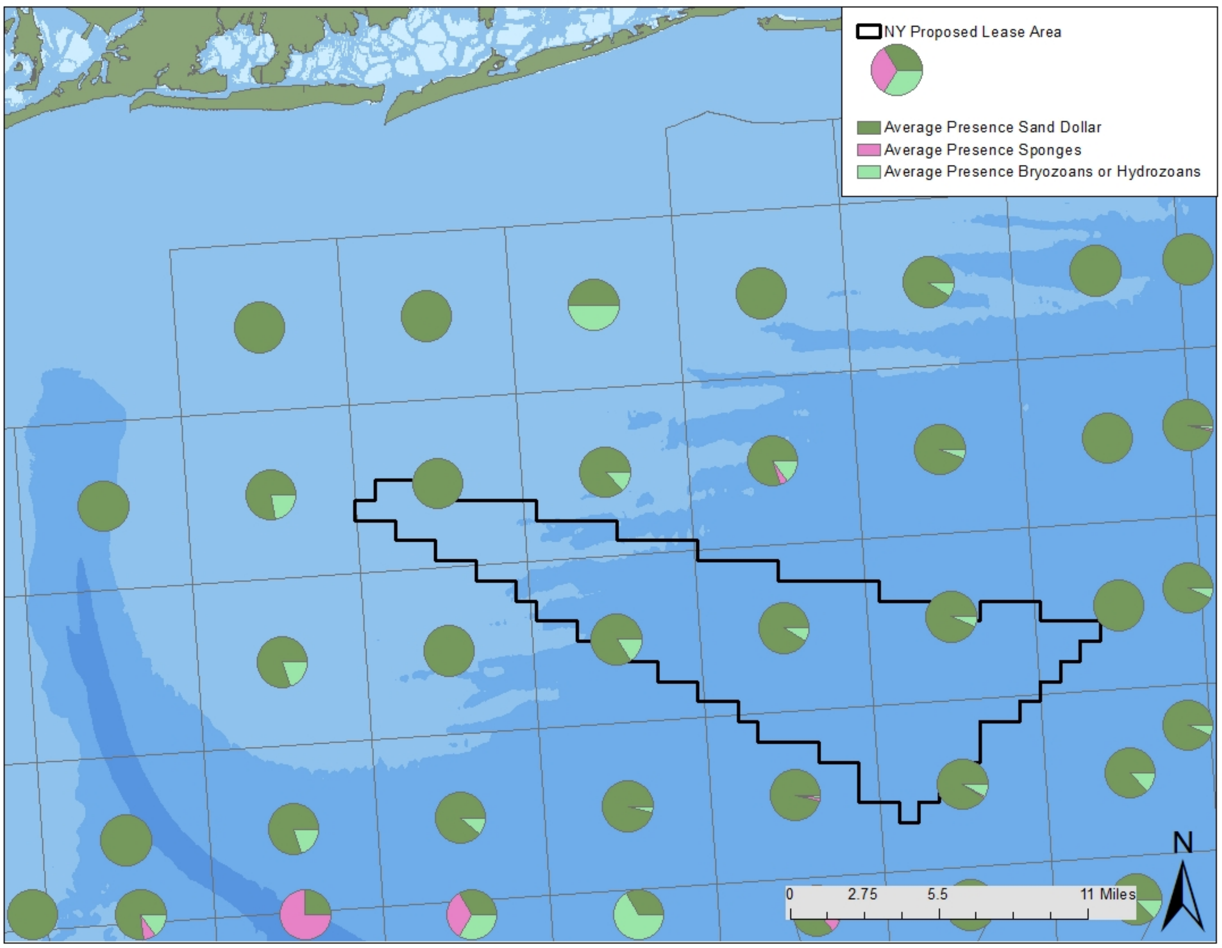


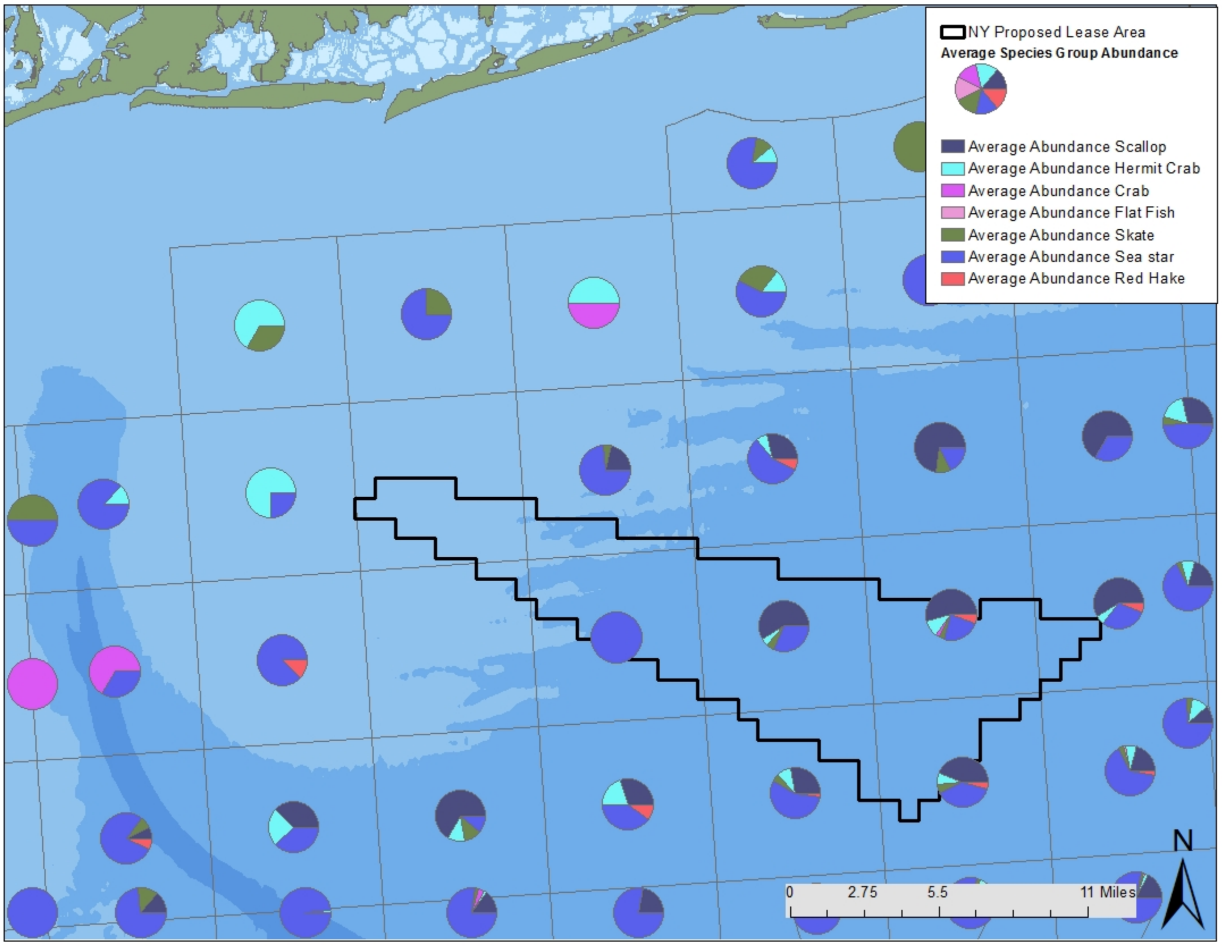
Figure 4-9 Location of Cholera Bank relative to the Proposed Lease Area with Recent Multibeam Bathymetry.

Benthic Habitats and Associated Species

From the mid-1950s to the mid-1960s, the NOAA Northeast Fisheries Science Center (NEFSC) collected roughly 1,000 grab samples of macrobenthic invertebrates from Maine to Long Island, New York (Theroux & Wigley, 1998). Within the Southern New England Shelf region (the area in which the WEA is located), the average number of individuals per square meter (roughly 11 ft^2) was 2,382, and the average net weight per square meter was 9.42 ounces (267 grams). These values were the highest among the six geographic regions defined. By number of specimens, samples within this region were dominated by crustaceans, followed by annelids, mollusks, and echinoderms. However, by weight, samples within this region were heavily dominated by mollusks. Sand sediments harbored the highest density and biomass of organisms.

The Nature Conservancy (TNC) analyzed ten years (2003–2012) of data from the University of Massachusetts School for Marine Science and Technology (SMAST) scallop video survey to identify benthic fauna across the Northeast ocean shelf. For each species group with abundance (count) data, the project team compiled average distribution data layers illustrating the total abundance for each taxa (Figure 4–10a). Abundance data was available for sea stars, scallops, hermit crabs, skates, red hake, moon snails, crabs, and flatfishes. For the remaining groups (bryozoans and hydrozoans, sand dollars, sponges, and burrowing species), numerical count data was not available, so the data illustrate only presence or absence of these groups (Figure 4–10b). This 10-year dataset shows the dominance of species associated with sandy unconsolidated bottom habitat, primarily sand dollars, sea scallops, and sea stars. Recently researchers have touted the importance of soft-bottom benthic communities in the mid-Atlantic (Kritzer et al. 2016). For instance, the paper noted that, "the substantial area covered by soft sediments combined with their interstitial complexity means that these habitats generate greater overall productivity than is generally appreciated, and should be monitored and managed accordingly."





Figures 4-10(a) & 4-10(b) Benthic fauna average presence and abundance respectively (2003-2012) from The Nature Conservancy (TNC) and the University of Massachusetts School for Marine Science and Technology (SMAST) analysis of scallop video survey data. For each species group with abundance (count) data, the project team compiled average distribution data layers illustrating the total abundance for each taxa (Figure 4–10a). For remaining taxa numerical count data was not available, so the data illustrate only presence or absence of these groups (Figure 4–10b).

Cold Water Corals

Cold water corals (also known as "deep sea" corals), such as sea pens (*Pennatulacea*), hard corals (*Scleractinia*), and soft corals (*Alcyonancea*), are known to inhabit the Atlantic waters offshore New York (Packer & Dorfman, 2012). There are no known locations of cold water/deep sea corals within the proposed lease area. However, there is extremely limited information on the distribution and abundance of these organisms in the northeastern United States. Nonetheless, predictive habitat maps developed by NOAA rank the region occupied by the WEA as "low suitability" habitat for stony corals, soft corals, and sea pens (NCCOS, n.d.). The most suitable habitats for these organisms are generally further offshore, along the continental slope.

Artificial Reefs

Artificial reefs may include shipwrecks or other materials lost at sea, as well as materials intentionally placed to support and enhance habitat or recreational fishing (e.g., tires, subway cars, concrete or steel debris, rock). According to a database compiled by TNC (MARCO, n.d.), there are no artificial reefs within the proposed lease area, but shipwrecks and marine debris are likely present.

Seagrasses

Seagrasses provide habitat and food for a variety of species. They are also protected under a number of state and federal statutes. In New York, *Zostera marina* is the dominant seagrass species and inhabits shallow coastal and estuarine waters in depths ranging from less than 3 ft (1 m) to about 26 ft (8 m) (NYS Seagrass Task Force, 2009), well outside the depth range of the WEA. Furthermore, according to the NOAA/BOEM Marine Cadastre, seagrass beds are not found within or near the proposed lease area (Marine Cadastre, 2015).

Impact Analysis of Alternative A

Although the total area impacted and level of disturbance is anticipated to be minor, BOEM removed from further lease consideration the shoal feature referred to as Cholera Bank. NMFS has determined that the topography of the feature is complex, and thus a sensitive benthic habitat for which bottom disturbing activities should be avoided. Based on the best available bathymetric data for the area, BOEM determined that the top of the bank and slope from the seafloor occupied three BOEM aliquots comprising 1,779 ac. This includes the shallow 19 m top of the shoal, as well as the slope down to an average of about 23 m in depth. Because of the availability of good bathymetry data for Cholera Bank, the area could be defined and removed from lease consideration without the need for additional site characterization data. Seagrasses and purpose-built artificial reefs are not present in the proposed lease area and are therefore not discussed further in this section. Additionally, there are no known locations of stony or soft corals in the proposed lease area, and the seafloor in the proposed lease area is ranked as "low suitability" habitat for these organisms. Hardbottom habitats (e.g., rocky reef communities) may exist in small isolated patches, and data collected during initial remote geophysical surveys would identify possible locations they exist. BOEM would require the lessee to develop and implement avoidance measures near these resources before authorizing activities that would disturb the seafloor, including installation of a meteorological tower. Although sea pens (*Pennatulacea*) are common in soft sediments, the proposed lease area is ranked as "low suitability" habitat for them. Because of their widespread presence in general, sea pens are typically not of concern for biodiversity or ecosystem management (Packer & Dorfman, 2012). Thus, discussion of impacts on benthic resources is limited to other organisms primarily associated with soft-bottom habitats, including annelids, arthropods, mollusks, and echinoderms.

Routine Activities

The main impacts on benthic organisms from routine activities include crushing, or smothering of organisms by anchors and moorings, the scour control system (if employed), and foundation piles for the meteorological tower (if constructed). Larger, mobile benthic organisms (e.g., lobsters, crabs) may be able to avoid lethal impacts but would still experience displacement within the footprint of project-related infrastructure. Additionally, sediment suspension and redistribution during tower or buoy construction/deployment could interfere with the filter-feeding mechanisms of bivalve mollusks (e.g., scallops). Because sonar, sub-bottom profiling, magnetometry, and benthic imaging (e.g., video) involve remote sensing of the seafloor, these site characterization activities would not physically alter the benthos.

Sub-bottom profilers, such as boomers, emit intense sound pulses. There is limited, but growing, data regarding the effect of sound on benthic invertebrates. The few available studies indicate that such pulses have minimal effects on marine invertebrates (Michel et al., 2007). Recently, Australian researchers completed a study evaluating the impact of seismic surveys on scallop resources (Przeslawski et al., 2016). This study evaluated scallop condition after exposure to seismic surveys, including morphology, fatty acid and sterol ratios and found no changes in commercial scallop abundance, mortality, size, condition, or biochemistry that could be attributed to seismic survey operations (Przeslawski et al., 2016).

However, physical sampling methods, such as grab samplers, benthic sleds, bottom cores, deep borings, and CPTs may disturb, injure, or cause mortality to benthic resources in the immediate area sampled. BOEM estimates that approximately 247 sub-bottom samples would be taken by the lessee for site characterization under Alternative A (see Appendix C for geotechnical sampling calculations). The physical bottom sampling footprint for each collection is anticipated to be on the order of 1 ft^2 (0.1 m^2) per sample in surficial area. The recovery of benthic soft-bottom communities from disturbance is discussed in greater detail below. Generally, recovery of soft-bottom benthic environment could take a few months to a few years. However, the impacts of the small footprint of the samples over the entire NY proposed lease area is not expected to result in the loss of any species diversity or ecosystem function. Thus, benthic impacts from site characterization activities are expected to be **minor**.

The area of sea bottom covered by a meteorological tower foundation, which is expected to range from 200 to 2,000 ft^2 (18.6–186 m^2; Table 3–6) depending on the type of foundation selected, would result in direct removal of benthic organisms and substrate. If scour control systems for the foundation are installed, they would affect up to an estimated 16,000 ft^2 (1,486 m^2) for rock armor and 7,800 ft^2 (725 m^2) for artificial seagrass mats. If scour control systems are not installed and scouring occurs, the area of benthic habitat affected by scour is expected to be similar to or slightly larger than the areas affected by a scour control system. Together, the area of seabed potentially affected as a result of the tower foundation and scour control system, or the scour area if no scour control system is installed, is a maximum of about 26,000 ft^2 (2,415 m^2), which is less than 0.001 percent of the proposed lease area. Note that this number does not take into account the area of the seabed potentially affected by the anchoring of support vessels. This anchoring would occur sporadically within a radius of approximately 1,500 ft (457 m) around the foundation site. The resulting area affected would be about 0.2 percent of the total proposed lease area. A small area beyond the footprint of the scour control mats may be affected by sediments suspended during mat installation. Thus, benthic impacts from meteorological tower installation are expected to be **minor**.

A spar-type buoy is estimated to disturb a maximum of 1,268 ft^2 (118 m^2) of seafloor between its clump anchor and mooring chain. Anchors for boat-shaped or discus-shaped buoys are assumed to have a sweep of about 370,260 ft^2 (34,398 m^2), which is about 0.01 percent of the WEA. Note that the anchor cable would not make complete contact with all areas of the bottom within its sweep. Thus, benthic impacts from buoy installation and operation are expected to be **minor**.

Tower decommissioning activities would include non-explosive severing methods and the removal of scour mats by divers or ROV. Removal would result in the suspension of sediments that were trapped in the mats and would affect the same area of the seafloor as when the mats were installed, with a small additional area affected by deposition of resuspended sediments. Resuspended sediment would temporarily interfere with filter feeding organisms until the sediment resettles. The duration of sediment suspension would depend on ocean currents and sediment grain size but is anticipated to be short-lived due to the predominantly sandy composition of the seafloor in the area. Benthic impacts from tower decommissioning are expected to be **minor**.

Decommissioning of buoys is not expected to result in adverse impacts on benthic resources. A decommissioning report for a research spar buoy deployed offshore New Jersey in 2015 states that after the buoy platform, mast, weights, and base were lifted to the surface by crane, a diver was able to remove all bottom debris (e.g., plastic sheeting, straps) introduced by the lessee’s operations and return the seafloor to its original state (GSOE, 2015). Thus, benthic impacts from buoy decommissioning are expected to be **negligible**.

Benthic soft-bottom communities that are affected by routine activities would take some time to recover. Generally, recovery times vary depending on species density and diversity, as well as the size of the disturbed area. BOEM (2012b) cites one to three years for benthic communities to recover from meteorological platform installation (though the benthic communities directly under the tower pilings and scour mats would not recover until after decommissioning). Brooks et al. (2006) note a recovery time of three months to two and a half years after disturbance linked to sediment removal, based on a synthesis of a limited number of existing studies. However, the area affected by physical site characterization activities (e.g., grabs, cores) is very small, on the order of 1 ft^2 (0.1 m^2) per sample. Thus, organisms from adjacent, unaffected sediments would simply migrate to the location where a grab or core had been taken, resulting in rapid recovery. For instance, Lindholm et al. (2004) found that sandy areas in water depths up to 197 ft (60 m) were characterized as mobile sand, influenced by tide and storm-driven currents, which regularly alter the microtopography of the bottom.

Sandy substrates are less stable than silt/clay substrates, and the benthic macrofauna consists mainly of opportunistic species that have rapid dispersal and high reproductive rates that allow them to colonize disturbed sediments rapidly (Grassle & Sanders, 1973). The macrobenthos in the Middle Atlantic continental shelf region is dominated by opportunistic species (Boesch et al., 1977; Port Liberty License Application, 2012). The recolonization of disturbed areas by opportunistic species has been reported many times since Grassle and Sanders (1973) (Thrush &

Dayton, 2002; Ray, 2001; Kaiser et al., 1998; Thistle, 1981). Lindholm et al. (2004) concluded that mobile sand habitats that experience natural movement are able to recover in a relatively short timeframe (less than 1 year). Blake et al. (1996) reported that in a sandy substrate, epibenthic surveys pre- and post-dredge were very similar because of the dynamic nature of sand and the low species diversity. Kritzer et al. (2016) supports the conclusion that soft-bottom habitats are generally more available that other habitat types, and have an inherent ability to recover more rapidly than other substrates, but that they should not be overlooked from the perspective of biological productivity.

Not all effects from the introduction of meteorological structures in the benthic environment would be adverse. For example, foundation structures would increase the hard surface available to support certain benthic organisms that prefer structured and hardbottom habitats, similar to an artificial reef. Michel et al. (2007) note that the composition of this "fouling community" (e.g., mussels, barnacles, algae, other encrusting organisms) would be very different from that of the original soft-bottom community. Furthermore, scour mats can provide habitat to marine organisms that settle into the stabilized sediment trapped therein. Therefore, over time, some of the total area covered by the mats might recover to some degree even prior to decommissioning and removal.

While none of the benthic invertebrates discussed in this section are listed under the ESA, some of these invertebrates are prey items for listed species (e.g., whales, sea turtles). Thus, impacts to benthic resources may alter the diet composition of these ESA-listed species. However, because the amount of benthic habitat affected by routine activities would be extremely small relative to the available foraging habitat in the WEA and mid-Atlantic, any effects to listed species resulting from benthic disturbance would be **negligible** (NMFS, 2013a).

Non-Routine Events

Non-routine events that could potentially have benthic impacts include spills from collisions/allisions and generator refueling operations. The material most likely to be spilled is diesel fuel, which is lighter than water and would float on the water surface or be dispersed by wave action into the water column. Dispersion down to the seafloor would be extremely unlikely. Because diesel oil does not contain the heavier, more persistent components found in crude oil, it would be expected to dissipate rapidly in the environment (MMS, 2007a), and therefore have no impact on the benthic community. Thus, benthic impacts from non-routine events are expected to be **negligible**.

Conclusion

Overall, impacts to benthic organisms and habitats would be **minor**. Impacts of routine activities including site characterization surveys and construction, operation, and removal of a meteorological tower and/or buoys on benthic communities would be minor, with the exception of buoy decommissioning and removal, which would have negligible impacts. Impacts to Cholera Bank have been avoided through the removal of five aliquots from consideration for leasing. Primary effects of routine activities would be crushing and smothering by anchors, moorings, driven piles, and scour control equipment. These impacts would be limited to the immediate footprint of the infrastructure. The maximum area affected would be less than 0.001 percent of the proposed lease area for tower-related activities and about 0.01 percent of the WEA for buoy-related activities. The recovery of affected soft-bottom communities to pre-disturbance levels is expected to take between a few months to three years, depending on the degree of impact and specific composition of the benthic community. BOEM would require a lessee to incorporate avoidance measures before physical sampling and tower and/or buoy installation near any hardbottom communities identified during geophysical surveying.

Impacts to benthic communities from non-routine events are limited to those associated with diesel spills. Given the low likelihood of spills and extremely low likelihood of diesel reaching the seafloor in the event of a spill, impacts from non-routine events would be negligible.

4.4.2.4 Coastal Habitats

Description of the Affected Environment

The *PEIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf* (MMS, 2007a) includes a general description of the affected environment for coastal habitats along the entire Atlantic coast, and is hereby incorporated by reference and summarized here. The proposed lease area is located offshore of the Atlantic coastal plain. This plain is a flat stretch of land that borders the Atlantic Ocean for approximately 2,200 mi (3,541 km) from Cape Cod through the southeast United States. The coastal resources of the New York and New Jersey shorelines include sandy beaches, coarse-grained beaches, cliffs, shellfish beds in tidal flats, seagrass beds, coastal dune systems, barrier island forests, and salt and freshwater marshes. These habitats and the species present within them are described in detail in the aforementioned PEIS (MMS, 2007a). Descriptions of site-specific coastal habitats present near the proposed lease area are included below.

New York has 120 mi (193 km) of coastline bordering the Atlantic Ocean between Coney Island and Montauk (Tanski, 2012). Most of the ocean-facing barrier islands along the south shore of Long Island consist of fine-to-medium grained sand beaches, solid manmade structures (e.g., docks, marinas, jetties, seawalls), and rip-rap (ESI, 2009). North-facing shores of the barrier islands border the Great South Bay and consist of tidal flats and tidal/brackish wetlands, while the interior of the islands comprise pockets of freshwater marshes, swamps, and scrub-shrub wetlands (ESI, 2009). Further west and deeper into the New York-New Jersey harbor, the shoreline is composed of rocky, exposed cliffs, man-made structures, and coarse-grained sand and gravel beaches, with fewer scattered tidal flats, eroding scarps, and saltwater marshes (ESI, 2001). Within the harbor, the Port of New York-New Jersey is the largest container port on the East Coast (USDOT, 2010).

New Jersey has 127 mi (204 km) of oceanfront shoreline, much of which is densely populated; however, about 31 mi (50 km) of non-contiguous shoreline between Sandy Hook and Cape May Point has no man-made barriers between land and water (Stockton University, 2015). New Jersey contains over 300,000 ac (121,400 ha) of tidal wetlands and over 1.5 million shorebirds use Cape May Point as a migratory stopover (NJDEP, 2002). In northern New Jersey, much of the shoreline around Raritan Bay is composed of coarse-grained beaches, mixed-sand and gravel, rip-rap, exposed tidal flats, as well as both salt/brackish and freshwater marshes. Sandy Hook is composed of fine- to medium-grained sand beaches, which extend south along most of the ocean-facing shoreline, along with exposed rocky cliffs and rip-rap (ESI, 2001).

The *National Coastal Condition Report IV* (EPA, 2012) summarizes the conditions of U. S. coastal waters based on EPA National Coastal Assessment data and USFWS National Wetland Inventory Status and Trends data from 2003 through 2006. The Northeast Coast region, which includes the New York and New Jersey coasts, has an overall condition rated fair. This overall condition is based on five indices, including water quality, sediment quality, benthic habitat, coastal habitat, and fish tissue contaminants. The coastal habitat index summarizes the health of coastal wetland habitats such as salt and brackish marshes, mangroves, intertidal oyster reefs, and tidal flats. Although the coastal habitat index for the Northeast is rated good to fair, the 2012 National Coastal Condition Report did not evaluate data more recent than the year 2000. Coastal wetlands along the New York and New Jersey coasts have been lost through land subsidence, sea-level rise, and exotic species impacts (EPA, 2012).

Impact Analysis of Alternative A

The proposed lease area is located approximately 12 nm (22 km) south of Long Island, New York, and 16 nm (30 km) east of New Jersey, and extends in a southeasterly direction away from shore for approximately 26 nm (48 km). Given the distance from shore, vessel traffic from site characterization surveys and site assessment activities would have no direct impacts on coastal habitats. Only nearshore vessel traffic and use of coastal facilities have the potential to affect coastal habitats in heavily used port areas.

Routine Activities

BOEM anticipates a range of between approximately 350 and 1,000 vessel round trips to conduct routine activities in the proposed lease area over approximately five to seven years, primarily during the months of April to August. These trips would be split between ports in New York and New Jersey. No expansion of these ports is expected in support of the proposed action, and the specific ports used by a lessee in the future would be determined primarily by proximity to the lease area and capacity to handle proposed activities.

Indirect impacts from routine activities may include wake erosion and increased turbidity caused by nearshore vessel traffic. Given that the Port of New York and New Jersey is the largest port on the East Coast and the third-largest port in the nation (Port Authority of New York and New Jersey, 2015), there would be a **negligible** increase, if any, to wake-induced erosion of channels or increases in turbidity based on the relatively small size and number of vessels associated with Alternative A. Because these ports handled over three million cargo containers in 2014, any coastal erosion from increased vessel traffic would likely be mitigated by preventive measures already in place. Although barrier beaches near smaller ports could be vulnerable to increased wake erosion and nearshore coastal habitats could experience increased levels of turbidity, the small number of vessel trips associated with Alternative A would have **negligible** impacts, if any.

Non-Routine Events

Non-routine events that could potentially affect coastal habitats include storms, vessel collisions/allisions, and spills/releases of contaminants. Major storms, nor’easters, and hurricanes pass through the region regularly and can cause storm surge and wave heights that impact coastal habitats. Although vessel collisions/allisions are unlikely, if a vessel collision/allision were to occur and result in a spill, the most likely pollutant would be diesel fuel, and the average spill size would be small (88 gallons [333 liters]) (Section 3.3.3 *Spills*). Diesel dissipates rapidly in the water column, then evaporates and biodegrades within a few days (MMS, 2007a); therefore, given the distance of the proposed lease area from shore, BOEM anticipates that there would be **negligible** impacts to coastal habitats from a spill.

Conclusion

Overall, impacts on coastal habitats would be **negligible**. Given the distance of the proposed lease area from shore, no expansion of existing facilities is expected, lessees would use existing ports, and the amount of vessel traffic associated with the proposed action would be minor compared to existing levels of traffic. No direct impacts on coastal habitats are anticipated from routine activities associated with site characterization and site assessment, or from non-routine events in the proposed lease area. Indirect impacts from routine activities would be negligible.

4.4.2.5 Marine Mammals

Description of the Affected Environment

There are 31 species of marine mammals that occur in the New York Bight. These 31 species include the following:

- 6 mysticetes (baleen whales; four federally endangered),
- 21 odontocetes (toothed whales including dolphins, a porpoise, beaked whales, dwarf and pygmy sperm whales, and federally endangered sperm whales), and
- 4 pinnipeds (seals).

The following extralimital species have also been reported in the New York Bight: beluga whale (*Delphinapterus leucas*), ringed seal (*Phoca hispida*), and West Indian manatee, Florida subspecies (*Trichechus manatus latirostris*). Sightings of these three species represent relatively rare encounters with individuals that are outside of their typical geographic range. These species are not discussed further in this EA.

Sightings data for species most commonly reported in the New York Bight, along with data treatment and preparation methods for handling those data, are presented in Appendix E. Details regarding abundance estimates, life history, hearing abilities, and foraging behavior for these species in general can be found in BOEM (2011c), the G&G Final PEIS (BOEM 2014a), and Waring et al. (2015), which are incorporated by reference herein.

In addition, there are several relatively new reports specific to offshore energy planning and marine mammals occurring in New York on the following topics: marine mammal and sea turtle distribution off Long Island, NY, NARW occurrence off New Jersey from visual and acoustic surveys, cetacean and sea turtle distribution in the New York offshore planning area, baseline monitoring for large whales in the New York offshore planning area, and distribution and habitat use for the six cetacean species of the greatest conservation need (Kenney & Vigness-Raposa, 2010; Lagueux et al., 2010; Whitt et al., 2013; NYDOS, 2013; Schlesinger & Bonacci, 2014; NYSDEC, 2015a).

The endangered NARW is the rarest whale in the western North Atlantic, with an estimated population of at least 465 individuals in this region (Waring et al., 2015). Because of potential impacts to this species from the proposed action, this EA includes an analysis of the existing conditions in the action area with respect to the presence of the NARW.

<u>Non-ESA-Listed Marine Mammals</u>

Twenty-five species of marine mammals that occur in the New York Bight are not listed under the ESA (4). These species are not listed as threatened or endangered under the ESA, but are offered protections under the MMPA. Five of these non-listed species are likely to occur in the action area: humpback whales, harbor porpoises, short-beaked common dolphins, Atlantic white-sided dolphins, and bottlenose dolphins (Right Whale Consortium, 2015; Kenney & Vigness-Raposa, 2010; Lageaux et al., 2010; Appendix E). Sightings data indicate the following patterns of occurrence for these species in the action area: Atlantic white-sided dolphins in the fall, short-beaked common dolphins in the spring, and bottlenose dolphins in the fall and to a lesser extent in the winter (Right Whale Consortium 2015; Appendix E). Harbor porpoise occur in the action area in relatively lower densities during the winter (Right Whale Consortium 2015; Kenney & Vigness-Raposa, 2010; Lageaux et al., 2010; Appendix E). Seals are very difficult to sight and identify at sea, with the only visible target being their head above the surface (Kenney & Vigness-Raposa, 2010). Nonetheless, stranding reports indicate that four species of seals may occur in the New York Bight: harp, harbor, grey, and hooded seals (RFMRP, 2015). Stranding records for New York from 1980 to 2013 indicate these four seal species have been a regular component of the regional marine mammal fauna (hooded seal, n = 117; gray seal, n = 434; harp seal, n = 904; and harbor seal, n = 707; RFMRP, 2015). The remaining 16 non-listed marine mammal species occur farther offshore or are considered accidental or rare and are not likely to occur in the action area.

Table 4–4
Non-ESA Listed Marine Mammals that Occur in the New York Bight

Common Name	Scientific Name	Federal Status	Potential to Occur in the Action Area
Mysticetes			
Humpback whale, West Indies distinct population segment	*Megaptera novaeangliae*	MMPA	Common; may be found in groups generally within continental shelf waters in spring, summer, early winter and fall;(1) abundance in the area may vary from year to year; occasionally observed in New York Harbor and surrounding shore
Common minke whale	*Balaenoptera acutorostrata*	MMPA	May occur year-round in continental shelf waters
Odontocetes			
Atlantic spotted dolphin	*Stenella frontalis*	MMPA	Rarely sighted near or beyond the shelf break; one confirmed stranding in New York in the 1980s
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	MMPA	May occur year-round; peak in the fall(1)
Bottlenose dolphin	*Tursiops truncatus*	Western North Atlantic coastal morphotype (northern migratory stock), MMPA Depleted	May occur during the summer.
		Western North Atlantic offshore stock, MMPA	May occur year-round.
Dwarf sperm whale	*Kogia sima*	MMPA	May occur in deep continental shelf waters. Strandings in the area have occurred rarely.

Common Name	Scientific Name	Federal Status	Potential to Occur in the Action Area
False killer whale	*Pseudorca crassidens*	MMPA	Accidental; may occur very rarely, typically beyond the shelf break.
Killer whale	*Orcinus orca*	MMPA	Uncommon or rare.
Long-finned pilot whale	*Globicephala melas*	MMPA	May occur primarily on the shelf break year-round.
Pan-tropical spotted dolphin	*Stenella attenuata*	MMPA	Rarely sighted near or beyond the shelf break; two confirmed strandings in New York in the 1980s.
Pygmy sperm whale	*Kogia breviceps*	MMPA	May occur in deep continental shelf waters. Strandings in the area have occurred throughout the year.
Risso's dolphin	*Grampus griseus*	MMPA	May occur primarily on the shelf year-round.
Short-beaked common dolphin	*Delphinus delphis*	MMPA	May occur year-round with peak in the winter and spring.(1)
Short-finned pilot whale	*Globicephala macrorhynchus*	MMPA	May occur primarily on the shelf break year-round.
Striped dolphin	*Stenella coeruleoalba*	MMPA	May occur near and beyond shelf edge year-round.
White-beaked dolphin	*Lagenorhynchus albirostris*	MMPA	Rare in southeastern New England; rare sightings at the shelf break near Hudson Canyon.
Harbor porpoise	*Phocoena phocoena*	MMPA	May occur year-round, peak in spring and winter.(1)
Blainville's beaked whale	*Mesoplodon densirostris*	MMPA	Rare near shelf break; seasonality is poorly known, but sightings have been recorded in spring or summer. Strandings in New England scattered throughout the year.
Cuvier's beaked whale	*Ziphius cavirostris*	MMPA	Rare near shelf break; seasonality is poorly known, but sightings have been recorded in spring or summer. Strandings in New England scattered throughout the year.
Gervais' beaked whale	*Mesoplodon europaeus*	MMPA	Rare near shelf break, seasonality is poorly known, but sightings have been recorded in spring or summer. Strandings in New England scattered throughout the year.
Sowerby's beaked whale	*Mesoplodon bidens*	MMPA	Rare near shelf break; seasonality is poorly known, but sightings have been recorded in spring or summer. Strandings in New England scattered throughout the year.

Common Name	Scientific Name	Federal Status	Potential to Occur in the Action Area
True's beaked whale	*Mesoplodon mirus*	MMPA	Rare near shelf break; seasonality is poorly known, but sightings have been recorded in spring or summer. Strandings in New England scattered throughout the year.
Pinnipeds			
Gray seal	*Halichoerus grypus*	MMPA	Sightings and/or strandings have occurred year-round on Long Island, NY, mainly in winter and spring.
Harbor seal	*Phoca vitulina*	MMPA	May occur from September through May; small numbers occur year-round on Long Island and Connecticut.
Harp seal	*Pagophilus groenlandicus*	MMPA	Sightings and/or strandings have occurred year-round on Long Island, NY, mainly in winter and spring
Hooded seal	*Cystophora cristata*	MMPA	Rare; sightings and/or strandings have occurred year-round on Long Island, NY.

(1) Occurrence reported in the Right Whale Consortium (2015) database.

MMPA = Marine Mammal Protection Act

ESA-Listed Marine Mammals

The ESA-listed marine mammal species that occur in the New York Bight include five large whale species (fin, sei, North Atlantic right, blue, and sperm whales) (Table 4–5). Sperm, blue, and sei whales that are sighted in the New York Bight are generally found farther offshore and/or near the shelf edge (Kenney & Vigness-Raposa, 2010; Right Whale Consortium, 2015). Thus, these species are not expected to occur in the action area. Only two listed species, fin and NARW, are likely to occur in the action area (Right Whale Consortium, 2015). Sightings per unit effort (SPUE) results for large baleen whales in the vicinity of the WEA (fin, humpback, and NARW combined) indicate that while baleen whales are not expected to be particularly common, they could occur in the action area at any time during the year (Figure 4-11).

Table 4–5
ESA-Listed Marine Mammals that Occur in the New York Bight

Common Name	Scientific Name	Federal Status	Potential to Occur in the Action Area
Blue whale	*Balaenoptera musculus musculus*	Endangered	Rare, Occurrence not well known, but primarily deep water, unknown seasonality
Fin whale	*Balaenoptera physalus*	Endangered	Most common; may be found in groups throughout NY Bight year-round
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Uncommon but regularly observed year round; primarily coastal, migratory, but may also may be foraging
Sei whale	*Balaenoptera borealis*	Endangered	Rare, primarily found near the continental shelf edge; unknown seasonal occurrence
Sperm whale	*Physeter macrocephalus*	Endangered	Rare, primarily found on the continental shelf, but also near Montauk Point; cows and calves regularly sighted in NY Bight; unknown seasonal occurrence

Source: USFWS, 1997; BOEM, 2011c; Whitt et al., 2013; Schlesinger & Bonacci, 2014; Right Whale Consortium, 2015; Waring et al., 2015

(1) Occurrence reported in the Right Whale Consortium (2015) database.

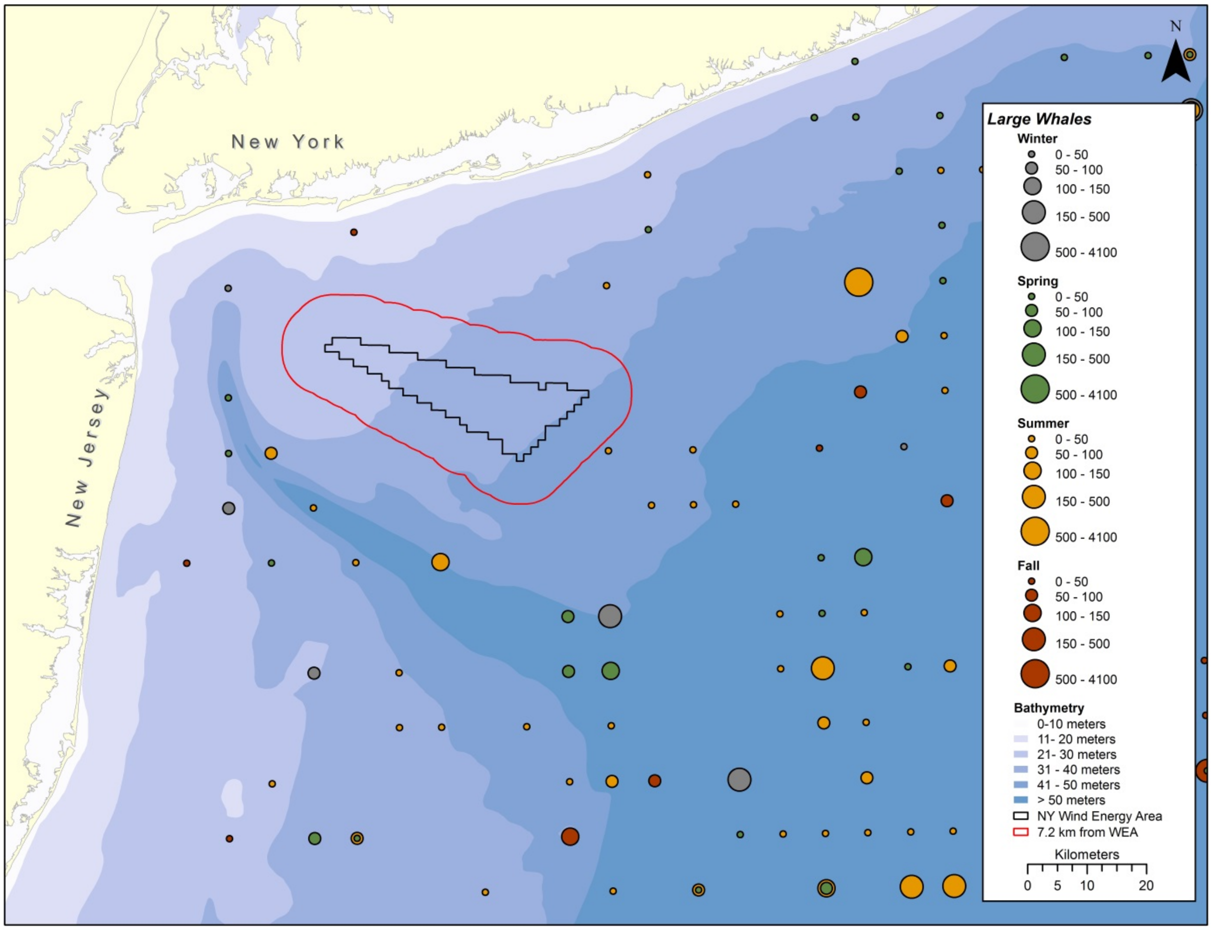


Figure 4-11 SPUE (whales per 621 mi [1,000 km] surveyed) for Large Whales in the Vicinity of the WEA from 1979 through 2014

Source: Right Whale Consortium, 2015 (map prepared by Normandeau Associates, Inc.)

NMFS reclassified humpback whale populations and de-listed the West Indies DPS of humpback whales on September 8, 2016 (81 FR 62018).

Fin whales are the most abundant endangered whale in the area, and may be found in the vicinity of the WEA during the summer, and in nearby inshore waters in all seasons (Figures E–3 and E–4 in Appendix E), although higher densities of fin whales generally occur offshore of the New York Bight (Roberts et al., 2016). Raw sightings data for NARW and fin whales (Figures E–1 through E–3 in Appendix E) indicate that these species may occur in the action area more regularly than the SPUE data suggest. For example, raw sightings data (Right Whale Consortium, 2015) (Figure E–2 in Appendix E) indicated that the West Indies distinct population segment (DPS) of humpback whales have occurred in the area during the spring, summer, fall, and winter, while the map presenting SPUE data indicated their occurrence only during fall and spring (Figure E–5 in Appendix E). This is because the SPUE analysis relies on a more limited dataset of sightings that is corrected for effort in order to standardize data for analysis and comparison with other datasets that have differing amounts of survey effort. The raw sightings data is not corrected for effort and reflects all visual detections of the relevant species.

In order to address the challenges with the SPUE and raw sightings data, Roberts et al. (2016) integrated 23 years of aerial and shipboard cetacean surveys, linked them to environmental covariates obtained from remote sensing and ocean models, and built habitat-based density models for 26 species and 3 multi-species guilds using distant sampling methodology. In the Atlantic, for 11 well-known species, including NARW and fin whales, model predictions resembled seasonal movement patterns previously suggested in the literature and monthly mean density maps were produced for these species (http://www.northeastoceandata.org/data-explorer/?marine-mammals-and-sea-turtles).

North Atlantic Right Whale

The NARW is the most endangered whale in the North Atlantic. The detection of only one whale in a management area is enough to trigger management protocols. For management purposes, determining whether the whales are present in an area is a priority over abundance information, particularly regarding vessel strikes (Clark et al., 2010). NARWs are known to migrate through the New York Bight from November 1 through April 30. However, results from passive acoustic surveys offshore New York and New Jersey (Cornell, 2010; Whitt et al., 2013) and raw sightings data (Figure 4–12) suggest that this species may occur in the action area during all seasons.

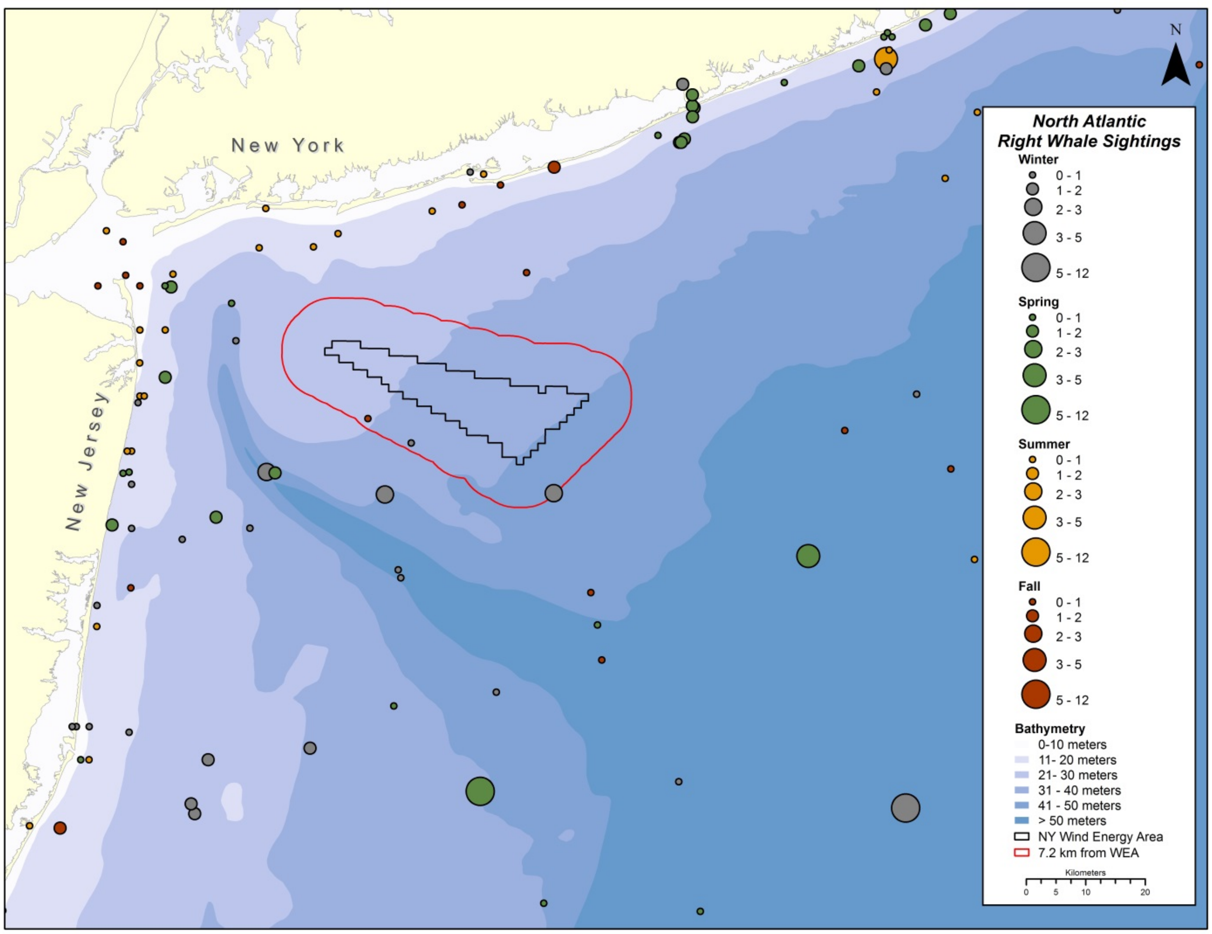


Figure 4-12 Raw Sightings for North Atlantic Right Whales in the Vicinity of the WEA from 1979 through 2014

Source: Right Whale Consortium, 2015 (map prepared by Normandeau Associates, Inc.)

Seasonal occurrence patterns and the spatial distribution of NARW sightings are illustrated by maps of both the raw sightings data and the SPUE data for this species (Figure 4–12, Figure 4–13, and Figure E–1 in Appendix E). The raw sightings data provide the most comprehensive record of sightings available since they include sightings reported by a wide variety of groups and individuals including federal agencies, mariners, commercial fisherman, whale-watch operators, and recreational boaters. In contrast, the SPUE data provide a more rigorous, effort-corrected assessment of occurrence and distribution, based on a subset of the raw sightings data for which effort was recorded. A detailed description of the differences between these data types is provided in Appendix E.

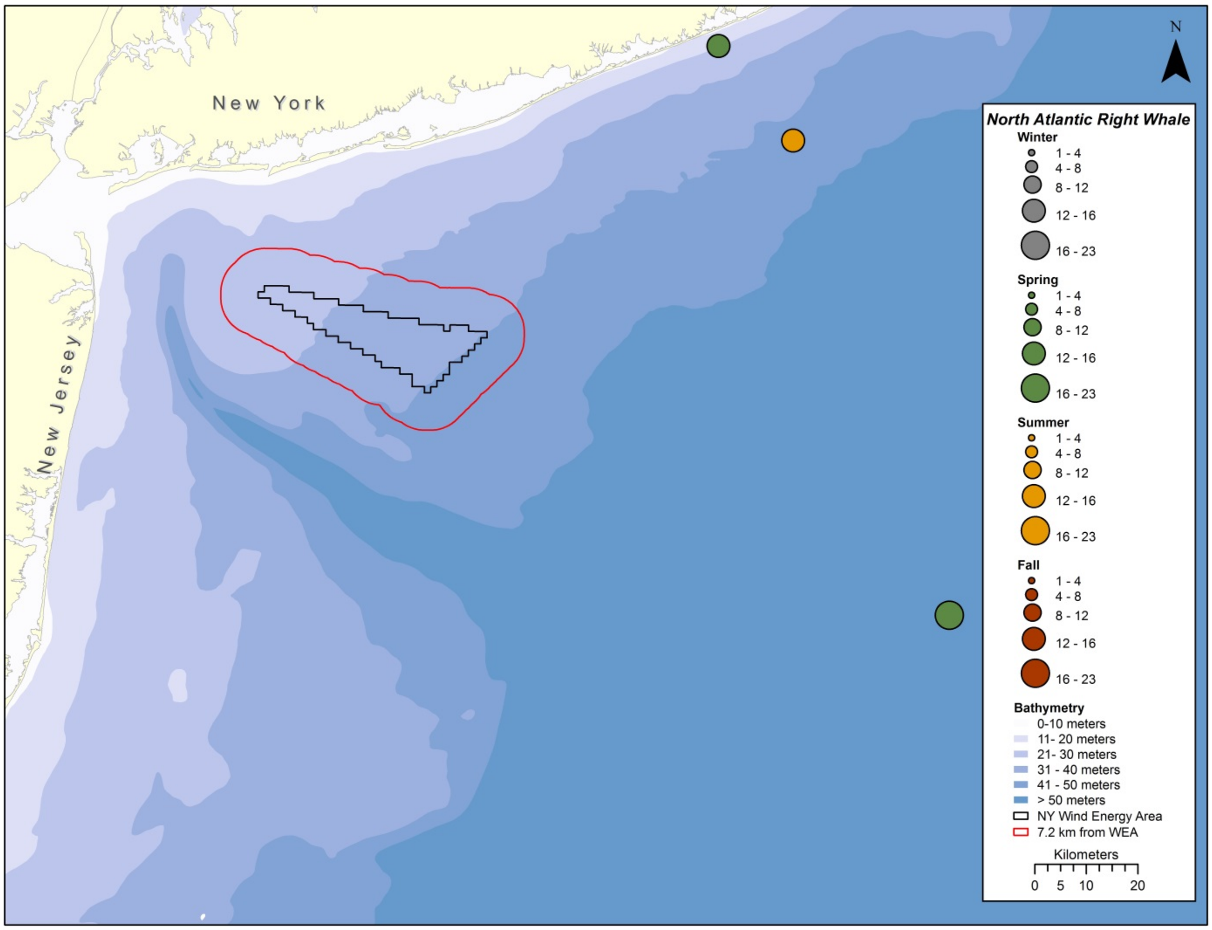


Figure 4-13 SPUE (whales per 621 mi [1,000 km] surveyed) for North Atlantic Right Whales in the Vicinity of the WEA from 1979 through 2014

Source: Right Whale Consortium, 2015 (map prepared by Normandeau Associates, Inc.)

The raw sightings data indicate that NARWs may occur in relatively low numbers in the action area in all seasons, while the SPUE data only indicate right whale occurrence in three blocks: two in the spring and one in the summer (Right Whale Consortium, 2015). Coincidentally, those three non-zero SPUE values were derived from one sighting each—one whale nearshore and two whales farther offshore in spring and one whale in summer (Figure 4–13) (Right Whale Consortium, 2015). Within the sightings dataset, this species occurred in the action area during all seasons (Appendix E; Right Whale Consortium, 2015). Part of the inconsistency between these two maps is because this species is more difficult to observe when migrating compared to when the whales are skim-feeding or socializing at the surface (Hain et al., 1999; Clark et al., 2010). Hain et al. (1999) concluded that diving behavior and time submerged were the principal factors affecting observability in the calving ground. Additionally, a higher percentage of whales are likely to be observed when whales remain in the survey area for extended periods, in good weather, and when multiple flights are flown. When animals are transitory, the weather is poor, and/or single flights are flown, many whales will be missed (Hain et al., 1999). Because of these factors, the distribution of NARWs in the vicinity of the WEA gleaned from both SPUE and opportunistic sightings data should be considered conservatively low. However, model predictions by Roberts et al. (2016) resembled seasonal movement patterns previously suggested in the literature and monthly mean density maps were produced (Figures 4–14a-c). These maps provide more spatiotemporally comprehensive results, at finer temporal resolution, compared to previous habitat-based cetacean modeling efforts and indicate that NARWs generally occur in low densities (0.03-0.33 individuals/100 km^2) in the New York lease area. Seasonally, NARWs are closer to the coast and surrounds during November to April, moving further offshore in May and June, then congregating in the northern feedings grounds from July to September, with October signaling the start of the southward migration (Figures 4–14a-c).

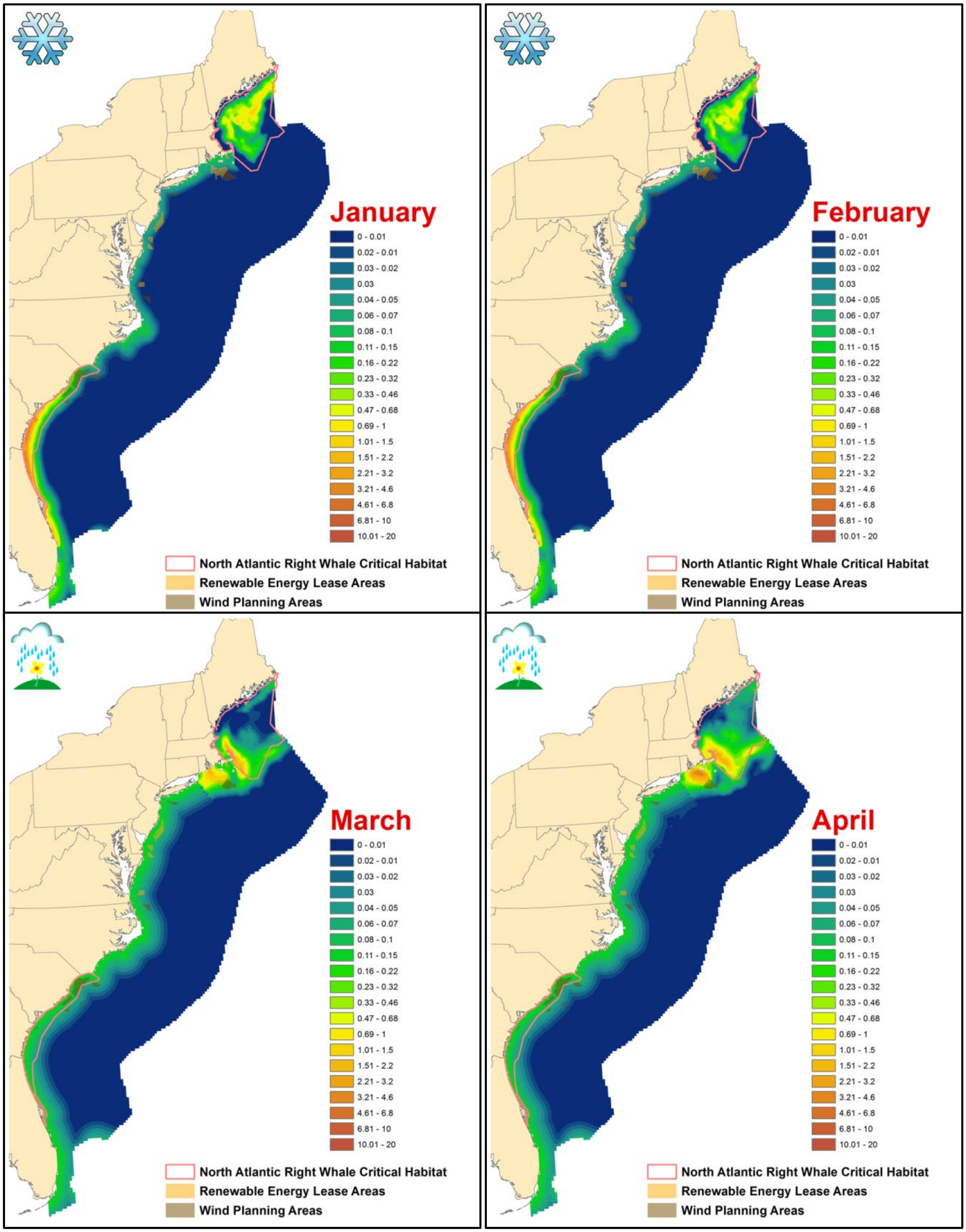


Figure 4-14(a) Predicted distribution and mean densities (individuals/100 km^2) of North Atlantic right whales during January to April along the US Atlantic coast (http://www.northeastoceandata.org/data-explorer/?marine-mammals-and-sea-turtles)

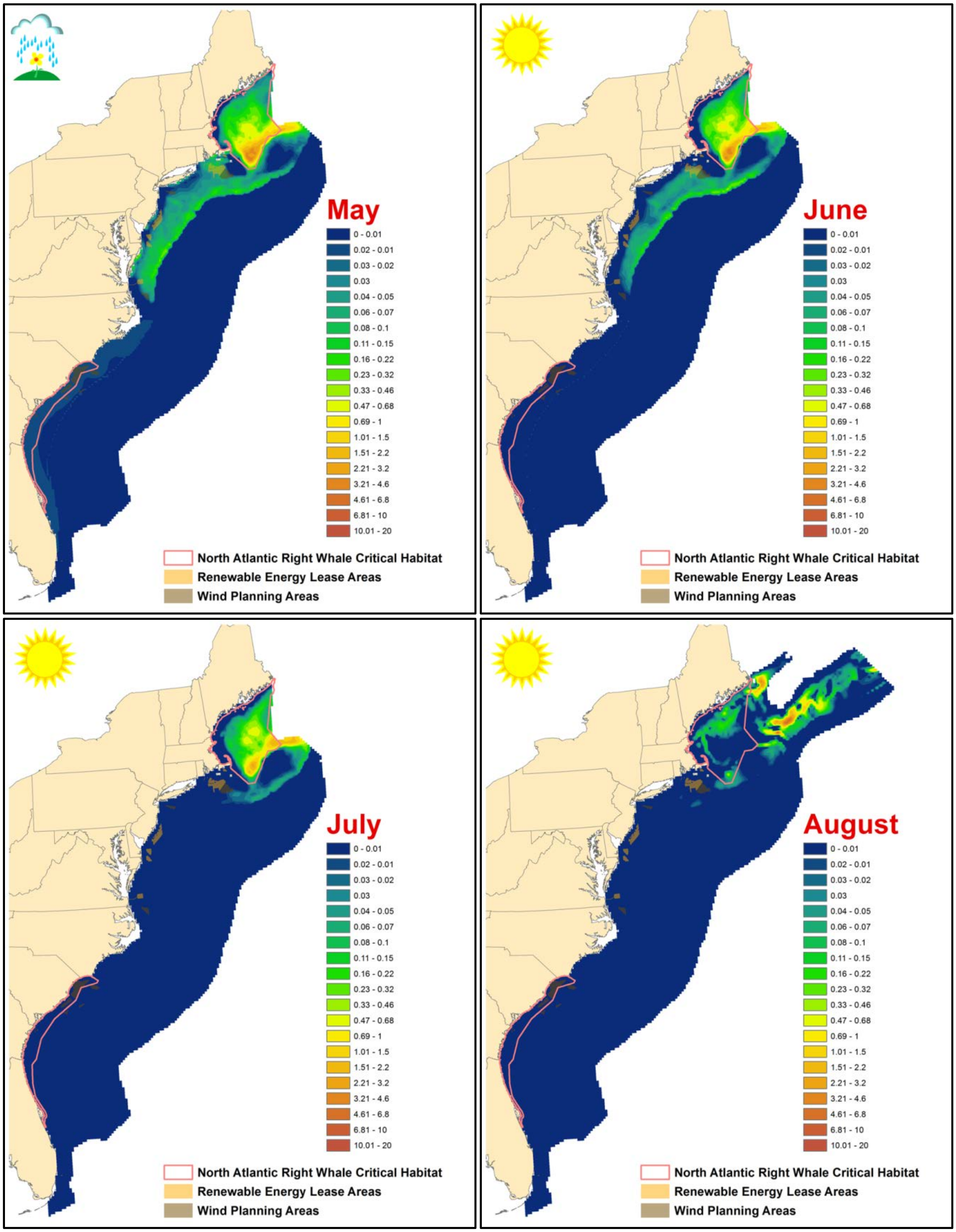


Figure 4-14(b) Predicted distribution and mean densities (individuals/100 km^2) of North Atlantic right whales during May to August along the US Atlantic coast (http://www.northeastoceandata.org/data-explorer/?marine-mammals-and-sea-turtles)

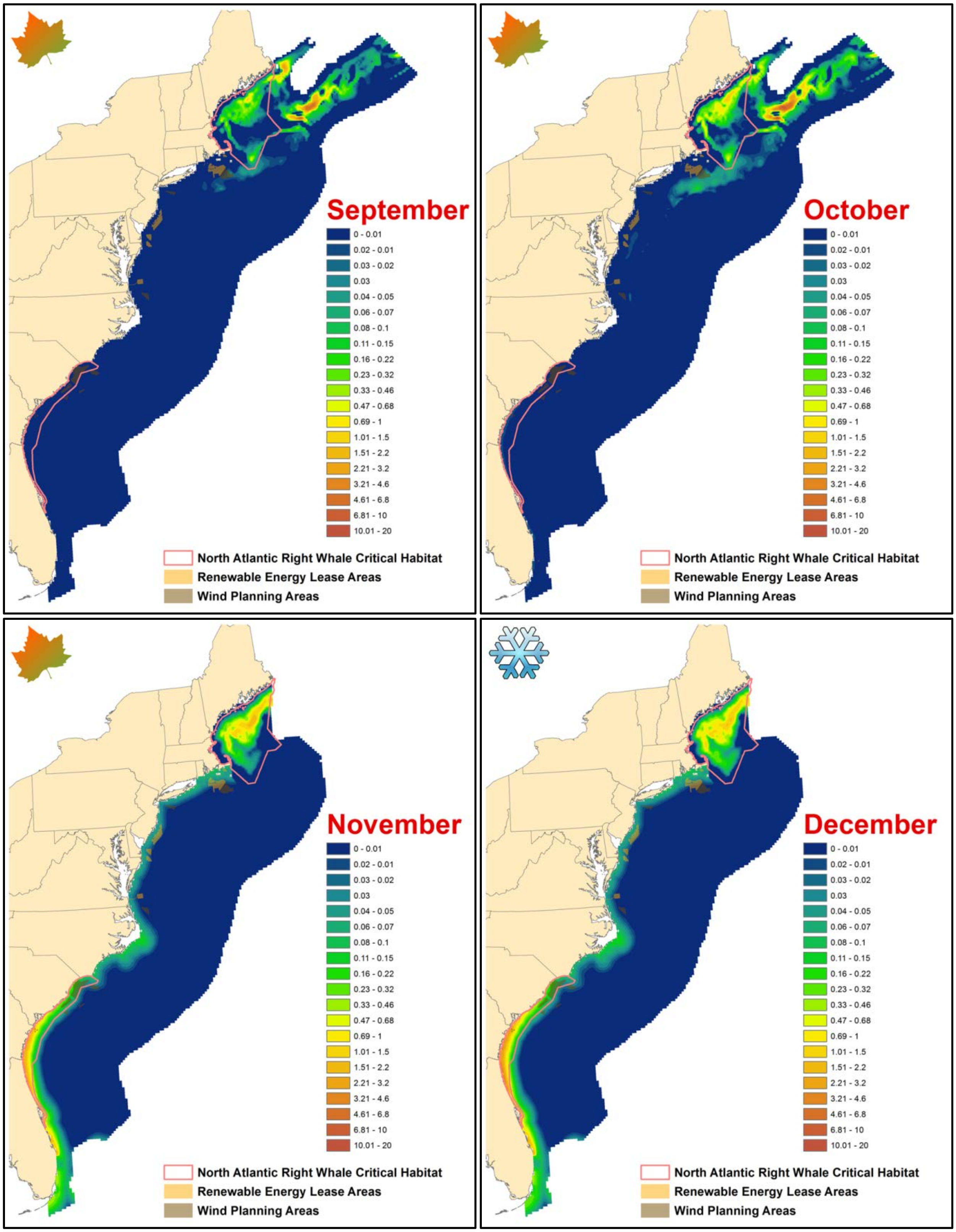


Figure 4-14(c) Predicted distribution and mean densities (individuals/100 km^2) of North Atlantic right whales during September to December along the US Atlantic coast (http://www.northeastoceandata.org/data-explorer/?marine-mammals-and-sea-turtles)

The most recent minimum count for the Western North Atlantic population of right whales was at least 465 individuals in 2011 (Waring et al., 2015). From 2008 to 2012, the mean annual minimum rate of human-caused mortality and serious injury to this species was 4.55 whales per year from two sources: incidental fisheries entanglements (3.65 per year) and ship strikes (0.9 per year) (Waring et al., 2015). These rates are minimum estimates and biased low, but thought to indicate a slowly increasing population (Waring et al., 2015). However, more recent data analysis indicates a decrease in calf productivity in the past five years, an increase in the number of severe injuries from entanglements in fishing gear and a significant decrease in the number of individuals sighted in all habitats in recent years (Knowlton et al., 2015; Pettis & Hamilton, 2015; Robbins et al., 2015). It is currently unclear how these notable habitat shifts are affecting population estimates, but researchers are concerned that all these factors may be indicative of a decreasing population. These concerns are amplified by an observed general decline in this population's health from 1980 to 2008 (Rolland et al., 2016). There is no critical habitat designated in the New York Bight.

NARWs are known to migrate from the calving/wintering grounds off the southeast United States to the feeding grounds of the Great South Channel and Cape Cod Bay coast beginning in early spring. They then move farther north to the Bay of Fundy and Scotian Shelf in the summer and fall. In the fall, they begin the southward migration back to the waters of the southeast United States and to as yet unknown wintering locations (LaBrecque et al., 2015). A Seasonal Management Area (SMA) has been established off New York Harbor from November 1 to April 30 to coincide with these movements. SMAs are implemented by NOAA to reduce ship strikes to NARWs, and require mandatory vessel speed restrictions whereby all vessels 65 ft (20 m) or longer must travel 10 knots or less within a 20 nm (37 km) radius of, in this case, New York Harbor. The New York Harbor SMA is inshore of, and does not overlap with, the WEA. Although NARWs are known to travel along the continental shelf of the United States (Whitt et al., 2013), with disproportionately higher numbers of reproductively mature females, pregnant females, and mothers with calves following this migratory route (Kraus et al., 1986). Whether NARW use the entire shelf area during migration or restrict their movements to nearshore waters is not known (LaBrecque et al., 2015).

Additionally, LaBrecque et al. (2015) have identified the coastal waters from Massachusetts to Florida as a NARW migratory corridor Biologically Important Area during the species' migration south to calving grounds in November and December, and north to feeding grounds in the Bay of Fundy and unknown areas in March and April. Biologically Important Areas are region-, species-, and time-specific delineations identified by an expert elicitation process for the purpose of providing the best available science to help inform regulatory and management decisions (Ferguson et al., 2015).

Impact Analysis of Alternative A

Factors that could potentially have an impact on marine mammals from Alternative A are shown in -6. BOEM has developed SOCs for lessees and operators that are designed to prevent or reduce possible impacts to marine mammals during site characterization and site assessment activities. These SOCs are described in detail in Appendix B.

Table 4–6
Alternative A Activities and Events, Potential Impact-Producing Factors and Potential Impacts on Marine Mammals

Phase of the Proposed Action	Activity	Impact-Producing Factor	Potential Impact
Site characterization and site assessment	Vessel operation	Vessel traffic	Vessel strike
		Vessel noise	Acoustic impacts
Site characterization	Geophysical surveying	HRG active acoustic sources	Acoustic impacts
	Geotechnical sampling	Equipment noise	Acoustic impacts
		Seafloor disturbance	Water quality effects (e.g., turbidity)
Site assessment	Installation of monopiles	Pile driving noise	Acoustic impacts
	Installation or removal of tower or buoy	Equipment noise	Acoustic impacts
		Seafloor disturbance	Water quality effects (e.g., turbidity)
		Ducted propeller (DP) thruster use during vessel positioning	Entrainment or physical disturbance
Site characterization and site assessment	Any activity	Release of trash or debris	Entanglement, ingestion
		Accidental fuel spill	Water quality effects (e.g., contaminants)

In the following discussion, marine mammals listed as federally endangered or threatened under the ESA (i.e., listed) and marine mammals protected under the MMPA (i.e., non-listed) are discussed together because the potential impact mechanisms are the same for all marine mammals.

Site Characterization

Impacts on marine mammals from site characterization were analyzed in the G&G Final PEIS (BOEM, 2014a) and are incorporated herein by reference and summarized below. Although the geographic boundary in the G&G Final PEIS was outside of the WEA (it included BOEM's Mid-Atlantic and South Atlantic planning areas: Delaware to Florida), many of the same species occur in the New York Bight area, and the conclusions on impact levels are applicable to this EA. Since the publication of the G&G Final PEIS, additional information on the effects of G&G surveys on marine mammals has been published; it is summarized below.

Bowhead whale (*Balaena mysticetus*) calling rates in the Alaskan Beaufort Sea were reported to begin increasing while in the presence of airgun pulses that exceeded a cumulative exposure level of about 127 dB re 1 μPa^2-s over a period of 10 minutes (Blackwell et al, 2015). Calling rates nearly ceased when cumulative exposure levels were above 160 dB re 1 μPa^2-s. It is important to note that airgun arrays used for seismic surveys produce very different types of acoustic signals from the HRG survey equipment analyzed in this EA. The main energy of airgun pulses is in lower frequency ranges where baleen whale hearings and behavior is believed to be most sensitive. By contrast, baleen whales are not expected to be harassed by many pieces of HRG equipment because their hearing is below the range in which many HRG sound sources operate. However, some sources produce frequencies ≤ 30 kHz (e.g., CHIRP sub-bottom profilers, boomers, and sparkers) that have frequency components audible to baleen whales were considered in the G&G Final PEIS and this EA, but are not as loud as airgun arrays. Overall, most HRG survey equipment produces non-impulsive, intermittent higher frequency sounds that have characteristically lower sound levels than the impulsive, intermittent sounds from airgun arrays. The combination of both higher frequency (fast sound attenuation underwater) and lower sound level result in HRG sound sources affecting much smaller areas than airgun pulses during seismic surveys. We have not altered our analyses as a result of this or other recent published summaries of the effects of seismic surveys (e.g., Nowacek et al., 2015), because seismic surveys are not proposed to occur for offshore wind leasing activities, including within the proposed lease area.

The G&G PEIS considered a report that assessed the causes of a mass stranding of melon-headed whales (Southall et al., 2013),and BOEM has reassessed those findings as they pertain to the proposed action. In summary, the use of a 12 kHz multi-beam echosounder system was implicated as a possible cause of a 2008 mass stranding of approximately 100 melon-headed whales in the Loza Lagoon system in Madagascar. An investigation by a team of experts determined that the use of a 12 kHz multi-beam echosounder was “the most plausible and likely initial behavioral trigger of the stranding event,” and concluded that the operation of the survey in a directed manner (north to south) parallel to shore may have trapped the animals between ship (and sound source) and shore, and that the animals continued to turn inland until they entered the lagoon and became entrapped which resulted in the stranding. The report noted that these types of systems are used worldwide for ocean bottom mapping, fish finding, and other common surveys without linkages to stranding events. The report concluded, however, that a variety of secondary factors contributed to, or ultimately caused, mortalities that were specific to the geographic area. The unique conditions under which the mass stranding occurred in Madagascar are not present in the proposed lease area, and BOEM therefore does not expect the HRG surveys contemplated in this EA to result in marine mammal strandings.

In addition to the information in our G&G PEIS and above-referenced studies, BOEM has also considered new information resulting from a collaborative study measuring the sound propagation from all types of HRG survey equipment being used on the OCS. The first year of results from this ongoing study (Crocker & Fratantonio, 2016) has been integrated into our analysis of effects to marine mammals. These results suggest that our 200 m exclusion zone is adequate to minimize the potential for hearing injury (Level A Harassment under the MMPA), as well as the majority of behavioral impacts (Level B Harassment under the MMPA) for the sound sources associated with HRG surveys. However, BOEM regulations require that if there is reason to believe that marine mammals may be incidentally taken as a result of a lessee’s proposed action, the lessee is required to apply for an incidental take authorization under the MMPA, and adhere to the requirements of the authorization (30 CFR 585.801(e)). In addition, Lessees are required to send a copy of the authorization to BOEM (30 CFR 585.801(f)) prior to commencing the proposed action.

The following conclusions for site characterization that were made in the G&G Final PEIS for BOEM’s Mid-Atlantic and South Atlantic planning areas are expected to be the same in the New York WEA:

- Impacts from HRG survey sound sources are expected to be **minor** because acoustic signals from HRG survey equipment are within the hearing range for marine mammals, and may cause Level B harassment. However, SOCs implemented to minimize acoustic impacts would include monitoring by a PSO of a 1,640 ft (500 m) exclusion zone for North Atlantic right whales and a 656 ft (200 m) exclusion zone for all other marine mammals, clearance of the exclusion zone 60 minutes prior to equipment start-up, “ramp up” of equipment, and immediate shutdown if a non-delphinoid cetacean (large whale) is sighted at or within the exclusion zone (Appendix B). If a delphinoid cetacean (dolphin or porpoise) or pinniped (seal) is sighted at or within the exclusion zone, the survey equipment must be powered down to the lowest power output feasible until the exclusion zone is clear.
- Impacts from vessel and equipment noise, including geotechnical sampling (e.g., coring) are expected to be **negligible** to **minor**. BOEM based the impact level on the basis that vessel and equipment source levels can be high enough to exceed threshold criteria for behavioral disturbance and undetected marine mammals may occur in the ensonified area during sampling activities. The following SOCs would minimize acoustic impacts: monitoring of the 656 ft (200 m) exclusion zone by a PSO, clearance of the 656 ft (200 m) exclusion zone 60 minutes prior to activity, and immediate shutdown if a non-delphinoid cetacean is sighted at or within the exclusion zone. Subsequent restart of geotechnical survey equipment may only follow clearance of exclusion zone for at least 60 minutes for all marine mammals (Appendix B).

  Impacts from vessel traffic associated with site characterization are expected to be **negligible** because SOC measures require that all vessel operators and crew maintain a vigilant watch for marine mammals, with separation of 1,640 ft (500 m) from a sighted North Atlantic right whale and 328 ft (100 m) from all other non-delphinoid cetaceans (Appendix B). Additional vessel strike avoidance measures for NARWs apply from November 1 to July 31. SOCs also require that all vessels underway do not divert to approach a delphinoid cetacean or pinniped.

To ensure the SOCs developed in the G&G Final PEIS for BOEM’s Mid-Atlantic and South Atlantic planning areas and biological opinion issued by NMFS are still applicable to the New York proposed lease area, we analyzed two new sources of information in this EA: NOAA’s guidance for assessing the potential for PTS in marine mammals resulting from underwater sound sources, published in August 2016 (81 FR 51693; NMFS, 2016b); and new information for 19 HRG sound sources recently measured (Crocker & Fratantonio, 2016). These are discussed in greater detail below.

Underwater Noise Impacts

Marine mammals use sound for vital biological functions, including socialization, foraging, responding to predators, and orientation. It has been documented that some anthropogenic noise can negatively impact the biological activities of marine mammals in some instances (Southall et al., 2007). The response of marine mammals to sound depends on a range of factors, including (1) the SPL: frequency, duration, and novelty of the sound; (2) the physical and behavioral state of the animal at the time of perception; and (3) the ambient acoustic features of the environment (Hildebrand, 2004; Nowacek et al., 2004; Southall et al., 2011).

Noise can cause behavioral disturbance, including changes in feeding, vocalization, and dive patterns, or avoidance of the ensonified area (i.e., the area filled with sound). Auditory masking, defined as the obscuring of sounds of interest by interfering sounds, generally at the same or similar frequency, may also cause important behavioral changes to marine mammals exposed to sound. In addition to behavioral disturbance, underwater noise can result in Permanent Threshold Shift (PTS), a physical injury that results in a permanent decrease in hearing sensitivity. Detailed discussions on underwater sound and its importance to marine mammals and their hearing capabilities can be found in the G&G Final PEIS and the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts Revised Environmental Assessment* (BOEM, 2014a; BOEM, 2014b).

BOEM follows NMFS's traditional threshold criteria to assess the potential for behavioral disturbance, based on received levels of sound for marine mammals during acoustic activities, as follows:

- 120 dB re 1 μPa root mean square (RMS) (dB[RMS]) for the potential onset of behavioral disturbance or harassment (Level B) from a *continuous* source of sound (e.g., vessel noise, geotechnical coring, or vibratory pile driving)
- 160 dB (RMS) for the potential onset of behavioral disturbance (Level B) from an *intermittent* source (e.g., impact pile driving, HRG surveys)

In the context of behavioral reaction, sounds are characterized as continuous (non-impulsive, continuous sounds) or intermittent (impulsive or non-impulsive sounds occurring repetitively or irregularly in time). Behavioral reactions are expected to occur over a wide spectrum of variable responses, some which may be negligible, while others can have more severe consequences. We are using the traditional threshold level used by NMFS to predict behavioral reactions, being 160 dB (RMS) for intermittent noise and 120 dB (RMS) for continuous noise. Animals exposed to levels above the threshold have the potential to be disturbed. An increasing number of studies indicate that the effect of underwater sound on marine mammal behavior is quite variable between species, individuals, life history stage, and behavioral state. Additionally, some species (e.g., beaked whales and porpoises or migrating baleen whales) or animals in certain behavioral states may be more sensitive to disturbance, while other species may be more tolerant to environmental noise. Some marine mammal species may show tolerance of some noise in certain frequency bands while different frequency contents may elicit stronger responses (Nowacek, 2004) that should be accounted for when such information is available.

An alternative model proposed by Wood et al. (2012) applies a probabilistic approach that predicts the percentage of animals exposed that may be disturbed by sound. The model proposes that marine mammals will generally show a gradually increasing behavioral response to mammal hearing weighted (M-weighted) sound levels (L_{rms}) according to Table 4–7. The application of this novel approach is not used in this EA. As stated above, we are applying the traditional criteria of 160 dB (RMS). The more conservative traditional level assumes 100 percent of animals will be disturbed from intermittent noise at 160 dB (RMS) and 100 percent of animals will be disturbed to continuous noise at 120 dB (RMS) which are higher than those proposed by Wood et al. (2012).

Table 4–7
Probabilistic Sound Level Thresholds for Marine Mammals

Marine Mammal Group	Probabilistic L_{rms} Thresholds (M-weighted dB re 1 μPa)			
	120	**140**	**160**	**180**
Porpoises/beaked whales	50%	90%	--	--
Migrating mysticetes	10%	50%	90%	--
All other species and behaviors	--	10%	50%	90%

Source: Wood et al. (2012)
L_{rms} = mammal hearing weighted (M-weighted) sound levels

NMFS has published marine mammal exposure thresholds for assessing the effect of sound exposure on marine mammal hearing (NMFS, 2016b). Considering the non-behavioral, auditory effects on marine mammals, studies indicate that the onset of hearing impacts is correlated with the Peak and SEL sound pressure levels depending on the type of sound (impulsive; non-impulsive, continuous; and non-impulsive, intermittent) and duration of exposure to a sound source. Assessment of potential hearing loss in marine mammals in this EA is based on NMFS technical guidance for assessing acoustic impacts (NMFS, 2016b). These threshold criteria are provided for both impulsive (e.g., impact pile driving) and non-impulsive (e.g., vibratory pile driving) sound types (Table 4–8). Previous ESA consultations applied the traditional 180 dB (RMS) threshold criteria for PTS injury (NMFS, 2015). The following analysis applies the threshold criteria found in NOAA's final technical guidance to assess the potential for PTS in marine mammals.

Table 4–8
Threshold Criteria
for the Onset of Permanent Hearing Loss in Marine Mammals

		Sound Type	
		Impulsive	**Non-impulsive**
Low-Frequency cetaceans (LF)	Peak	$L_{pk,flat}$: 219 dB re 1 μPa	NA
	SEL	$L_{E,LF,24h}$: 183 dB re 1 μPa^2-s	$L_{E,LF,24h}$: 199 dB re 1 μPa^2-s
Mid-Frequency cetaceans (MF)	Peak	$L_{pk,flat}$: 230 dB re 1 μPa	NA
	SEL	$L_{E,MF,24h}$: 185 dB re 1 μPa^2-s	$L_{E,MF,24h}$: 198 dB re 1 μPa^2-s
High-Frequency cetaceans (HF)	Peak	$L_{pk,flat}$: 202 dB re 1 μPa	NA
	SEL	$L_{E,HF,24h}$: 155 dB re 1 μPa^2-s	$L_{E,HF,24h}$: 173 dB re 1 μPa^2-s
Phocid pinnipeds (PW)	Peak	$L_{pk,flat}$: 218 dB re 1 μPa	NA
	SEL	$L_{E,PW,24h}$: 185 dB re 1 μPa^2-s	$L_{E,PW,24h}$: 201 dB re 1 μPa^2-s

Source: NMFS, 2016b

μPa = micropascal

μPa^2-s = micropascal squared second

dB = decibel

$L_{pk,flat}$ = the maximum absolute value of instantaneous pressure during a specified time

$L_{E,LF,24h}$ = the cumulative sum-of-square pressures over the duration of a sound, 24h indicates the reset period or the level over which cumulative noise exposure is evaluated (daily)

SEL = sound exposure level

BOEM calculated the PTS exposure distances for each functional hearing group under NOAA's sound exposure guidelines, using the NOAA sound exposure spreadsheet tool (http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm). BOEM also applied the highest reported source levels from the measurements in Crocker and Fratantonio (2016) and appropriate marine mammal hearing group weighting functions for each of the sound sources. Based on the results of the spreadsheet calculations, we combined the results of similar sound sources into seven distinct categories summarized in Table 4–9.

Table 4–9
Cumulative Sound Exposure Level Distances for HRG Survey Equipment

HRG SOURCE	PTS INJURY DISTANCE (m)			
	Low Frequency Cetaceans	Mid Frequency Cetaceans	High Frequency Cetaceans	Seals (Phocids)
Boomers	9	0	2	2
Sparkers, Mini-GI Gun, Bubble Gun (impulsive)	26	<1	95	13
Mini-GI airgun (impulsive)	20	0	45	8
Sub-bottom profilers	2	<1	36	<1
Multi-beam echosounder (100 kHz)	0	2	430	<1
Multi-beam echosounder (>200 kHz)	0	0	0	0
Side-scan sonar (>200 kHz)	0	0	0	0

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

The results of our analysis of the new information show that the risk of exposing low frequency cetaceans, mid frequency cetaceans, and seals (phocids) to injurious SELs is negligible for mid frequency cetaceans (< 2 m from the source), and minor for low frequency cetaceans (0-26 m from the source). Although different HRG sources may be used during future surveys, we applied the highest source levels from various power levels tested in Crocker and Fratantonio (2016) (Table 3–3), and these PTS distances represent conservative overestimations of actual sound levels that would be expected during future surveys. Consequently, BOEM's 200-m exclusion zone is conservatively protective for low frequency cetaceans (including all

ESA-listed whales in the area), mid frequency cetaceans, and seals. In sum, the impacts to these marine mammals associated with site characterization are anticipated to be minor. This conclusion is consistent with the G&G Final PEIS for BOEM's Mid-Atlantic and South Atlantic planning areas.

All site characterization surveys completed thus far on existing offshore wind leases have not used any multi-beam echosounders or side-scan sonars that operate at frequencies less than 200 kHz. Surveys using side-scan sonars operating at frequencies less than 200 kHz are very unlikely, because the resolution provided from lower frequencies would not likely meet BOEM's guidelines, assuming the lessee would follow BOEM's guidelines to meet the geophysical data requirements at 30 CFR 585.610–585.611 and 30 CFR 585.626(a). BOEM acknowledges that some commercially available multi-beam echosounders are capable of operating at frequencies below 200 kHz that could have the potential to impact high frequency cetaceans (i.e., harbor porpoises, pygmy and dwarf sperm whales) beyond the 200 m exclusion distance (Table 4–7), however the use of equipment operating below 200 kHz have not been used during any surveys completed so far are not expected to be used in the future. The 200 m exclusion zone will remain effective at minimizing the potential for PTS in all marine mammals if industry continues to use multi-beam echosounders or side-scan sonars equipment operating only at frequencies above 200 kHz.

BOEM will evaluate actual HRG survey equipment proposed for use when any future survey plan is submitted in support of any site characterization activities that may occur in the proposed lease area. BOEM will continue to reevaluate our SOCs as new information becomes available.

Based on the potential for multi-beam echosounders below 200 kHz to be used, there is a possibility of exposing harbor porpoises to cumulative exposure levels that could result in PTS. However, the risk of sound exposure will be reduced as a result of restriction of operations to daylight hours (unless an alternative monitoring plan is approved by BOEM and NMFS), implementation of the required SOCs to monitor the exclusion zones for marine mammals, and the requirement to power down equipment whenever animals are seen. Therefore, the risk of PTS impacts in marine mammals from HRG surveys will be **minor**.

Site Assessment

Impacts on marine mammals from site assessment activities are divided into two categories: underwater noise impacts and non-acoustic impacts. Impacts are assessed by relative potential of overlap, both spatially and temporally, between marine mammal species and impact-producing factor.

Pile Driving

Among all acoustic activities during site assessment, pile driving has the potential to produce the highest noise levels. Propagation of sound levels during pile driving can vary and depend on pile size, hammer power, water depth, and bottom type. There are two methods of pile driving that may be used in the WEA, vibratory pile driving and impact pile driving, and each produce very different noise levels that can have different potential impacts. BOEM anticipates that pile driving would occur for 3 to 8 hours per day for up to 3 consecutive days, and that pile diameters would be approximately 3 ft to 10 ft (1-3 m) depending on the structural design of the meteorological tower.

Vibratory Pile Driving

Vibratory hammers use a combination of vibration and a heavy weight to force the pile into the sediment, producing continuous low-frequency sound compared to impact hammering (Hanson et al., 2003; Nedwell & Howell, 2004). A compendium of pile driving measurements shows that the SPLs from vibratory pile driving are generally much lower than impact pile driving (Caltrans, 2015). Compared to impact hammers, vibratory hammers produce lower frequencies and SPLs, but may take longer to install piles than impact driving methods (Caltrans, 2015).

The loudest reported underwater sound measurement for underwater vibratory pile driving is 180 dB SEL for a 1.8-m-diameter steel pile (Caltrans, 2015). We calculated exposure distances for a pile with a source level of 180 dB SEL occurring for up to eight hours per day using NOAA's sound exposure spreadsheet tool. The results of calculations for PTS distances from vibratory pile driving are summarized in Table 4–10 for each marine mammal hearing group found in the proposed lease area.

Table 4–10
Cumulative Sound Exposure Level Distances for Vibratory Pile Driving

Cumulative Exposure Level Distance	**Marine Mammal Hearing Group**			
	Low-Frequency Cetaceans	**Mid-Frequency Cetaceans**	**High-Frequency Cetaceans**	**Seals (Phocids)**
PTS distance for vibratory pile driving over 3-8 hr	116-189 m	19-31 m	156-254 m	0

BOEM calculated the distance to the behavioral harassment threshold criterion (120 dB [RMS]) using a 20 LogR spreading loss equation. The potential disturbance distance extends up to 1,000 m from vibratory pile driving activity. Under BOEM's SOCs (Appendix B, Section B.4), which requires that PSOs monitor an exclusion zone to minimize the risk of PTS exposure and that pile driving only be conducted from May 1 to October 31, BOEM does not expect risk of prolonged exposure within 254 m of any vibratory pile driving that can cumulatively expose animals to noise and cause PTS. We analyzed exposure to vibratory pile driving over an eight hour period. Animals within the 833 ft (254 m) PTS distance are expected to be detected and a shut-down of equipment will occur following our SOCs (Appendix B). Animals are not expected to be exposed to sound levels for long enough periods to be affected by PTS (i.e., exposure over a time is required for the noise to cause Level A Harassment through PTS). Therefore, vibratory pile driving will not impact marine mammals through PTS. However, measurements from Illingworth and Rodkin, Inc. (2013) indicate that source levels above Level B harassment (120 dB [RMS]) that can impact the behavior of animals could occur up to 1,000 m from the source. Therefore, marine mammals may occur in or near the proposed lease area during times of the year when pile driving may cause Level B Harassment through either disturbance or causing animals to avoid the area. However, the occurrence or duration of such disturbance will be reduced to low levels with implementation of the SOCs (Appendix B, Section B.4).

The requirements under BOEM's SOCs are expected to reduce the potential impacts to marine mammals from vibratory pile driving activities. Nonetheless, there is a potential for behavioral impacts. Overall, impacts from vibratory pile driving activities are expected to be **minor** for both non-ESA-listed marine mammals and for ESA-listed fin and NARWs that could occur in the WEA.

Impact Pile Driving

A detailed discussion on impact pile driving can be found in the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts, Revised Environmental Assessment* (BOEM, 2014b). Pile driving noise is typically produced from the installation of open-ended, steel piles that are commonly used for foundations for meteorological platforms and towers. These piles are usually driven into the sea floor with impact hammers using diesel fuel or hydraulic power as the source of energy. The amount of noise produced by pile driving depends on a variety of factors, including the type and size of the impact hammer, size of the pile, the properties of the sea floor, and the depth of the water. Consequently, even if the source level is the same for different meteorological tower installations, the actual sound propagation of sound through the water could vary between locations.

Table 4–11 represents characteristic source levels reported in the literature for the pile sizes that could be used for a meteorological tower foundation.

Table 4–11
Representative Field Measurements of Sound Levels from Impact Pile Driving of a Meteorological Tower

Pile Diameter[b]	**Source Level (dB re 1 µPa at 1 m)**		
	Peak	RMS	SEL
1 m (40 in)	228	215	200
1.2 m (48 in)	208	215	200
1.4 m (54 in)[a]	229	214	205
1.7 m (66 in)	230	215	unreported (206 est.)
2.4 m (96 in)	240	225	214

[a] Data from Block Island Wind Farm offshore Rhode Island (Deepwater Wind, 2016b)

All data other than Block Island Wind Farm are compiled from bridge and port construction reported in Illingworth and Rodkin, Compendium of Pile Driving Data (Version October 1, 2012) and oil and gas pile driving noise reported in Genesis (2011). In some cases, we have back-calculated using 20 LogR spreading loss to obtain estimated source levels dB re 1 µPa at 1 m.

Both PTS (Level A harassment) and disturbance (Level B harassment) are possible impacts to marine mammals associated with impact pile driving. This analysis will compare the PTS distances for Block Island Wind Farm for a 1.4-m pile and a high sound level associated with a

2.4-m steel pile (Genesis, 2011) that could be used for a meteorological tower. According to NOAA's sound exposure guidelines, dual criteria of SEL and peak pressure levels are used to assess the potential for hearing effects from impact pile driving. According to the dual criteria, the sound measurement (Peak or SEL) that results in the largest PTS distance should be used to assess potential impacts to marine mammals. For each functional hearing group, the SEL metric will result in the largest PTS distance from a pile and is used in this EA. We calculated exposure distances for a pile with a source level of 205 dB SEL for a 214 dB SEL occurring between three to eight hours per day using NOAA's sound exposure spreadsheet tool. The results of calculations for PTS distances from impact pile driving are summarized in Table 4–12 for each hearing group.

Table 4–12
Cumulative Sound Exposure Level Distances for PTS over 3 to 8 Hr of Pile Driving per Day without a Sound Reduction System

Cumulative Sound Exposure Level Distance	Marine Mammal Hearing Group			
	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Seals (Phocids)
PTS distance for a 1.4-m-diameter pile over 3-8 hr	859-1,403 m (2,818-4,603 ft)	70-115 m (230-377 ft)	980-1,560 m (3,215-5,118 ft)	538-878 m (1,765-2,881 ft)
PTS distance for a 2.4-m-diameter pile over 3-8 hr	2,421-3,954 m (7,943-12,970 ft)	198-324 m (650-1,063 ft)	2,761-4,508 m (9,058-14,790 ft)	1,515-2,474 m (4,970-8,117 ft)

The size of the exclusion zone must be determined based on the details of a site assessment plan; however, this analysis concludes that a 1,500 m exclusion zone is anticipated under a typical scenario for pile dimaters <2.4 m. A 1,500 m exclusion zone would cover the greatest distance for the most sensitive marine mammal hearing group. For >2.4-m diameter piles, the estimated cumulative sound level exposure distances for PTS may be considerably larger than 1,500 m for low-frequency cetaceans, high-frequency cetaceans, and seals (Table 4–12). We expect smaller diameter piles would be used for a meteorological tower on a jacket or tripod foundation, but larger diameter piles that may have a PTS impact zone beyond 1,500 m could be used for monopiles.

BOEM will evaluate the details in a SAP submitted under a lease to determine the required size of the exclusion zone at the site assessment stage. BOEM will also evaluate SAPs to determine if additional measures, such as a sound reduction system, may be required to reduce the size of large exclusion zones. Sound reduction systems would decrease the potential for PTS to occur in marine mammals by decreasing the size of the impact area and increasing the effectiveness of PSO monitoring due to the smaller exclusion zone. Sound reduction systems can typically reduce sound levels by12 dB or more (8 dB to >20 dB), depending on the type of sound reduction system used (BOEM, 2010; Reinhall & Dahl 2011; Bellman, 2014). Based on our calculations for the pile sizes considered in this EA, a 12-dB reduction (and as little as a 10 dB reduction) in pile driving sound levels with a sound reduction system (Table 4–13) would significantly decrease the largest cumulative exposure distances for piles >2.4 m to less than the estimated 1,500 m exclusion zone for smaller piles.

Table 4–13
Cumulative Sound Exposure Level Distances for PTS over 3 to 8 Hr of Pile Driving per Day using a Sound Reduction System

Cumulative Sound Exposure Level Distance	Marine Mammal Hearing Group			
	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Seals (Phocids)
PTS distance for a 1.4-m-diameter pile over 3-8 hr	216-352 m (709-1,155 ft)	18-29 m (59-95 ft)	246-402 m (807-1,319 ft)	135-221 m (443-725 ft)
PTS distance for a 2.4-m-diameter pile over 3-8 hr	608-993 m (1,995-3,258 ft)	50-81 m (164-266 ft)	693-1,132 m (2,274-3,714 ft)	381-621 m (1,250-2,037 ft)

Some sound reduction systems could cause temporary and minor impacts, although a beneficial reduction in underwater sound is expected. Hammer and pile cushions use circular material place between the pile and the pile hammer. The cushions are recovered after pile driving is complete and cause no impacts to water quality or benthos. Sound attenuation systems using a pile sleeve, attenuation pile, or coffer dam style pile system may result in minor benthic disturbances. In these types of systems, a larger-diameter pile with a sound dampening material (air, foam, or both) is placed over the pile being driven. A sound attenuation pile effectively increases the diameter of circular impact area of the pile being driven, and as a result, additional benthic organizations may be killed in the increased footprint. However, the increase in the size of the benthic area impacted will be small and the area is expected to recover once the pile is removed. Although some minor turbidity can occur when placing the sound attenuation pile on the sea bed, it will have a beneficial effect of reducing the turbidity caused by pile driving by containing suspended sediments within the inner walls of the sound attenuation pile. The sound attenuation piles are removed once pile driving is completed and the impact to water quality and benthic organizations from such removal is expected to be temporary and minor. Other types of sound attenuation systems are attached to a light-weight PVC frame and may rest on the sea floor while in operation. Some localized turbidity may occur during placement and removal of these systems, but the effect on water quality in the area will be negligible.

Behavioral disturbance due to exposure to impact pile driving sound is likely to occur due to the larger size of the impact zone. BOEM has previously considered the exposure distances associated with the 160 dB (RMS) disturbance threshold from impact pile driving (BOEM, 2012b). The received sound levels of a pile driven without a sound reduction system could remain above the Level B threshold criteria within 11,200 to 24,000 ft (3,414- 7,315 m) from the source (Table 4–14).

Table 4–14
Reported Sound Distances to 160 dB (RMS) for Impact Pile Driving

Proposed Action (Modeled)	Additional Information	160 dB re 1 μPa (RMS)
[(1)]Bluewater Wind (Interim Policy Lease offshore Delaware)	3 m (10 ft) diameter monopile; 900 kJ hammer	7,230 m (23,721 ft)
[(1)]Bluewater Wind (Interim Policy Lease offshore New Jersey)	3 m (10 ft) diameter monopile; 900 kJ hammer	6,600 m (21,654 ft)
[(1)]Cape Wind Energy Proposed Action (Lease in Nantucket Sound)	5.05 m (16.57 ft) diameter monopile; 1,200 kJ hammer	3,400 m (11,155 ft)
Deepwater Wind, Block Island Wind Farm (Deepwater Wind, 2016b)	1-1.4 m (3.3–4.6 ft); 600 kJ hammer	1,780–4,640 m (5,840–15,223 ft)

[(1)] Source: BOEM, 2012b
μPa = micropascal
dB = decibel

The possible effects of Level B harassment for each marine mammal hearing group and SOCs are discussed under the separate subparagraphs below.

Low-Frequency Cetaceans (Mysticetes)

The two ESA-listed threatened and endangered whale species that are most likely to occur in the WEA are fin and North Atlantic right whales. The only other non-listed mysticetes that may occur in the New York Bight area, and thus the action area, are minke and humpback whales. Pile driving activities are expected to be **minor** for minke and humpback whales. SPUE data suggest that occurrences of minke whales do not typically occur within 25 mi (40 km) of the WEA (Right Whale Consortium, 2015). Humpback whale sightings are not common in the WEA, but do occasionally occur. Many marine mammals that may occur are expected to be sighted by PSOs; however, not all marine mammals are expected to be sighted in the large exposure areas associated with longer periods of pile driving (~50 km^2 for 8-hr pile driving/day). The short duration of pile driving (1-3 days) and required implementation of the SOCs will reduce potential impacts to **minor to moderate** levels.

BOEM's SOCs (Appendix B, Section B.4), which require a lessee to limit pile driving between May 1 and October 31 and only to daylight operations (unless an alternative monitoring plan is approved by BOEM and NMFS), monitor an exclusion zone, and implement "soft start" procedures, are all expected to minimize Level A effects of PTS noise in ESA-listed whales and other mysticetes. However, it is possible that any undetected whale may experience Level A or Level B harassment. For example, recent acoustic data indicate the possible presence of NARWs in the New York Bight at any time during the year (Whitt et al., 2013). Large whales engaged in migration are known to be more sensitive to relatively low levels of noise (lower than Level B harassment threshold levels), and this sensitivity may cause them to avoid the area (Southall et al., 2007; 2011) and go undetected in the immediate area of the exclusion zone. As more information becomes available, BOEM will continue to reassess our SOCs.

Considering the short duration of impact pile driving activities (anticipated to be approximately 3- 8 hours per day for up to 3 consecutive days), impacts from impact pile driving on fin and NARWs are expected to be **minor** to **moderate**.

Mid- and High-Frequency Cetaceans (Odontocetes)

There are no ESA-listed odontocete species (e.g., sperm whales) occurring in the proposed lease area. However, non-listed marine mammal species are expected to occur. There are limited data on behavioral impacts for odontocetes from pile driving (Southall et al., 2007). Disruption to resting, communication, nursing, swimming, and diving behavior are some possible effects depending on the species, time of year, location, sound level, and duration of the pile driving activity. For bottlenose dolphins (mid-frequency cetaceans), Bailey et al. (2010) predicted behavioral reactions at an SPL of 140 dB re 1 μPa, which may occur at 31 mi (50 km) from the source, and for harbor porpoises (high-frequency cetaceans), behavioral reactions may occur at an SPL of 90 to 155 dB re 1 μPa at the 12 to 43 mi (20-70 km) range. These received levels would be capable of masking vocalizations by bottlenose dolphins from 6 to 25 mi (10-40 km).

Harbor porpoises forage by using echolocation, with critical frequencies at the 10 kHz band around 125 kHz (Kastelein et al., 2013). Harbor porpoises are expected to fully recover from small temporary threshold shifts (TTSs) caused by noise bands centered at 4 kHz, so there would be relatively low-level impacts on harbor porpoises. However, little is known about the long-term effects of multiple and large TTSs and their effects on echolocation. The overall effect of hearing disruption on echolocation (and therefore foraging) may be critical (Kastelein et al., 2013).

The range of the cumulative sound exposure distance in which PTS may occur is 70 to 1,063 m for mid-frequency cetaceans, and 980 to 14,790 m for high-frequency cetaceans over three to eight hours of pile driving. Under BOEM's SOCs (Appendix B, Section B.4), which require a lessee to limit pile driving from May 1 to October 31 and only to daylight operations (unless an alternative monitoring plan is approved by BOEM and NMFS), monitor an exclusion zone, and implement "soft start" procedures, the potential for odontocetes to be exposed to Level A noise impacts will be reduced. Since odontocetes may occur within the proposed lease area and surrounding waters, behavioral impacts may occur to the mid- and high-frequency hearing groups of cetaceans. The species most likely to occur in the proposed lease area during the allowable pile driving period include the common dolphin in the spring, Atlantic white-sided dolphin in the fall, bottlenose dolphin in the summer and fall, and harbor porpoise in the spring and summer (Right Whale Consortium, 2015). In order to ensure sufficient and effective protection of protected species, BOEM will continue to reassess required mitigation measures as more information becomes available.

Considering the short duration of impact pile driving activities (anticipated to be approximately 3-8 hours per day for up to 3 consecutive days) and required SOCs, Level A and Level B impacts to odontocetes are expected to be **minor** to **moderate**.

Pinnipeds

Results from studies on behavioral reactions of seals to pile driving have revealed responses at varying distances from the source. For example, results from Bailey et al. (2010) indicated a behavioral response in grey and harbor seals at predicted received levels of 143 dB re 1 μPa at 705 ft to 9 mi (215 m-14 km) from the source. In another study on seals in the German Bight, peak SPLs from pile driving measuring 189 dB re 1 μPa at 1,312 ft (400 m), caused behavioral responses up to 12 mi (20 km) from the source and masking up to 50 mi (80 km) (Thomsen et al., 2006).

Hastie et al. (2015) fitted harbor seals with GPS/GSM tags to measure movements and proximity of seals at sea during pile driving for the installation of 17.1 ft (5.2 m) diameter steel wind turbine monopiles offshore of England. Acoustic exposure from pile driving for each seal was predicted using source characteristics of the pile that were derived from existing literature and a series of modeling approaches. Modeled received maximum cumulative sound exposure levels (SEL_{cum}) ranged from 170.7 to 195.3 dB re 1 micropascal squared second (μPa^2-s) for individual seals (Hastie et al., 2015). These authors extrapolated that approximately 50 percent (12 of 24) of seals received SELs that exceeded the threshold levels that were predicted to cause PTS. Horizontal distances at which threshold levels were exceeded were not included in Hastie et al. (2015), but the closest distances of individual seals to the active pile driving location ranged from 2.9 to 25.2 mi (4.7-40.5 km). In this case, the horizontal distance alone was not always indicative of exposure level. Received levels were variable and dependent not only on the distance of the seal from the source when pile driving was taking place, but also on the dive behavior at the time (e.g., predicted received levels were higher at deeper dive depths), where the seal was geographically in relation to the pile driving, and the force of the pile driving at the time (Hastie et al., 2015).

Additionally, the amount of time to recover from TTS depends on the level of threshold shift incurred; in general, the greater the shift, the longer the recovery period (Hastie et al., 2015). For example, for a seal with a mean TTS of 2 to 12 dB, a full recovery was observed within 24 hours (Kastak et al., 2005). In a separate study, a harbor seal exposed to a much higher SPL of 163 dB re 1 μPa at 3 ft (1 m) with frequency centered at 4 kHz for 60 minutes resulted in a TTS of 44 dB, from which it took 4 days for the seal to recover (Kastelein et al., 2013). A TTS of this level is considered severe for seals, and it suggests that the critical level (above which TTS increases rapidly with increasing SPL) is between 150 and 160 dB re 1 μPa for a 60-minute exposure to octave band noise centered at 4 kHz (Kastelein et al., 2013). If a seal is in the area with received levels of 150 to 160 dB re 1 μPa (11,155-23,721 ft [3,400-7,230 m] from the source), a TTS of this level may occur.

Recent studies also indicate that hearing loss induced by noise does not depend solely on the total amount of energy, but on the interaction of several factors, such as the level and duration of the exposure, the rate of repetition, and the susceptibility of the animal (Kastelein et al., 2013). The TTS caused by noise bands centered at 4 kHz is likely to reduce the audibility of ecologically and socially important sounds for seals. More specifically, a TTS of 6 dB would decrease by half the distance at which a seal could detect another seal, a fish, or a predator (assuming spherical spreading, no absorption, no noise, and no reverberation) (Kastelein et al., 2013). The authors also indicate that it is debatable whether a small PTS is more harmful than severe TTS from which recovery may take days. Long-lasting severe TTS may hamper behaviors such as courtship, navigation, foraging, and predator avoidance, and may thus reduce an animal’s chances of survival and reproduction (Kastelein et al., 2013).

These data suggest pile driving may cause TTS and PTS for seals (and other marine mammals) for greater horizontal distances near the bottom than at the surface. However, marine mammals are expected to be spotted by PSOs at the surface which adequately covers the horizontal distance on the bottom that may be ensonified by pile driving noise.

According to Riverhead Foundation for Marine Research and Preservation (2015), gray, harbor, harp, and hooded seals may occur in the New York Bight area year-round; however, pile driving activities will only take place from May 1 to October 31. This seasonal restriction would eliminate impacts during the winter and spring, resulting in a small potential for exposure to pile driving noise in the summer. The cumulative sound exposure distance for PTS is expected to range from 538 to 8,117 m for three to eight hours of pile driving per day. SOCs require only daylight operations (unless an alternative monitoring plan is approved by BOEM and NMFS), monitoring of an exclusion zone, and the use of “soft start” procedures, which are expected to reduce the likelihood of acoustic impacts from pile driving for seals in the WEA from May 1 to October 31. If a SAP proposes large pile sizes that could result in exclusion zones greater than 1,500 m, BOEM may require additional SOCs, such as a sound reduction system. Ringed seals are not likely to be affected by pile driving, as they typically occur during the winter off the New York coast. Considering the short duration of impact pile driving activities (anticipated to be approximately 3-8 hours per day for up to 3 consecutive days), impacts from impact pile driving activities are expected to be **minor** for harbor, harp, hooded, and gray seals, and **negligible** for Ringed Seals.

Ducted Propeller Thruster Use for Dynamic Positioning Vessels

Although it is more likely that a jack-up barge would be used, a dynamic positioning vessel with ducted propellers (DPs) may be used for aspects of the foundation installation for the meteorological tower. DP thrusters were modeled for a project offshore of Virginia (BOEM, 2015b) and recently measured during the installation of the Block Island Wind Farm transmission cable (Deepwater Wind, LLC & National Grid, Inc., 2016). For both projects, the sound source level was 177 dB (RMS) at 3 ft (1 m). We calculated exposure distances for DP thrusters with a source level of 177 dB (RMS), occurring for pile installation up to three to eight hours per day using NOAA’s sound exposure spreadsheet tool (Table 4–15).

Table 4–15
PTS Level A Distances for DP Thrusters during Pile Installation

Cumulative Exposure Level Distance	Marine Mammal Hearing Group			
	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Seals (Phocids)
PTS distance for DP thrusters over 3-8 hr	40-107 m	2-4 m	11-29 m	0

For Level A harassment threshold for marine mammals, PTS could potentially occur within 107 m of the DP vessel while pile driving is occurring. However, marine mammals would need to remain within that distance for a prolonged period to be impacted by PTS, which is extremely unlikely to occur. Therefore, the potential for Level A Harassment of marine mammals from DP thruster use will be **minor**.

Distances to the Level B harassment threshold for marine mammals would be approximately 0.9 to 2 mi (1.4-3.2 km). However, impact pile driving activities for the proposed action are anticipated to take approximately three to eight hours per day for up to 3 consecutive days, and most marine mammals are highly mobile and therefore likely to spend only a small proportion of their time within the effective range of operations. Operators will also implement the SOCs contained in Appendix B, including daylight only operations (unless an alternative monitoring plan is approved by BOEM and NMFS). Behavioral impacts to marine mammals are therefore expected to be **minor**.

Non-Acoustic Impacts to Marine Mammals

Vessel Strike

Potential impacts to marine mammals include strikes from vessels used during site assessment and site characterization activities. BOEM anticipates that up to 710 to 1,066 round trips of various vessel types may occur as a result of the activities covered in this EA (Section 3.2.4 *Vessel Traffic*).

Southall et al. (2011) indicate that the behavioral response of some whale species to noise may secondarily increase the risk of vessel strike to large whales (e.g., changes in ascent behavior and rapid acceleration away from the source). Recent studies have also indicated that some whale species are more sensitive to sound during migration than during feeding (Southall et al., 2007; 2011) and may show avoidance responses at greater distances if the noise can be heard by the animal. Therefore, we analyzed the possibility that marine mammals, including NARWs, known to migrate through the New York Bight, could be susceptible to vessel strikes due to site characterization and site assessment activities. This is especially important for endangered whales (North Atlantic right and fin whales) and other large whales for which vessel strikes are a major cause of human-related mortality in whales (Waring et al., 2015).

Since the volume of commercial vessel traffic in the surrounding area is high in the north, south, and east directions surrounding the proposed lease area marine mammals within the area would need to transit through the commercial shipping lanes to get to and from the proposed lease area. It is unlikely that any site characterization and site assessment activities will measurably increase the risk of a collision between a marine mammal and non-project related vessels operating in the vicinity of the proposed lease area. Considering BOEM's required implementation of the SOCs for HRG surveys, geotechnical surveys, and pile driving (Appendix B), any slight increase in vessel strike risk by non-project related vessels will be reduced to negligible levels.

BOEM's SOCs were designed to minimize potential vessel strikes to marine mammals (Appendix B, Section B.1.1). NMFS (2013c) concluded that during site characterization and assessment activities, the potential for construction- and maintenance-related vessel strike to marine mammals is extremely low. Potential impacts to marine mammals from vessel strikes during site assessment activities are therefore expected to be **negligible** because of the low probability of such an event. Nonetheless, if a low-probability vessel strike did occur they could result in **minor** to **moderate** impacts to ESA-listed marine mammals.

Entrainment in Ducted Propeller Thrusters of Dynamic Positioning Vessels

Although it is more likely that a jack-up barge would be used, a dynamic positioning vessel may be used for aspects of the foundation installation for the meteorological tower. Both harbor (*Phoca vitulina*) and grey (*Halichoerus grypus*) seals were found on the coasts of Scotland, England, Northern Ireland, and Canada with injuries consisting of a single continuous curvilinear skin laceration spiraling down the body (Thompson et al., 2010). Based on the pathological findings, it was concluded that mortality was caused by a sudden traumatic event involving a strong rotational shearing force. The injuries were consistent with the animals being drawn through the DP thrusters of marine vessels (Bexton et al., 2012). DP and azimuth thrusters are used for the dynamic positioning of vessels, towing, and for general low-speed maneuvering where high thrust is needed at low speeds. These boats maintain their position by altering the speed and direction of their thrust. This can involve an almost-stationary vessel repeatedly starting or reversing its rapidly rotating propellers, a situation that used to be relatively rare. This may increase the opportunities for animals to approach propellers and be drawn into them (Thompson et al., 2013). Harbor porpoises (*Phocoena phocoena*) exhibiting large lacerations have stranded around the United Kingdom and southern North Sea in recent years. In the light of the seal strandings, photographic records of these harbor porpoise strandings are being re-examined (Thompson et al., 2013). However, more recently, researchers have found evidence that an adult male gray seal had killed young gray seals and left distinctive spiral lacerations around their bodies and that DPs may not be responsible for these corkscrew injuries (Thompson et al., 2015). To date, there have been no reported incidents of cetaceans becoming entrained in DPs.

Considering that pinnipeds generally occur in the New York Bight area during winter and spring months and that pile driving would be prohibited from November 1 to April 30, it is unlikely that any DP thruster use would take place when pinnipeds are generally present. In addition, the short duration (approximately 3-8 hours per day for up to 3 consecutive days) of potential DP thruster use, and the simultaneous application of SOCs for pile driving activities described in Appendix B, including daytime only operations (unless an alternative monitoring plan is approved by BOEM and NMFS), in addition to power downs when technically feasible, the entrainment impacts of DP thruster use to marine mammals are expected to be **negligible**.

Water Quality Effects

Details on impacts to water quality from site assessment activities can be found in Michel et al. (2007) and are incorporated by reference and summarized here. These water quality effects would occur during the installation and/or decommissioning of a tower and/or buoys. Potential impacts during tower and/or buoy installation or decommissioning may include an increase in suspended sediment, resulting in elevated turbidity levels and also the release of contaminants that may be in the sediment. Increased turbidity may cause temporary displacement of prey, and thus of marine mammals. However, these impacts would be short-term and temporary, and would take place in a very small area compared to the available foraging habitat. Prey species and marine mammals would be expected to return to the area shortly after installation was completed.

Potential impacts to marine mammals from water quality effects of installing and operating a meteorological tower and/or buoys are therefore expected to be **negligible**.

Entanglement

A potential impact on marine mammals during meteorological tower or buoy operation is entanglement with physical structures in the water column. The potential for marine mammals to interact with the buoy and to become entangled in the buoy or mooring system is extremely unlikely given the low probability of a marine mammal encountering one buoy or mooring system within the expanse of the WEA, and the high tension of the chain, which further reduces risk of entanglement (NMFS, 2013a). Potential impacts on marine mammals from entanglement related to meteorological tower and buoy operation are thus expected to be **negligible**. In order to ensure sufficient and effective protection of protected species, as more information becomes available, BOEM will continue to reassess required mitigation measures.

Loss of Habitat, Prey Abundance, and Distribution Effects

Meteorological tower or buoy installation and decommissioning would result in a temporary disturbance of benthic habitat. The presence of a tower foundation or buoy mooring system, along with scour control mats and rock armoring, would result in a loss of benthic habitat over a very small area in the WEA. In the case of a tower, there would be a shift from a soft horizontal bottom to a hard, vertical substrate, which may attract finfish and benthic organisms, which may in turn attract seals, dolphins, and some whale species. However, a single meteorological tower within the total area of the WEA is unlikely to alter distribution of forage species for marine mammals. The anchor and chain sweep for the buoy mooring is expected to denude a small area around the anchor, but the area of benthic habitat loss would be very small compared to the available habitat in the lease area, and is not expected to have a negative impact on foraging abilities for marine mammals.

Potential impacts on marine mammals due to loss of habitat, and changes to prey abundance and distribution from a meteorological tower or buoy, are expected thus to be **negligible**. As more information becomes available, BOEM will continue to reassess required mitigation measures.

Non-Routine Events

The following conclusions for non-routine events that were made in the G&G Final PEIS for BOEM’s Mid-Atlantic and South Atlantic planning areas (2014a) are expected to be the same for the New York WEA (see discussion of the applicability of the G&G Final PEIS for this impact analysis in Section 4.4.2.5, above). These conclusions are applicable to the proposed action because the same species of marine mammals occur in the New York Bight area, and would be engaged in the same activities.

- Impacts from trash and debris are expected to be **negligible**.
- Potential impacts on marine mammals from fuel spills are expected to range from **negligible** (if the fuel does not contact individual marine mammals) to **minor** (if individual marine mammals encounter the sheen).

Therefore, these impacts to marine mammals will not be discussed further in this EA.

Conclusion

Overall, impacts to marine mammals are expected to be **moderate** due to potential acoustic impacts during site assessment activities that involve pile driving. However, all other potential impacts covering site characterization and other site assessment activities would range from negligible to minor, depending on the activity being conducted. Vessel strike and noise are two of the most important factors that may affect marine mammals. Implementing the vessel strike avoidance measures in the SOCs (Appendix B, Section B.1.1) would minimize the potential for vessel strikes. BOEM’s SOCs related to site characterization surveys (Appendix B, Section B.3) and site assessment (Appendix B, Section B.4) would minimize the potential for noise impacts to marine mammals. In order to ensure sufficient and effective protection of protected species, as more information becomes available, BOEM will continue to reassess required mitigation measures.

4.4.2.6 Sea Turtles

Description of the Affected Environment

Four species of sea turtles occur in the New York Bight: loggerhead, green, Kemp's ridley, and leatherback (Table 4–16). All four species are listed as threatened or endangered under the ESA. Of the four species, loggerhead turtles are sighted more frequently than any other sea turtle species in the vicinity of the WEA (Appendix E).

Table 4–16
ESA Listing Status, Relative Occurrence, and Seasonality of Sea Turtles in the New York Bight

Common Name	Scientific Name	Federal Status	Potential Occurrence in the Action Area
Loggerhead turtle	*Caretta caretta*	Threatened (Northwest Atlantic DPS)	Most common sea turtle; found in bays and along the coast up to 40 mi (64 km) or greater offshore in late spring to early fall (May–October)
Green turtle	*Chelonia mydas*	Threatened (North Atlantic DPS)	Regular; distribution related to vegetative forage off eastern side of Long Island from July–November
Kemp's ridley turtle	*Lepidochelys kempii*	Endangered	Common to abundant in summer to early fall (June–October)
Leatherback turtle	*Dermochelys coriacea*	Endangered	Common; found in near coastal waters from May–November

Source: USFWS, 1997; BOEM, 2011c; Right Whale Consortium, 2015; NMFS OPR, 2015; NMFS, 2013a; NYSDEC, 2015b

DPS = distinct population segments

The hawksbill sea turtle, which is listed as endangered under the ESA, is typically found in tropical and subtropical waters and is considered rare in New York. The likelihood of the species occurrence in the WEA is so low, that the potential for any effects to hawksbills from the activities in this EA is negligible. Therefore, the species will not be discussed further in this EA.

Green turtles are more likely to be found in New York state waters than in the federal waters of the WEA, with distribution of this species generally restricted to shallow areas with aquatic vegetation (Table 4–1). Loggerhead, leatherback, and Kemp's ridley are the most abundantly occurring species in nearshore waters of the New York Bight. SPUE data for each of these species are presented in Appendix E, and Figure 4–15 presents seasonal SPUE data for all three species combined. These species occur only seasonally, in relatively widespread abundance during the summer and fall, with a few sightings in the spring (Right Whale Consortium, 2015) (Figure 4–15). Detailed information on sea turtles, including life history, behavioral ecology, and hearing abilities, are available in Kenney and Vigness-Raposa (2010), BOEM (2011c), and the G&G Final PEIS (BOEM, 2014a), which are incorporated herein by reference.

Impact Analysis of Alternative A

Impact-producing factors associated with the proposed action that could have potential impacts on Kemp's ridley, loggerhead, leatherback, and green sea turtles are shown in Table 4–17. BOEM has developed SOCs for sea turtles that are designed to prevent or reduce any possible impacts during both site characterization and site assessment activities. These SOCs are described in detail in Appendix B.

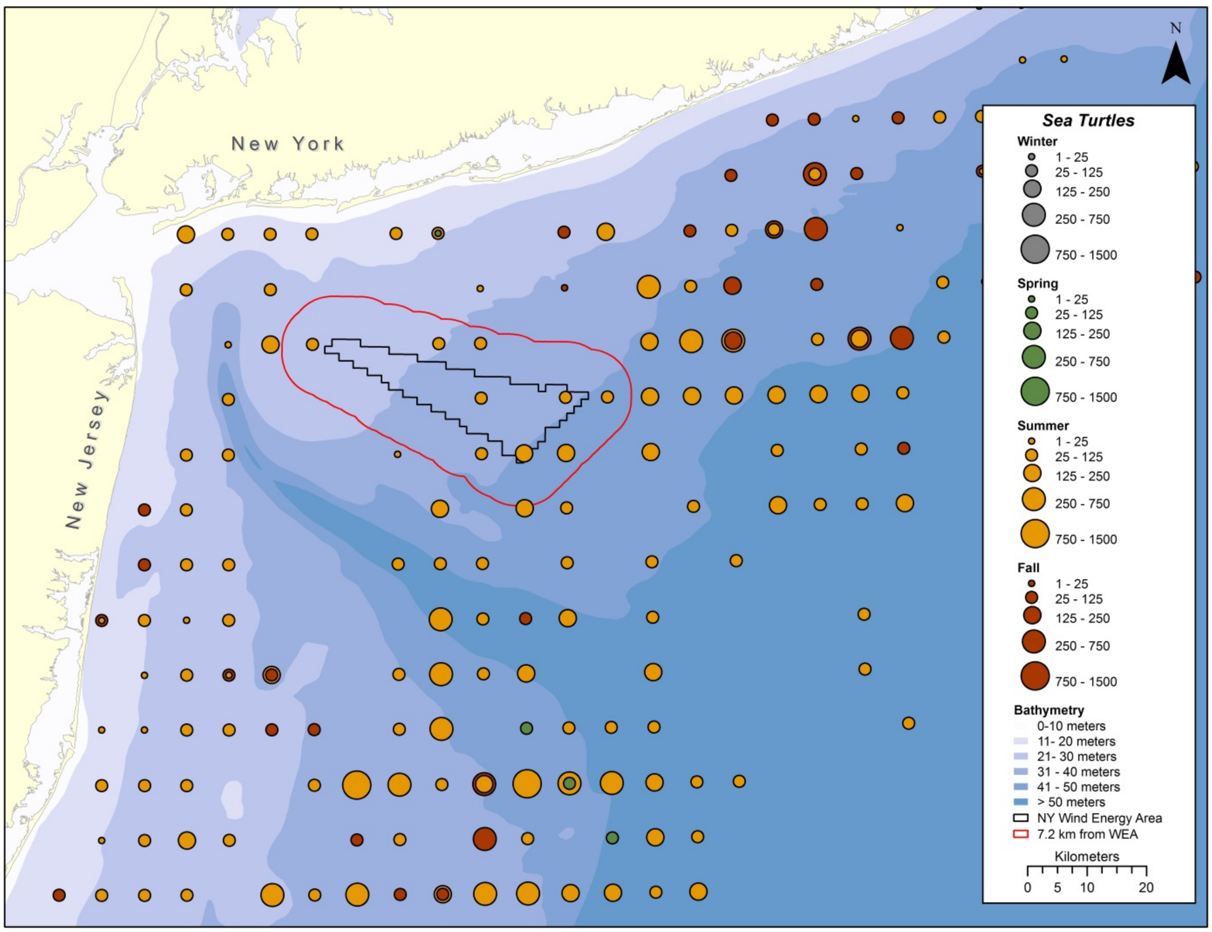


Figure 4-15 SPUE (turtles per 621 mi [1,000 km] surveyed) for Sea Turtles (loggerhead, leatherback, and Kemp's ridley) in the Vicinity of the WEA from 1979 through 2014

Notes: SPUE calculation methods provided in Appendix E; figure prepared by Normandeau Associates, Inc.
Source: Right Whale Consortium, 2015

Table 4–17
Activities with Potential Impact-Producing Factors on Sea Turtles from Alternative A

Proposed Action Phase	Activity	Impact-Producing Factor	Potential Impact
Site characterization and site assessment	Vessel operation	Vessel traffic	Vessel strike
		Vessel noise	Acoustic impacts
Site characterization	Geophysical surveying	HRG active acoustic sources	Acoustic impacts
	Geotechnical sampling	Equipment noise	Acoustic impacts
		Seafloor disturbance	Water quality effects (e.g., turbidity)
Site assessment	Installation of monopiles	Pile driving noise	Acoustic impacts
	Installation or removal of tower or buoy	Equipment noise	Acoustic impacts
		Seafloor disturbance	Water quality effects (e.g., turbidity)
		DP thruster use during vessel positioning	Entrainment or physical disturbance
Site characterization and site assessment	Any activity	Release of trash or debris	Entanglement, ingestion
		Accidental fuel spill	Water quality effects (e.g., contaminants)

DP = ducted propeller

Site Characterization

Impacts from site characterization have been analyzed in the NMFS Biological Opinion (NMFS, 2013a) and the G&G Final PEIS (BOEM, 2014a), which are incorporated herein by reference and summarized below. Although the geographic boundary for the G&G Final PEIS was outside of the WEA (it included BOEM's Mid-Atlantic and South Atlantic planning areas: Delaware to Florida), the conclusions on impact levels are applicable to this EA. The conclusions are applicable because the four species of sea turtles that occur in the New York Bight area also occur in BOEM's Mid and South Atlantic planning areas, and would be engaged in the same activities (e.g., feeding and diving). No critical habitat for sea turtles is designated in the WEA. The following conclusions for site characterization that were made in the G&G Final PEIS for BOEM's Mid-Atlantic and South Atlantic planning areas are expected to be the same in the WEA:

- Impacts from HRG active acoustic sound sources are expected to be **minor.** Acoustic signals from boomers are the only HRG equipment that operate within the hearing range for sea turtles, and may be audible to sea turtles. As such, BOEM would require a lessee to implement SOCs to minimize acoustic impacts. These SOCs include daylight only operations (unless an alternative monitoring plan is approved by BOEM and NMFS), monitoring of the 656 ft (200 m) exclusion zone by a PSO, clearance of the exclusion zone 60 minutes prior to electromechanical survey equipment start-up, "ramp up" of equipment, and immediate shutdown if a sea turtle is sighted at or within the exclusion zone (Appendix B).

- Impacts from vessel and equipment noise, including geotechnical sampling (e.g., coring), are expected to be **negligible** to **minor**. BOEM based the impact level on the basis that vessel and equipment source levels could be high enough to exceed the threshold criteria for behavioral disturbance and undetected sea turtles may occur in the ensonified area during sampling. BOEM would require a lessee to implement the following SOCs to minimize acoustic impacts: monitoring of the 656 ft (200 m) exclusion zone by a PSO, clearance of the 656 ft (200 m) exclusion zone 60 minutes prior to activity, and immediate shutdown if a sea turtle is sighted at or within the exclusion zone (Appendix B).
- Impacts from project-related vessel traffic are expected to be **negligible** because SOCs require that all vessel operators and crew maintain a vigilant watch for sea turtles, and a separation of 164 ft (50 m) from a sighted sea turtle (Appendix B).

Therefore, these impacts to sea turtles will not be discussed further in this EA.

Site Assessment

Impacts on sea turtles from site assessment activities are divided into two categories: potential impacts of underwater noise and non-acoustic impacts. Impacts are assessed by relative potential of overlap, both spatially and temporally between sea turtle species and impact-producing factors.

Underwater Acoustic Impacts

Noise is one of the most important factors that may affect sea turtles. Studies show that sea turtles are particularly sensitive to low-frequency sounds, so they hear much of the low-frequency and high-intensity man-made noise in the ocean such as vessel traffic and offshore oil and gas exploration activities (Dow Piniak et al., 2012). Although BOEM's SOCs (Appendix B, Section B.4) have incorporated the best known measures designed to minimize potential impacts on sea turtles, including daylight only operations (unless an alternative monitoring plan is approved by BOEM and NMFS), there are large data gaps regarding their behavioral and physiological responses to sound (Nelms et al., 2016). For example, when avoiding a noise, it is not known whether turtles move vertically (by surfacing or diving) or horizontally. By diving, sea turtles may be more vulnerable to acoustic exposures, and by surfacing, they may be more vulnerable to vessel strike. Sea turtles moving horizontally away from an acoustic source may be temporarily displaced from habitat being used while an active acoustic source is present. Observing turtles at the surface when the sea is not calm or with only light ripples (i.e., in sea states above Beaufort 1) is unreliable, and observation becomes more difficult with increased distance from the observation vessel (Nelms et al., 2016). It is also not possible to detect sea turtles below the surface, where they may be most exposed to sound (Nelms et al., 2016). Dow Piniak et al. (2012) indicated that repeated exposures to sound sources can cause habituation or sensitization (decreases or increases in behavioral response), which would increase long-term physiological effects. The authors recommend future studies to investigate the potential physiological (critical ratios, TTS, and PTS) and behavioral effects of exposing sea turtles to these sound sources.

Impact and Vibratory Pile Driving

Impact or vibratory pile driving may be used for the installation of a meteorological tower. Differences between impact and vibratory pile driving are discussed in Section 4.4.2.5 *Marine Mammals*. Data for impacts to sea turtles from pile driving are lacking. However, as indicated by NSF and USGS (2011), sea turtles would likely react in the same way they do to seismic sounds at the same frequency, with behavioral changes including a startle response, increased swim speed, diving responses, and avoidance of the sound source.

Although pile driving for one meteorological tower would take a relatively short time (approximately 3- 8 hours per day for up to 3 consecutive days), it would occur from May 1 to October 31, which is when sea turtles are known to be in the WEA and surrounding waters in relatively high densities. The SOCs include monitoring of an exclusion zone, limiting pile driving activities to daylight hours, implementing "soft start" to warn sea turtles away from the immediate area, and requiring a 60-minute observation period before beginning activities. While these measures are designed to minimize hearing injury impacts, some sea turtles may still be exposed to PTS levels (> $L_{pk,flat}$ 207 dB or > $L_{E,24h}$ 210 dB; Popper et al., 2014) or behavioral disturbance at L_{rms} 166 dB SELs (McCauley et al., 2000) if individuals are not sighted.

Potential impacts on sea turtles during impact and vibratory pile driving are expected to be **negligible** to **moderate** depending on the turtle's distance from the source and the source level of the driven piles.

Ducted Propeller Thruster Use for Dynamic Positioning Vessels

Although it is more likely that a jack-up barge will be used, a dynamic positioning vessel with DPs may be used for certain aspects of the foundation installation for the meteorological tower. DP thrusters and trenching activities over 8 weeks were modeled for a project offshore of Virginia (BOEM, 2015b). The sound source level assumption employed in the underwater acoustic analysis was 177 dB re 1 μPa at 3 ft (1 m) and a vessel draft of 8 ft (2.5 m) for placing source depth. For the behavioral threshold of 166 dB (RMS) for sea turtles, it was concluded that the distance would be **negligible**; therefore, no injury or behavioral harassment is expected for sea turtles.

Potential acoustic impacts caused to sea turtles due to DP thrusters are expected to be **negligible**.

Non-Acoustic Impacts

Vessel Strikes

Sea turtles have potential to be struck by vessels resulting from activities under the proposed action. In general, strikes of sea turtles would probably go undetected by vessels and are not documented unless the turtles strand. Despite the lack of on-water reporting, stranding records show that interactions between vessels and turtles are common along coastal areas. Lethal and nonlethal vessel-strike injuries observed include cracked and crushed carapaces, animals cut in half, missing limbs, propeller cuts, and scars (Foley et al., 2008; Chaloupka et al., 2008). Evaluations of published stranding data indicate that vessel-strike injuries are present in an average of 10 percent (2.5-23.7%) of all stranded sea turtles (Chaloupka et al. 2008; Foley et al., 2008; Foley, 2013; Hazel, 2009; Hazel & Gyuris, 2006; Poli et al., 2014; Casale et al., 2010; Orós et al., 2005; Tomás et al., 2008; Kopsida et al., 2002).

The proposed lease area is adjacent to major shipping lanes._The annual number of vessel trips associated with the proposed lease will be approximately 142-213 round trips annually based on the total trips for site characterization and site assessment over a 5- to 7-year period (Table 3–11). The low number of annual trips from site characterization and assessment is < 1 percent of the total annual vessel trips occurring in the New York/New Jersey ports area (>30,768 vessel trips annually). We do not expect a high risk of vessel strikes from the proposed action because the number of vessel trips is relatively low, and high densities of sea turtles are not expected to be concentrated in the vicinity of the proposed lease area. The area is considered a low density habitat because the proposed lease area is not offshore of nesting beaches, biologically important foraging areas, critical habitat, or migratory areas in which sea turtles may occur in high densities at certain times of year.

In addition to the low risk of strikes,_survey and work vessels generally travel at slow operational speeds (typically 4-6 knots), further reducing the risk of a turtle strike by allowing vessel captains to more easily spot sea turtles, and allow a greater reaction time for sea turtles to avoid an approaching vessel. Lessees will be required to follow the vessel strike avoidance SOC which requires vessel operators to the Lessee to maintain a separation distance of 50 m (164 ft) or greater from any sighted sea turtle and slow down or stop their vessel to avoid striking any turtle in a vessel's path. Considering the low number of vessel trips from the proposed action and vessel strike avoidance requirements, the risk of a vessel strike with any species of sea turtles is discountable.

Potential impacts to sea turtles from vessel traffic associated with site characterization and site assessment will be **negligible**.

Operation of Meteorological Tower/Buoy

Potential impacts on sea turtles during meteorological tower or buoy operation include operational noise, associated vessel traffic for routine maintenance of the tower or buoy and the presence of the physical structure in the water column. An increase in vessel traffic may cause an increase in sea turtle collisions or boat-related injuries, behavioral changes, or displacement from the area (NMFS, 2013a). However, with the implementation of the vessel strike avoidance measures required by the SOCs (Appendix B, Section B.1.1), the potential for construction- and maintenance-related vessels to strike sea turtles would be extremely low. The potential for sea turtles to interact with the buoy and to become entangled in the buoy or mooring system is extremely unlikely given the low probability of a sea turtle encountering one buoy or mooring system within the expanse of the WEA, and the high tension of the chain, which further reduces risk of entanglement (NMFS, 2013a).

Potential impacts to sea turtles from meteorological tower and buoy operation are expected to be **negligible**.

Entrainment in Ducted Propeller Thrusters of Dynamic Positioning Vessels

There are no documented occurrences of entrainment of sea turtles in DP thrusters. However, DP thrusters have been implicated in potential incidences of gray seal entrainment in DP thrusters. While DP thrusters have been identified as potential causes of the observed wounds, observations of predation by adult male gray seals could also explain many, if not most of the observed mortalities (Thompson et al., 2015). Other than this study, to date, there have been no documented occurrences of animal entrainment in DP thrusters. Turtles are capable of actively swimming away from thrusters and avoiding any entrainment risk. The risk of entrainment of sea turtles in DP thrusters is expected to be **negligible**.

Water Quality Effects

Meteorological tower and/or buoy installation would occur from May through October (SOCs require that no pile driving occurs from November 1 through April 30; Appendix B, Section B.4). During meteorological tower or buoy installation, disturbance of the sediment can cause elevated levels of turbidity and release of contaminants that may negatively affect foraging sea turtles. However, water quality effects from tower/buoy installation are anticipated to be short-term, temporary, and highly localized compared to the available forage habitat for sea turtles.

Potential impacts on sea turtles caused by water quality effects as a result of meteorological tower/buoy installation are therefore expected to be **negligible**.

Loss of Habitat, Prey Abundance, and Distribution Effects

The installation and presence of a meteorological tower or buoy, scour control mats, and rock armoring would result in a temporary disturbance and a permanent loss of benthic habitat over a very small area in the WEA. In the case of a tower, there would be a shift from a soft horizontal bottom to a hard, vertical substrate, which may attract finfish and benthic organisms. It is possible that some of these benthic organisms would be prey species for loggerhead and Kemp's ridley sea turtles. Additionally, all four sea turtle species addressed in this EA may be attracted to the meteorological tower structure for shelter (NMFS, 2013a). However, a single meteorological tower within the total area of the WEA is unlikely to alter distribution of any forage species for sea turtles. The chain sweep area around the anchor is expected to be denuded of benthos, but this is a very small area compared to the available benthic habitat in the entire WEA, and thus not likely to negatively affect sea turtle foraging habitat.

Potential impacts to sea turtles due to loss of habitat, changes to prey abundance, and distribution from installation and operation of a meteorological tower or buoy are expected to be **minor**.

Meteorological Tower or Buoy Decommissioning

During meteorological tower or buoy decommissioning, disturbance of the sediment can cause elevated levels of turbidity and release of contaminants that may negatively affect foraging sea turtles. However, impacts would be of lower magnitude than those resulting from installation activities. Water quality effects from tower/buoy decommissioning are expected to be short-term, temporary, and highly localized compared to the available forage habitat for sea turtles.

Potential impacts to sea turtles from meteorological tower or buoy decommissioning are expected to be **negligible**.

Non-Routine Events

Non-routine events could affect sea turtles during both site characterization and site assessment. The following conclusions for non-routine events that were made in the G&G Final PEIS for BOEM's Mid-Atlantic and South Atlantic planning areas (BOEM, 2014a) are expected to be the same in the New York WEA. These conclusions are applicable to the proposed action because the same species of sea turtles occur in the New York Bight area, and would be engaged in the same activities (e.g., feeding and diving). No critical habitat for sea turtles is designated in the WEA.

- Impacts from trash and debris are expected to be **negligible** because the SOCs require a briefing on marine trash and debris awareness and elimination (Appendix B).
- Potential impacts on sea turtles from fuel spills are expected to range from **negligible** (if the fuel does not contact individual turtles) to **minor** (if individual turtles encounter the slick). Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills.

Therefore, these impacts to sea turtles will not be discussed further in this EA.

Conclusion

Overall, impacts to sea turtles are expected to be **moderate**, although potential impacts to sea turtles would range from negligible to moderate depending on the activity being conducted during site characterization and site assessment. Vessel strike and noise are two of the most important factors that may affect sea turtles. However, implementing the vessel strike avoidance measures in the SOCs (Appendix B, Section B.1.1) would minimize the potential for vessel strikes and adverse impacts on sea turtles. There are large data gaps regarding behavioral and physiological responses of sea turtles to sound, and recommendations for future studies include the potential physiological (critical ratios, TTS, and PTS) and behavioral effects of exposure to sound sources.

Although implementation of the SOCs is expected to minimize the potential of hearing injury impacts and disruption the behavior of sea turtles, pile driving from May 1 to October 31 (Appendix B, Section B.4), coincides with the time of year that sea turtles are known to occur in the WEA. However, pile driving of one meteorological tower would take a relatively short time (approximately 3-8 hours per day for up to 3 days), which would limit the turtles' exposure to the sound to periodic disruptions over a 1- to 3-day period. Sea turtles that avoid the area are expected to successfully forage in nearby habitats with similar prey availability. There are no critical or otherwise important foraging habitats known to occur in the area of the WEA. As more information becomes available, BOEM will continue to reassess required SOCs in order to ensure sufficient and effective protection of protected species.

4.4.2.7 Finfish, Invertebrates, and Essential Fish Habitat

Description of the Affected Environment

<u>Finfish</u>

As a result of its seasonal water temperatures and unique bathymetry, the New York Bight contains a wide range of habitats that vary in physical and biological properties. The ridge and swale topography and the Hudson River Canyon, which nearly bisects this area of the northern Mid-Atlantic Bight (located south of the proposed lease area), contribute to the diverse biological habitat. The oceanographic and biological processes of this area have been described by Steves et al. (1999) and Stevenson et al. (2004). Finfish distribution patterns and assemblages for larval, juvenile, and adult life stages in the Mid-Atlantic Bight have been characterized in a number of publications, including Colvocoresses and Musick (1984), Morse et al. (1987), Gabriel (1992), Cowen et al. (1993), Mahon et al. (1998), and Steves et al. (1999). Table 418 summarizes the dominant demersal finfish species observed in the New York Bight during spring and fall NMFS Groundfish Surveys conducted from 1967 through 1976. It is important to note that Table 4–18 is characterizing the entire Mid-Atlantic Bight. Detailed commercial catch by value from the proposed NY lease area is in Appendix G. Although the time period that the information on these species assemblages may seem outdated it is nonetheless a good characterization of the species assemblages by season and spatial occurrence on the OCS. Many of the fish species found in the WEA are important because of their value as commercial and recreational fisheries.

Table 4–18
Dominant Demersal Finfish Species in the Mid-Atlantic Bight

Season	Species Assemblage			
	Boreal	**Warm Temperate**	**Inner Shelf**	**Outer Shelf**
Spring	• Atlantic cod • Little skate • Longhorn sculpin • Monkfish • Ocean pout • Red hake • Silver hake • Spiny dogfish • Winter flounder • Yellowtail flounder	N/A	• Windowpane flounder	• Fourspot flounder
Fall	• Little skate • Red hake • Silver hake • Spiny dogfish • Winter flounder • Yellowtail flounder	• Black sea bass • Butterfish • Northern searobin • Scup • Smooth dogfish • Spotted hake • Summer flounder	• Windowpane flounder	• Fourspot flounder

Source: Colvocoresses & Musick, 1984

The affected environment encompasses demersal and pelagic habitats in the open ocean that provide habitat for over 300 fish species (Jones et al., 1978). A general description of the affected environment for this section of the Atlantic OCS is provided in the *PEIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf* (MMS, 2007a). Mid-Atlantic Bight hardbottom and soft-bottom demersal fishes, pelagic fishes (i.e., coastal pelagic, epipelagic, and mesopelagic fishes), and ichthyoplankton are discussed in the G&G Final PEIS (BOEM, 2014a). These descriptions of the affected environment for fish are hereby incorporated by reference. Finfish use of the proposed lease area is also discussed further in the EFH section below.

Invertebrates

Several managed invertebrate species occur in the New York Bight and are known to occur or could occur in the WEA, including longfin inshore squid (*Doryteuthis pealeii* formerly named

Loligo pealeii), Atlantic sea scallop (*Placopecten magellanicus*), Atlantic surfclam (*Spisula solidissima*), ocean quahog (*Artica islandica*), horseshoe crabs (*Limulus polyphemus*), and American lobster (*Homarus americanus*). These species are briefly discussed below.

Longfin Inshore Squid

Longfin inshore squid is a pelagic schooling species that occurs from Newfoundland to the Gulf of Venezuela along continental shelf and slope waters. Commercial exploitation occurs from southern Georges Bank to Cape Hatteras, and longfin inshore squid are considered to be a single stock in this range (Jacobson, 2005). Longfin inshore squid eggs are demersal and generally spawned in water depths < 164 ft (50 m) (Lange, 1982), at temperatures of 10 to 23 degrees Celsius (°C), and salinities of 30 to 32 parts per thousand (ppt) (McMahon & Summers, 1971). Egg clusters are often found attached to rocks and small boulders, on sandy/muddy bottoms, and on aquatic vegetation (Jacobson, 2005). Larvae are pelagic and occur in near surface water at temperatures of 10 to 23 °C and salinities of 31.5 to 34.0 ppt (Vecchione, 1981). Squid shift from inhabiting surface waters to a demersal lifestyle at 1.75 in. (45 mm) mantle length (Vecchione, 1981). The population makes seasonal migrations that appear to be based on water temperatures, moving offshore during late autumn to overwinter in warmer waters along the continental shelf and returning inshore during the spring and early summer to spawn (Black et al., 1987; MAFMC, 1998). Larger individuals (> 7 in. [18 cm] mantle length) migrate inshore during April and May, while smaller individuals (3-4 in. [8-10 cm] mantle length) move inshore in the summer (Lange, 1982). Longfin squid are known to occur in the WEA (NEFSC, 2011). Squid abundance in the WEA during the NEFSC 1975–2008 bottom trawl surveys ranged from 0 to 1 to 300 squid per tow in the spring and from 301 to 2,500 to 5,001 to 27,589 squid per tow in the fall (NEFSC, 2011). Catch data for NMFS statistical area 612 (New York Bight) for 2000–2014 show most of the squid catch occurs in the summer between June and August for that area. (Source: NMFS NEFSC Vessel Trip Report Records 2000–2014 for Statistical Area 612).

Atlantic Sea Scallop

The Atlantic sea scallop (*Placopecten magellanicus*) is a bivalve mollusk that ranges from the Strait of Belle Isle, Newfoundland, to Cape Hatteras, North Carolina, at depths from the low tide level to approximately the 328 ft (100 m). Sea scallops in the Mid-Atlantic Bight are generally found at depths between 88 to 262 ft (27- 80 m) (Hart & Chute, 2004). Sea scallop eggs are not buoyant and remain on the seafloor until they develop into free-swimming pelagic larvae (Merrill, 1961; Culliney, 1974; Langton et al., 1987; Hart& Chute, 2004). At the end of the pelagic larval stage, larvae settle on areas of gravelly sand with shell fragments, pebbles, or substrates covered with a biofilm (Culliney, 1974; Parsons et al., 1993; Hart & Chute, 2004). Scallops end their pelagic existence when they enter the pediveliger stage (spat), developing a foot and secreting threads (byssus) which are used to attach to hard surfaces (Merrill, 1961; Culliney, 1974). Juvenile scallops (0.2- 0.5 in [5-12 mm] shell height) leave the substrate they originally settled on and attach themselves to gravel, small rocks, shells, and branching organisms (Thouzeau et al., 1991; Stokebury and Himelman, 1995; Hart and Chute, 2004). Adult scallops prefer coarse substrate such as gravel, shell, and rocks with some water movement and often occur in dense aggregations called beds (Thouzeau et al., 1991; Hart & Chute, 2004). Atlantic sea scallops occur in the WEA at densities that range from zero to one scallops per station (0-0.08 scallops per m^2) to one to four scallops per station (0.08-0.31 scallop per m^2) based on observations made during the 2011 SMAST video survey (Figure 4–13) (Stokesbury et al., 2004; Stokesbury et al., 2015). A density of 0.08 scallops per m^2 is considered to be the minimum commercially viable density (Stokesbury, 2002; Adams et al., 2008).

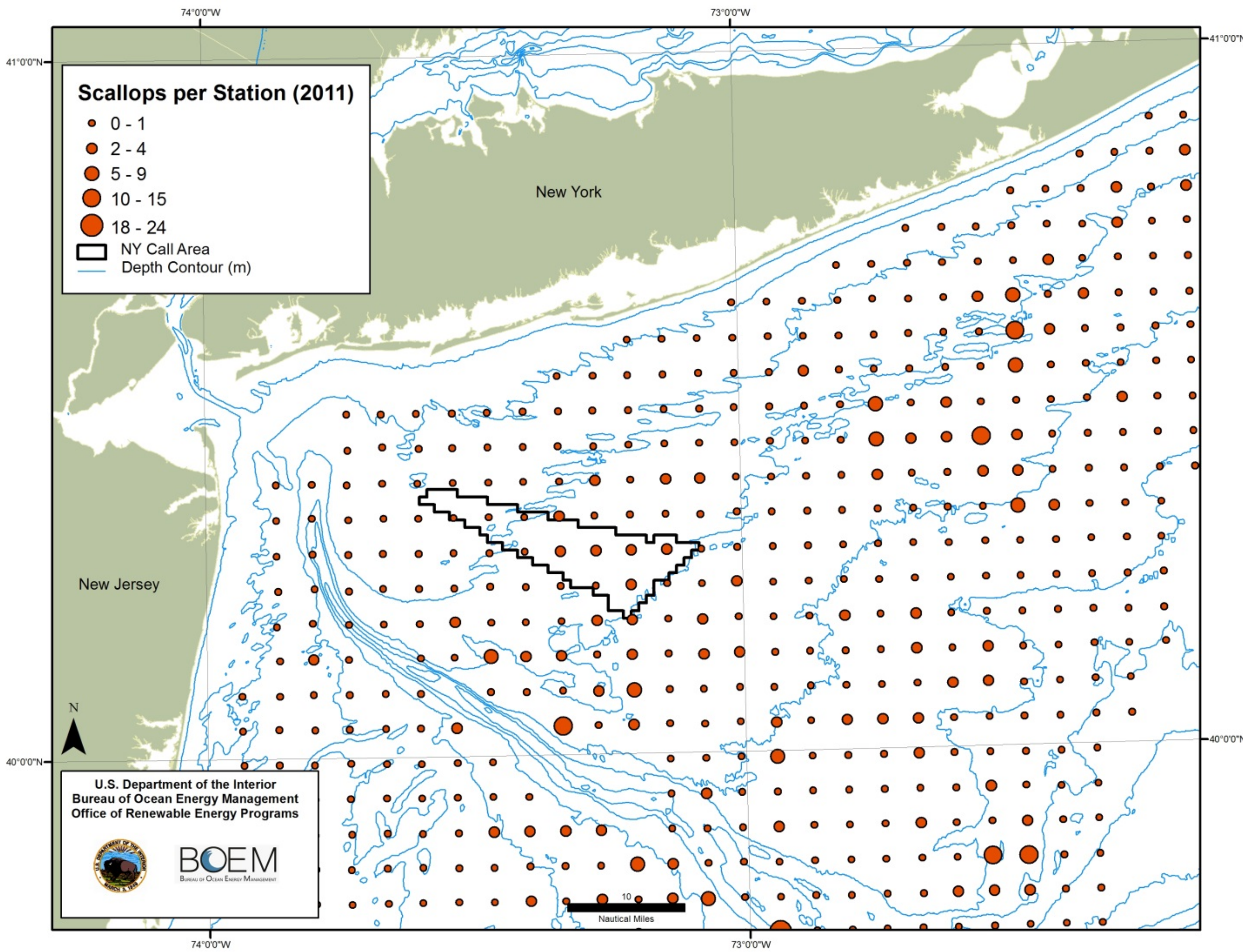
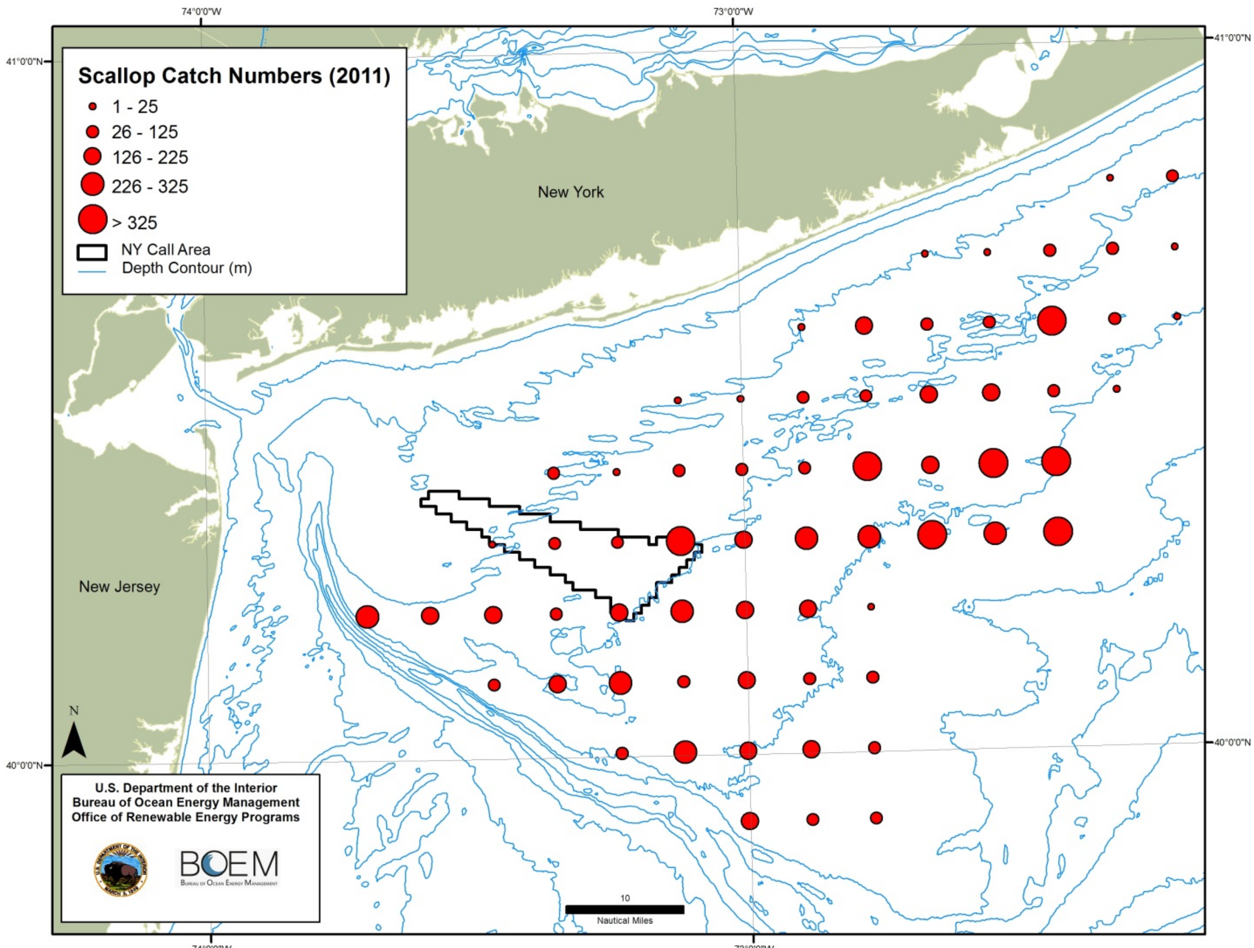
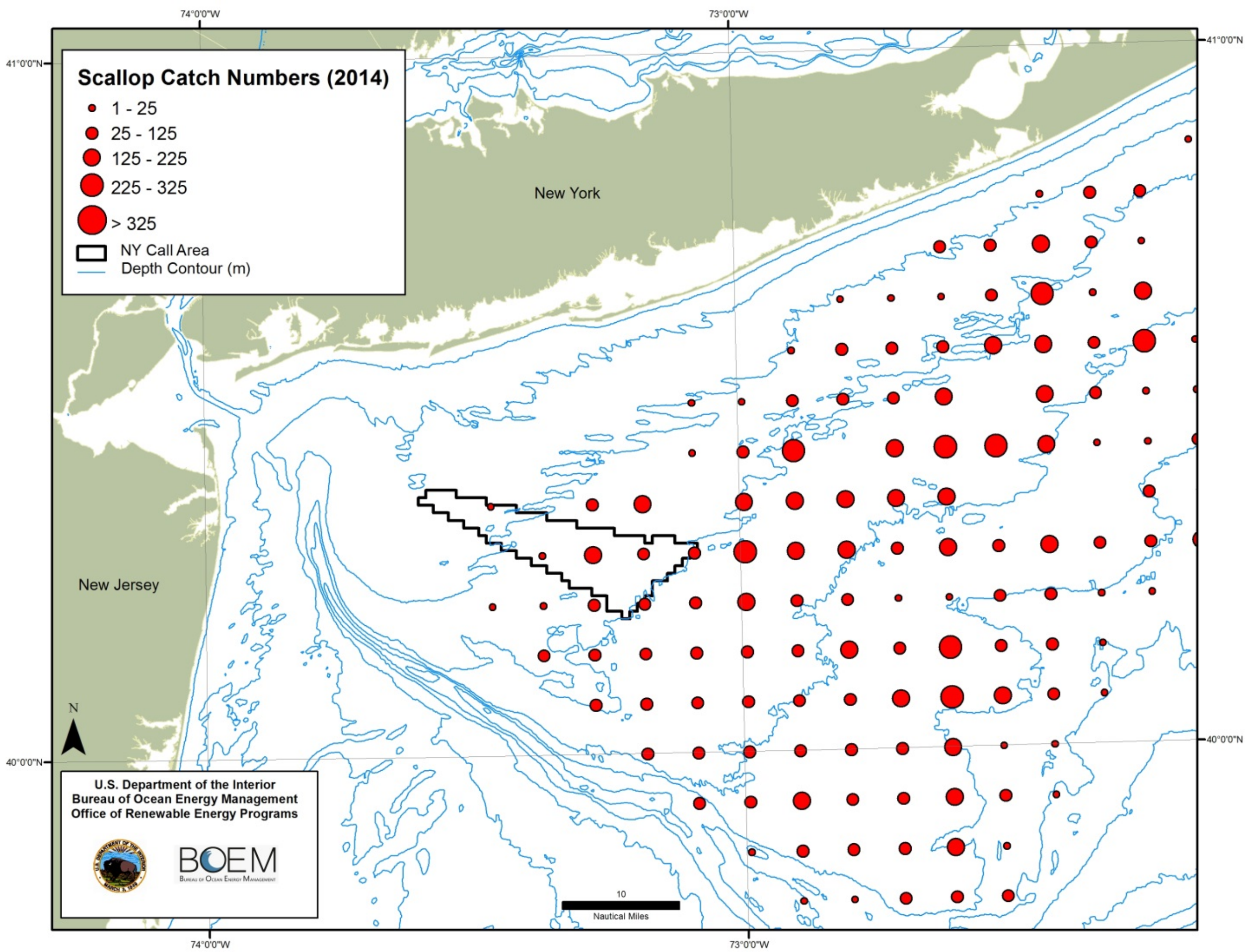


Figure 4-16 Atlantic Sea Scallops Abundance in the New York Bight Recorded during the 2011 SMAST Video Survey.

Note: The sampled bottom area was approximately 12.94 m^2 per station (Stokesbury et al., 2015). The New York WEA is outlined in black.

In addition to the SMAST scallop resource video surveys, the Virginia Institute of Marine Science (VIMS) also conducted scallop resource dredge surveys in the New York Bight in 2011, 2014, 2015, and 2016 (David Rudders, VIMS personal communication). However, only in 2011 and 2014 were there survey stations in the New York WEA. The results are shown in Figures 4–17a and 4–17b below.





Figures 4-17(a) & 4-17(b) Atlantic sea scallops abundance surveys in the New York Bight in 2011 and 2014 from the VIMS mid-Atlantic scallop resource dredge survey.

Atlantic Surfclam

The Atlantic surfclam is a bivalve mollusk that inhabits sandy continental shelf habitats from the southern Gulf of St. Lawrence to Cape Hatteras, NC (Merrill & Ropes, 1969). Major concentrations of surfclams are found in the United States on Georges Bank, south of Cape Cod, and off Long Island, southern New Jersey, and the Delmarva Peninsula (Merrill & Ropes, 1969; Ropes, 1980). Surfclam eggs and larvae are planktonic and drift with the currents until the larvae metamorphose through several stages into juveniles and settle to the bottom (Ropes, 1980; Loosanoff & Davis, 1963; Ropes, 1980; Fay et al., 1983). Juveniles and adults burrow in medium to coarse sand and gravel, and in silty to fine sand substrates at depths of 26 to 217 ft (8-66 m) in the turbulent areas beyond the breaker zone (Fay et al., 1983; Cargnelli et al., 1999a). Surfclam concentrations in the WEA appear to be moderate or secondary (<1 bushel) concentrations (Ropes, 1980; Fay et al., 1983). The NEFSC 2011 clam dredge survey data showed low catch rates (0 and 1-50 clams per tow) of total surfclams and pre-recruits in the WEA (NEFSC, 2013).

Ocean Quahog

Ocean quahog is a long-lived, slow growing bivalve mollusk that inhabits temperate and boreal waters on both sides of the North Atlantic (Cargnelli et al., 1999b). In the western Atlantic it is found on the continental shelf from Newfoundland to Cape Hatteras, NC, with the greatest concentrations occurring south of Nantucket to the Delmarva Peninsula (Merrill & Ropes, 1969; Serchuk et al., 1982). Ocean quahog eggs and larvae are planktonic and drift with the currents until the larvae metamorphose into juveniles and settle to the bottom (Cargnelli et al., 1999b). Juveniles and adults occur in medium to fine sand, sandy mud, and silty sand substrates with temperatures remaining below 20 ºC at depths between 46 to 269 ft (14-82 m) (Cargnelli et al., 1999b). Ocean quahog concentrations in the WEA during the NEFSC 2008 clam survey ranged from 1 to 50 to 251 to 750 clams per tow for quahogs greater than 2.75 in. (70 mm) and from 0 to 1 to 50 clams per tow for quahogs less than 2.75 in. (70 mm) (NEFSC, 2009).

Horseshoe Crab

Horseshoe crabs are benthic arthropods that occur in western Atlantic estuaries and on the continental shelf from Maine to the Yucatan peninsula (Shuster, 1982). They are most abundant from New Jersey to Virginia (ASMFC, 1998). Horseshoe crabs are ecological generalists and occur in a wide range of habitats. They are generally found in waters shallower than 66 ft (20 m), although they have been observed 35 mi (56 km) offshore (Botton & Ropes, 1987; ASMFC, 1998). Adult horseshoe crabs in the Mid-Atlantic migrate from deep bay waters and the continental shelf to spawn on sheltered intertidal sandy beaches (Shuster & Botton, 1985). Horseshoe crabs feed on a wide variety of benthic organisms, including mollusks, annelids, arthropods, and nemertean worms (Botton, 1984; Botton & Haskin, 1984).

American Lobster

The American lobster is a commercially important, long-lived, epibenthic crustacean that occurs in the western Atlantic from Labrador to North Carolina, from the intertidal zone to 2,362 ft (720 m) (MacKenzie & Moring, 1985). American lobsters prefer rocky habitat and sand-mud burrowing areas that provide sheltering habitats. They occur in clay, mud-silt, mud-rock, sand-rock, and rock-bedrock substrates (Cooper & Uzmann, 1980; MacKenzie & Moring, 1985; Lawton & Lavalli, 1995). Inshore lobsters tend to be solitary and territorial with a home range of 0.77 to 3.1 mi^2 (2-8 km^2). Large offshore lobsters share shelters and make seasonal migrations inshore to reproduce (MacKenzie & Moring, 1985). Lobster diet is omnivorous consisting of a variety of benthic invertebrates (crabs, bivalves, sea urchins, and polychaetes), fish, and plants (MacKenzie & Moring, 1985). The WEA is located within the NOAA Statistical Area 612 and lobsters in the WEA are managed under the Southern New England stock by NMFS. This stock is currently in a severely depleted condition (ASMFC, 2015). The Southern New England 2011–2012 spring and fall trawl survey data show low catch rates (0 and 1–50 lobsters) in Statistical Area 612, with no large lobster (≥ 5 in. [127 mm]) collected (ASMFC, 2015).

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act of 1976, amended in 1996 by the U.S. Congress under the Sustainable Fisheries Act, and reauthorized in 2006, recognized that many fisheries depend on marine, nearshore, and estuarine habitats for at least part of their lifecycles. It introduced requirements to protect estuarine and marine ecosystems through identification and conservation of EFH for those species regulated under a federal fisheries management plan. NMFS is mandated by the Sustainable Fisheries Act to coordinate with other federal agencies to avoid, minimize, mitigate, or offset adverse effects on EFH that could result from proposed activities. EFH is defined as waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (50 CFR 600.10; 16 U.S.C. 1802(10)). Fish are defined as finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds (50 CFR 600.10). The EFH procedure involves the identification and designation of Habitat Areas of Particular Concern (HAPC) within fishery management plans. HAPC are discrete subsets of EFH that provided especially important ecological function or are particularly vulnerable to degradation (50 CFR 600.10).

EFH has been designated for 37 species in the WEA (Table 4–19). No HAPC have been designated in the WEA. EFH descriptions for several of the designated species in the WEA are provided in the G&G Final PEIS (BOEM, 2014a) and are hereby incorporated by reference. EFH descriptions for species and life stages that were not discussed in the G&G Final PEIS (BOEM, 2014a) are summarized in Table 4–19. Although not a conservation recommendation in the EFH consultation with NMFS, NMFS did indicate in comments on this EA that Cholera Bank was considered a sensitive habitat for which bottom disturbing should be avoided. In this revised EA BOEM removed the Cholera Bank area (1,779 ac) from further lease consideration. More information on Cholera Bank is in Section 4.4.2.3.

Impact Analysis of Alternative A

The *PEIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (MMS, 2007a) identified potential impacts to fish resources and EFH that could occur in OCS WEAs in the Atlantic region during site characterization, including G&G surveys; vessel and equipment noise; and meteorological tower/buoy installation, operation, and decommissioning. The potential impacts of renewable energy site characterization on finfish resources and EFH have been analyzed in the G&G Final PEIS (BOEM, 2014a) and are incorporated herein by reference and summarized below. Although the geographic boundary in the G&G Final PEIS is outside of this WEA (it included BOEM's Mid-Atlantic and South Atlantic planning areas: Delaware to Florida), many species occur in both areas, and the conclusions on impact levels are applicable to this EA. The following conclusions for site characterization that were made in the G&G Final PEIS are expected to be the same in the WEA:

- Impacts from acoustic sound sources from HRG surveys and geotechnical exploration are expected to be **negligible**. A boomer sub-bottom profiler is the only sound source expected to produce sounds within finfish and invertebrate hearing ranges (see Table 3–3 in Section 3.2.1.1 *High-Resolution Geophysical Surveys* and Table 48 showing acoustic thresholds).
- Impacts from vessel and equipment noise are expected to be **negligible.**
- Impacts from seafloor disturbances are expected to be **negligible.**

Table 4–19
Species and Life Stages with Essential Fish Habitat Designated in the WEA

Species	Life Stages			
	Eggs	**Larvae**	**Juveniles**	**Adults**
New England Species				
Atlantic cod (*Gadus morhua*) References: Lough, 2004; NEFSC HCD, 2014	Not in AOI	Not in AOI	Not in AOI	Rocky, pebbly, or gravelly bottom substrates at depths from 33 to 492 ft (10 to 150 m) with salinities of 29–34 ppt and temperatures of <10 °C.
Atlantic sea herring (*Clupea harengus*) References: Stevenson and Scott, 2005; NEFSC HCD, 2014	Not in AOI	Pelagic estuarine, coastal, and offshore waters from the Bay of Fundy to New Jersey. Larvae occur in very shallow water to 656 ft (200 m), at salinities of 2.5–52.5 ppt, and temperatures of −1.8 to 24 ºC.	Designated*	Designated*
Haddock (*Melanogrammus aeglefinus*) References: Brodziak, 2005; NEFSC HCD, 2014	Not in AOI	Pelagic larvae drift with surface currents at depths of 33 to 164 ft (10 to 50 m) and temperatures between 5 to 9 °C. Larvae occurring in the New York Bight have been swept off Georges Bank.	Not in AOI	Not in AOI
Little skate (*Leucoraja erinacea*) Reference: Packer et al., 2003a	Insufficient information	Does not apply	Sand, mud, or gravel substrates at depths from 3 to 1,312 ft (1 to 400 m) with salinities of 26–36 ppt, and temperatures of 1–22 °C. Little skate move seasonally onshore and offshore, generally into shallow water during the spring and deeper water in the winter.	
Monkfish (*Lophius americanus*)	Designated*	Designated*	Designated*	Designated*

Species	Life Stages			
	Eggs	Larvae	Juveniles	Adults
Ocean pout (*Macrozoarces americanus*) References: Steimle et al., 1999a; NEFSC HCD, 2014	Sheltered nests in holes or crevices at depths of < 164 ft (50 m) with salinities 32–34 ppt, and temperatures < 10 °C.	Demersal habitats in close proximity to bottom and nest areas at depths of < 164 ft (50 m) with salinities > 25 ppt and temperatures < 10 °C.	Bottom habitats that provide shelter (rocks, algae, and shells) at depths from 3 to 656 ft (1 to 200 m) with salinities > 25 ppt, and temperatures of 3–14 °C.	Sand, gravel, rough bottom, and other substrates that allow fish to dig depressions at depths of < 1191 ft (363 m), with salinities of 32–34 ppt, and temperatures of 3–14 °C.
Red hake (*Urophycis chuss*)	Designated*	Designated*	Designated*	
Silver hake (*Merluccius bilinearis*)	Designated*	Designated*	Designated*	Designated*
Windowpane flounder (*Scophthalmus aquosus*)	Designated*	Designated*	Designated*	Designated*
Winter flounder (*Pseudopleuronectes americanus*) References: Pereira et al., 1999; NEFSC HCD, 2014	Demersal eggs spawned on sand, muddy sand, mud, and gravel bottom substrates at depths from 1 to 16 ft (0.3 to 5 m) inshore and < 295 ft (90 m) on Georges Bank at salinities of 10–32 ppt and temperatures of 1–10 °C.	Larvae are found in pelagic and bottom waters over fine sand and gravel, at depths from 3 to 16 ft (1 to 5 m) inshore at salinities of 3.2–30 ppt and temperatures of 2–20.5 °C.	Sand with shell or leaf debris, muddy sand, and mud bottom substrates at depths from 1.6 to 59 ft (0.5 to 18 m) inshore and < 328 ft (100 m) offshore with salinities of 10–33 ppt and temperatures of 2–25 °C.	Sand, mud, gravel, cobble, and boulder bottom substrates at depths from 3 to 98 ft (1 to 30 m) inshore and < 328 ft (100 m) offshore with salinities of 15–33 ppt and temperatures of 1–25 °C.
Winter skate (*Leucoraja ocellata*) Reference: Packer et al., 2003b	Insufficient information	Does not apply	Sand and gravel bottom substrates at depths from 3 to 1,312 ft (1 to 400 m) with salinities of 20–35 ppt and temperatures of 0–21 °C.	Not in AOI
Witch flounder (*Glyptocephalus cynoglossus*)	Designated*	Designated*		

Species	Life Stages			
	Eggs	**Larvae**	**Juveniles**	**Adults**
Yellowtail flounder (*Limanda ferruginea*) References: Johnson et al., 1999; NEFSC HCD, 2014	Pelagic eggs are found in surface waters at depths from 33 to 2,461 ft (10 to 750 m), with salinities of 32.4–33.5 ppt, and temperatures of 2–15 °C.	Pelagic larvae are found in surface waters at depths from 33 to 4,100 ft (10 to 1,250 m) with salinities of 32.4–33.5 ppt and temperatures of 5–17°C.	Sand or sand mud bottom substrates at depths from 29.5 to 942 ft (9.0 to 287 m) with salinities of 32.4–33.5 ppt and temperatures of 2–18°C.	Sand or sand mud bottom substrates at depths from 29.5 to 780 ft (9.0 to 238 m) with salinities of 32.4–33.5 ppt and temperatures of 2–18°C.
Mid-Atlantic Species				
Atlantic butterfish (*Peprilus triacanthus*)	Designated*	Designated*	Designated*	
Atlantic mackerel (*Scomber scombrus*)	Designated*	Designated*	Designated*	
Black sea bass (*Centropristis striata*)	Insufficient information	Designated*	Designated*	Designated*
Bluefish (*Pomatomus saltatrix*)	Designated*	Designated*	Designated*	Designated*
Longfin inshore squid (*Doryteuthis pealeii /Loligopealeii*)	Designated*	N/A	Designated*	Designated*
Ocean quahog (*Artica islandica*)	N/A	N/A	Designated*	Designated*
Scup (*Stenotomus chrysops*) References: Steimle et al., 1999b; NEFSC HCD, 2014	Insufficient information	Insufficient information	Sand and mud substrates, and mussel and eel grass beds in estuarine and coastal areas from the intertidal to 125 ft (38 m) at temperatures from 7 to 27 °C.	Designated*
Spiny dogfish (*Squalus acanthias*)	Does not apply	Does not apply	Designated*	Designated*
Summer flounder (*Paralichthys dentatus*)	Designated*	Designated*	Designated*	Designated*

Species	Life Stages			
	Eggs	**Larvae**	**Juveniles**	**Adults**
Surfclam (*Spisula solidissima*)	N/A	N/A	Designated*	Designated*
South Atlantic Coastal Migratory Pelagic Species				
Cobia (*Rachycentron canadum*)	Designated*	Designated*	Designated*	Designated*
King mackerel (*Scomberomorus cavalla*)	Designated*	Designated*	Designated*	Designated*
Spanish mackerel (*Scomberomorus maculatus*)	Designated*	Designated*	Designated*	Designated*
Highly Migratory Species				
Atlantic bluefin tuna (*Thunnus thynnus*)	Not in AOI.	Not in AOI.	Designated*	Not in AOI.
Basking shark (*Cetorhinus maximus*) References: NMFS, 2006; NMFS, 2009	Does not apply	Not in AOI.	Atlantic east coast from the Gulf of Maine to the northern Outer Banks of North Carolina. Continental shelf in waters 164 to 656 ft (50 to 200 m) deep, where high abundances of zooplankton are created by water column physical conditions.	
Blue shark (*Prionace glauca*) Reference: NMFS, 2009	Does not apply	Neonate/YOY ≤90 cm total length. Atlantic Ocean areas off of Cape Cod through New Jersey.	91 to 220 cm total length. New England to Cape Hattaras, and localized areas in the Gulf of Maine, off South Carolina and the mid-east coast of Florida.	≥221 cm total length. The Gulf of Maine to South Carolina, and localized areas in the Atlantic off Georgia and Florida. Localized areas off Puerto Rico and the U.S. Virgin Islands.
Common thresher shark (*Alopias vulpinus*) Reference: NMFS, 2009	Does not apply	In the Atlantic, from Cape Cod through North Carolina, and localized areas in the Gulf of Maine, South Carolina, Georgia, and off the mid-east coast of Florida. Localized areas off of Puerto Rico.		

Species	Life Stages			
	Eggs	Larvae	Juveniles	Adults
Dusky shark (*Carcharhinus obscurus*) Reference: NMFS, 2009	Does not apply	Neonate/YOY ≤121 cm total length. Pelagic waters along the Atlantic coast from southern Cape Cod to South Carolina, mid-coast of Georgia to the east coast of Florida.	Pelagic waters in the Atlantic from southern Cape Cod to South Carolina, and the east coast of Florida. Localized areas in the Florida Keys, mid-west coast of Florida, the Florida Panhandle, southern Texas, and central Gulf of Mexico.	
Sand tiger shark (*Carcharias taurus*) Reference: NMFS, 2009	Does not apply	Neonate/YOY ≤129 cm total length. Along the Atlantic east coast from Cape Cod to northern Florida.	Not in AOI	Not in AOI
Sandbar shark (*Carcharhinus plumbeus*) Reference: NMFS, 2009	Does not apply	Neonate/YOY ≤78 cm total length. Long Island, New York to Cape Lookout and localized areas along the Atlantic coast of South Carolina and Georgia.	79 to 190 cm total length. Southern New England to Cape Lookout and localized areas along the Atlantic coast of southern North Carolina South Carolina, and Florida.	≥191 cm total length. Atlantic coastal areas throughout southern New England to Florida. Coastal areas from the Florida Keys to the Florida Panhandle in the Gulf of Mexico, and localized area off of Alabama.
Shortfin mako shark (*Isurus oxyrinchus*) Reference: NMFS, 2009	Does not apply	In the Atlantic, localized areas off of Maine, South Carolina, and Florida, and from southern New England though Cape Lookout.		
Skipjack tuna (*Katsuwonus pelamis*) Reference: NMFS, 2009	Does not apply	Not in AOI	Not in AOI	≥45 cm fork length. Cape Cod to Cape Hatteras and the southern east coast of Florida through the Florida Keys, and localized areas in the Atlantic off of South Carolina and the northern east coast of Florida.

Species	Life Stages			
	Eggs	Larvae	Juveniles	Adults
Tiger shark (*Galeocerdo cuvieri*) Reference: NMFS, 2009	Does not apply	Not in AOI	205 to 319 cm total length. Atlantic east coast from New England to Florida.	≥ 320 cm total length. Atlantic east coast from southern New England to Florida.
White shark (*Carcharodon carcharias*) Reference: NMFS, 2009	Does not apply	In the Atlantic, Cape Cod to Maryland, and along North Carolina, South Carolina, and the northern east and mid- coast of Florida.		

AOI = Area of Interest (New York WEA)

Designated* = denotes that EFH has been designated for this life stage in the area of interest. A summarized EFH description is available in the G&G Final PEIS (BOEM, 2014a).

Does not apply = Life stage does not exist for this species.

Insufficient information = there is insufficient data for the life stages listed and no EFH designation has been made as of yet.

N/A = there are no EFH designations for these squid, ocean quahog, or surfclam life stages.

ppt = parts per thousand

YOY = Young-of-the-year

Table 4–20
Pile Driving Sound Exposure Guidelines for Fish[(1)]

Fish Type	Hearing Detection Type	Mortality and Potential Mortal Injury[(2)]	Impairment			Behavior Changes[(4)]
			Recoverable Injury[(2),(4)]	Temporary Threshold Shift[(3),(4)]	Masking[(4)]	
No swim bladder	Particle motion	> 219 dB SEL_{cum} or > 213 dB_{peak}	> 216 dB SEL_{cum} or > 213 dB_{peak}	> 186 dB SEL_{cum}	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Swim bladder (is not involved in hearing)	Particle motion	210 dB SEL_{cum} or > 207 dB_{peak}	203 dB SEL_{cum} or > 207 dB_{peak}	> 186 dB SEL_{cum}	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Swim bladder (is involved in hearing)	Primarily pressure detection	207 dB SEL_{cum} or > 207 dB_{peak}	203 dB SEL_{cum} or > 207 dB_{peak}	186 dB SEL_{cum}	(N) High (I) High (F) Moderate	(N) High (I) High (F) Moderate

Fish Type	Hearing Detection Type	Mortality and Potential Mortal Injury[2]	Impairment			Behavior Changes[4]
			Recoverable Injury[2],[4]	Temporary Threshold Shift[3],[4]	Masking[4]	
Eggs and larvae	N/A	> 210 dB SEL_{cum} or > 207 dB_{peak}	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low

(1) Data on mortality, recoverable injury, and the relative risk (high, moderate, and low) of masking and behavior changes for fish at three distances (near, intermediate, and far) from a pile driving source without mitigation measures. Adapted from Popper et al. (2014).

(2) Halvorsen et al., 2011, 2012a, 2012b

(3) Popper et al., 2005

(4) Relative terms of distance from source: N = near (tens of meters); I = intermediate (hundreds of meters); F = far (thousands of meters)

dB = decibel
dB_{peak} = peak sound pressure
SEL_{cum} = cumulative sound exposure level

The G&G Final PEIS (BOEM, 2014a) assessment of impacts on fish and EFH from acoustic sound sources, vessel and equipment noise, seafloor disturbance, and discharge of waste materials and accidental fuel releases was for G&G-related site characterization activities only. While the number of vessel trips and area of seafloor disturbance for activities covered in this EA differ from those in the G&G Final PEIS, the overall types of impacts to finfish, shellfish, and EFH would be the same. The Atlantic G&G Final PEIS concludes that high-frequency sounds emitted by active electromechanical acoustic (HRG) operations in the AOI would likely affect the behavior of herrings and other fish resources in a detectable way. Changes in behavior, particularly in pre-spawning fish assembling to move into spawning rivers, could affect reproductive potential or feeding activity. In addition, temporary displacement of prey species could affect feeding routines of predatory fishes and marine mammals. Because the use of electromechanical sources would be mostly from moving vessels and individual surveys would be temporary and spatially limited, the impacts on these fishes and populations are expected to be **minor** (Section 4.2.5.2.2 of FPEIS). The following sections discuss the potential impacts on finfish, shellfish, and EFH that could result under the proposed action and were not considered in the G&G Final PEIS analysis or where new or updated information is available. These include impacts from meteorological tower/buoy installation, operation, and decommissioning, including the acoustic effects from pile driving, sedimentation, habitat loss, and changes in species abundance and distribution.

Meteorological Tower/Buoy Installation

Pile Driving Acoustic Effects

The primary factor that could affect finfish and shellfish resources from meteorological tower installation is the underwater noise generated during installation of the piles to support a meteorological tower. Impacts of man-made underwater sound on fishes and invertebrates, such as those generated during pile driving, have been discussed in a number of publications including McCauley et al. (2000), Hastings and Popper (2005), Thomsen et al. (2006), Popper and Hasting (2009), Normandeau Associates, Inc. (2012), and Popper et al. (2013, 2014). Impact pile driving generates intermittent, impulsive sounds characterized by a rapid rise time followed by a decay period in a wide range of frequencies (20 hertz [Hz] to > 20 kHz; Thomsen et al., 2006; Popper et al., 2014). The type and intensity of the sounds produced during pile driving depend on a variety of factors, including the type and size of the pile, the substrate firmness, water depth, and the type and size of the pile driving hammer (Hanson et al., 2003). Major effects on fish from pile driving are behavioral changes (including suspension of feeding behavior), non-auditory tissue damage (e.g., internal hemorrhaging and swim bladder ruptures), auditory tissue damage, and TTSs to permanent hearing loss (Hastings and Popper, 2005; CalTrans, 2015). The biology of individual fish species and the physiological state of individual fish may change the characterization and order of effects, as there are substantial differences in how a noise will affect different fish species (Carlson et al., 2007).

Sound detection in fish and invertebrates has been discussed in a number of publications, including Fay (1984), Popper and Fay (1993), Popper et al. (2001), Popper et al. (2003), Popper and Schilt (2008), and Mooney et al. (2010). Hearing thresholds (sensitivity) have been determined for approximately 100 fish species and for a small number of invertebrates (e.g., Mann et al., 2001; Casper et al., 2003; Popper et al., 2003; Nedwell et al., 2004; Pye & Watson, 2004; Lovell et al., 2005; Song et al., 2006; Casper & Mann, 2009; Meyer et al., 2010; Mooney et al., 2010; and Mooney et al., 2012). The G&G Final PEIS (BOEM, 2014a) summarizes fish and invertebrate hearing capabilities and sensitivities, and these are incorporated herein by reference.

Hearing threshold data suggest that most fish species cannot hear sounds above 3,000 to 4,000 Hz, with the majority of fish species being able to detect sound only to 1,000 Hz or below. The data from Lovell et al. (2005) and Meyer et al. (2010) suggest that sturgeons (*Acipenseridae*) have relatively poor sensitivity and can detect frequencies no higher than 800 Hz. A small number of studies on tunas suggest that they can detect frequencies no higher than 1,100 Hz (Song et al., 2006). The few studies on cartilaginous fishes suggest that sharks and skates are not very sensitive to sound and can detect frequencies no higher than 1,000 Hz (Casper et al., 2003; Casper & Mann, 2009). The limited data available on fish larvae suggest that hearing frequency ranges and acoustic startle thresholds of larval fish are similar to those of the adult of the species (Zeddies & Fay, 2005; Wright et al., 2011; Popper et al., 2014). Fish eggs and larvae developing swim bladders may be vulnerable to pile driving-generated vibrations that could result in pressure-related injuries (Popper et al., 2014). The few studies on squid suggest that they can detect particle motion at frequencies below 300 Hz (Mooney et al., 2010; Mooney et al. 2016). A study on American lobster suggests that immature lobsters can detect frequencies between 20 and 1,000 Hz, while mature lobsters showed acoustic sensitivity at two distinct ranges of 20 to 300 Hz and 1,000 to 5,000 Hz (Pye & Watson, 2004). Although no auditory thresholds exist for scallop or other bivalves a recent empirical study in Australia during oil and gas seismic surveys evaluated the impact of that activity on the scallop, *Pecten fumatus* (Przeslaski et al 2016).

Three metrics have been used for evaluating hydroacoustic effects on fish: peak SPL (dB_{peak}), RMS SPL, and SEL. Peak sound pressure (dB_{peak}) represents the maximum point of energy in a signal, while RMS describes the average energy level in the signal. The concern with both of these metrics is that they do not provide a good representation of the total energy in the signal over time, and it is the total energy that is likely to be the critical factor in determining the potential effects on marine organisms. Investigators have recently started to use SEL, which is an index of the total acoustic energy received by an organism, representing the total energy in a signal or sequence of signals. SEL allows different signals to be compared and can be used to estimate the sum of the energy in a sequence of signals. SEL_{cum} is the index of energy in all of the signals presented, accounting for accumulated exposure to repeated sound energy of a repetitive activity (e.g., pile driving) or for continuous activity over a specified time period (Popper et al., 2006; CalTrans, 2015; Popper and Hastings, 2009; BOEM, 2014a).

Established interim noise exposure criteria for the onset of direct physical injury in fish from pile driving activities are discussed in the G&G Final PEIS (BOEM, 2014a) and are incorporated herein by reference. The current interim criteria identified a peak SPL of 206 dB re 1 µPa, or 187 dB accumulated SEL for all listed fish larger than 0.07 ounce (2 grams) and 183 dB accumulated SEL for fish less than 0.07 ounce (2 grams), for the onset of direct physical injury in fish (Popper et al., 2006; Carlson et al., 2007). These criteria are based on sound pressure and SELs; they do not include particle motion. Data that arose concurrently and subsequently to the interim criteria indicate that, at least for cumulative exposure, the set levels are far too low for the onset of physiological effects. Halvorsen et al. (2011) suggest that the onset of physiological response from pile driving sound occurs at least 16 dB above, and probably more than 23 dB above, these interim criteria.

Popper et al. (2014) recently published sound exposure guidelines for pile driving that represent the lowest received level of sound that was found to produce a specified effect on fish based on the currently available data (Table 4–20). Sounds above the guideline levels in Table 4–20 will likely result in the specified effect; higher sound levels are expected to result in greater effects (Popper et al., 2014). Currently, there is insufficient data to establish noise exposure guidelines for any invertebrate species (Hawkins & Popper, 2014). However, recent studies regarding squid and scallop resources in Mooney et al (2016) and Przeslaski (2016), suggest that low frequency noise does not have injurious impacts to these species. Mooney et al (2016) demonstrates that longfin squid habituate to pure tone sounds over repeated exposures. Mooney et al. (2016) also concludes that lower level effects, such as masking or behavioral response, is more likely than the type of anatomical damage suggested in André et al. (2011). Lastly, Mooney et al. (2016) suggests that population-level impacts remain unclear. In Przeslaski (2016) the data suggests that no changes in commercial scallop abundance, mortality, size, condition, or biochemistry resulted from marine seismic surveys off the coast of Australia with received SELs of at least 150 dB re 1 μPa^2-s with particle velocities of 171 dB re 1 nm/s.

The use of vibratory hammers (vibratory pile driving) is a recommended conservation measure and best management practice for pile installation in marine fisheries habitat (Hanson et al., 2003; Johnson et al., 2008). Fish consistently display an avoidance response without sound habituation to the continuous sounds produced by vibratory hammers. Limited data are available on the effectiveness of vibratory hammers to reduce noise generated by pile installation. The current data indicate that vibratory hammers usually produce sound levels much lower than impact hammer driving (CalTrans, 2015). Research using a continuous wave sound suggests that a 220 dB threshold for accumulated SEL may be an appropriate starting point for determining a vibratory driving threshold, with a suggested final threshold ranging from 187 to 220 dB (Popper et al., 2006; Caltrans, 2015). No criteria for injury to fish or effects to fish behavior from vibratory pile driving have been established.

Modeled estimates of underwater noise levels for pile driving during meteorological tower installation vary, ranging from 185 dB re 1 µPa to 200 dB (RMS), with noise levels dissipating to below 180 dB (RMS) at a distance of 1,640 to 3,281 ft (500-1,000 m) from the source and below 160 dB (RMS) within 2.1 to 4.5 mi (3.4-7.2 km, NMFS, 2013a). Unmitigated meteorological tower installation noise is expected to disturb normal fish behavior; mask biologically important sounds; and cause temporary hearing threshold shifts, injuries, and mortality if fish are present within the construction area during pile driving activities.

The SOCs required by BOEM (Appendix B, Section B.4.) that are intended to reduce the potential for adverse impacts to marine mammals and sea turtles are expected to also benefit fish. With the “soft start” procedure for pile driving, it is anticipated that the majority of fish would flee the area during the tower installation period and return to the area and resume normal activity after construction. Fish that do not flee the area during pile driving could be exposed to noise levels that result in temporary hearing threshold shifts, injuries, or mortality. Thus, the noise associated with pile driving would cause avoidance or other adverse effects resulting in **minor** impacts to adult finfish. Demersal eggs and larvae may also be vulnerable to pile driving-generated vibrations (Popper et al., 2014), and could experience some adverse effects near pile installation resulting in **minor** impacts finfish populations. Underwater noise impacts (from all sources) to finfish and invertebrate populations and EFH are expected to be **negligible** to **minor**.

Suspended Sediments

Installation of piles or anchor systems associated with a tower and/or buoys may cause an increase in local suspended sediments. These impacts would be limited to the immediate area surrounding the piles or anchors and of short duration. Depending on the currents, the suspended sediment is expected to disperse and settle on the surrounding seafloor, potentially coating or burying some benthic organisms. Effects on finfish and shellfish populations, and EFH from suspended sediments would be **negligible** because these activities would be localized and of short duration.

Habitat Loss

The installation of a meteorological tower foundation and/or buoy anchor systems and associated scour control systems may result in the direct mortality of benthic invertebrates, the loss of benthic habitat, and the displacement of water column (pelagic) habitat. Sessile marine invertebrates, including molluscan shellfish, would be lost (buried or crushed) in the footprint (200 ft^2-2 ac [19 m^2-0.8 ha]) of the tower foundations/moorings and scour control systems. Although sea scallops are mobile molluscan shellfish (Hart & Chute, 2004), it is a conservative assumption that they would not be able to avoid sudden deployment of an anchor or foundation/mooring system, and for these analyses are considered to be sessile. The amount of habitat temporarily displaced or lost in the area is small compared to the amount of habitat available in the surrounding area. Fish and mobile invertebrates are expected to move to the surrounding areas during installation activities and bottom recovery period. Meteorological tower foundations and moorings will adversely affect EFH; however, these structures have a small footprint, and are not expected to significantly affect the quality or quantity of EFH in the proposed lease area. Additionally, to further avoid impacts to sensitive benthic habitat, BOEM removed from consideration for leasing 1,779 ac on and around the Cholera Bank. Impacts from habitat loss due to meteorological tower foundations and/or buoy anchor systems installation on finfish, shellfish, and EFH are expected to be **negligible**.

Meteorological Tower/Buoy Operations

Meteorological tower foundations and large anchoring systems installed on soft substrates would introduce hard substrate to these areas that could be colonized by benthic invertebrates. Fish species that prefer hardbottom or complex habitats would likely be attracted to the foundations or anchoring systems, potentially increasing local fish abundance. Pelagic fish may be attracted to the habitat created in the water column by the foundations and anchoring systems. Changes in species composition and community assemblage is expected only at the foundations or anchoring systems, and as a result, effects on finfish and shellfish populations and EFH are expected to be **negligible**.

Meteorological Tower/Buoy Decommissioning

A meteorological tower foundation pile would be removed by cutting the pile 13 to 16 ft (4-5 m) below the substrate surface using a common non-explosive severing method. Pile removal is expected to generate localized increases in noise and suspended sediment. The increase in noise levels produced by pile cutting is expected to be below the sound levels produced during pile installation. Fish and mobile invertebrates would most likely leave the area in the immediate vicinity of the pile being cut to a surrounding area and return once the activity has ceased. Increases in suspended sediments could reduce the ability of some fish to forage, while some species would benefit from opportunistic foraging. These effects are anticipated to be restricted to the immediate vicinity of the pile or anchor system and would be of short duration. The effects of decommissioning activities are expected to be **negligible** to finfish and shellfish populations, and EFH.

Non-Routine Events

Collisions/allisions are considered unlikely, as discussed in Section 3.3.2 *Allisions and Collisions*; accidental fuel spills that could occur if such an event were to happen are expected to be small (88 gallons [333 liters]) (Section 3.3.3 *Spills*). Accidental fuel spills and the effects on finfish and EFH were analyzed in the *PEIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (MMS, 2007a) and G&G Final PEIS (BOEM, 2014a) and are incorporated herein by reference.

The meteorological tower or buoys could attract fish, resulting in an increase in recreational fishing in the area, which would increase the potential for collisions between recreational fishing vessels that could result in an accidental release of fuel. Storms may also contribute to collision and allision occurrences that could result in a fuel spill. Diesel fuel is a light refined petroleum product, and released fuel would dissipate quickly on the surface and evaporate within a few days. Pelagic fish and invertebrate eggs and larvae near the surface in the water column could be negatively impacted by a fuel spill; however, the impacts to fish and invertebrate populations would not be significant because of the small affected area and short duration of persistence. Overall, the impacts to finfish and shellfish populations, and EFH resulting from accidental fuel spills from collisions/allisions, should they occur, are expected to be minimal and temporary, and therefore **minor**.

Conclusion

Overall, impacts from site characterization and site assessment activities to finfish and shellfish populations and EFH in the proposed lease area would be **minor.** However, impacts would range from negligible to minor depending on the activity.

A meteorological tower foundation and/or buoy anchor systems installation and decommissioning would produce noise that could disturb normal fish behaviors. Fish are expected to avoid or flee from the noise source. Fish that do not flee the immediate action area during pile driving could be exposed to injurious or lethal noise levels that may result in adverse effects. The short duration (3-8 hours per day over 3 days) and the use of mitigation measures required by the SOCs (Appendix B) would minimize the possible exposure to injurious and lethal noise levels, resulting in minor effects to finfish and shellfish populations, and EFH. The increases in suspended sediments, loss of benthic habitat, and displacement or alteration of water column habitat due to meteorological tower installation, operation, and decommissioning and/or installation and operation of buoy anchor systems are expected to be small compared to the available habitat in the surrounding areas, and would therefore result in negligible effects to finfish and shellfish populations, and EFH. The potential increase in vessel collisions and allisions that could result in accidental fuel spills due to a meteorological tower and/or buoys is expected to be minimal. The overall impact on finfish and shellfish populations and EFH from a fuel spill that could result from such an occurrence is expected to be minimal and temporary, and would therefore be considered minor.

4.4.2.8 ESA-Listed Fish Species

A federally endangered anadromous fish, Atlantic Sturgeon, and three federally designated Species of Concern, bluefin tuna, dusky shark, and sand tiger shark, could occur in the WEA. These species are discussed below. Atlantic sturgeon life history and DPS have been previously summarized in the Atlantic OCS WEAs Biological Opinion (NMFS, 2013a) and are hereby incorporated by reference.

Atlantic Sturgeon

Atlantic sturgeon is a long-lived, late maturing, estuarine dependent, anadromous fish that ranges from Labrador to northern Florida (Collette & Klein-MacPhee, 2002; ASSRT, 2007). Thirty-five rivers have been confirmed to have had a historical spawning population; currently 32 rivers contain Atlantic sturgeon, with at least 20 having a spawning population. Many of these stocks are at historic lows (ASSRT, 2007). On February 6, 2012, NMFS listed five DPS of Atlantic Sturgeon under the ESA: the New York Bight, Chesapeake Bay, Carolina, and South Atlantic populations were listed as endangered, while the Gulf of Maine population was listed as threatened (77 FR 5880; 77 FR 5914). The Hudson River contains one of the two spawning subpopulations found in the New York Bight DPS and enters the Atlantic Ocean approximately 23 nm (43 km) northwest of the WEA. The Hudson River currently supports the largest subpopulation of spawning adults (approximately 850 individuals) in the United States (ASSRT, 2007). Atlantic sturgeon have been documented in the vicinity of the WEA in commercial fisheries bycatch, New York bottom trawl sub-adult Atlantic sturgeon surveys, and a variety of tagging studies (Stein et al., 2004a; Stein et al., 2004b; Dunton et al., 2010; Erickson et al., 2011; Damon-Randall et al., 2013; Dunton et al., 2015; Wirgin et al., 2015). The New York bottom trawl surveys from 2005 through 2007 captured a total of 149 Atlantic sturgeon in 512 bottom trawls (0.291 fish per tow), and all captures occurred in depths of less than 66 ft (20 m) (Dunton et al., 2010). Atlantic sturgeon were collected within all months sampled with the highest catch per unit effort occurring during the fall months (0.35 fish per tow), followed by the spring (0.33 fish per tow), summer (0.26 fish per tow), and winter (0.07 fish per tow) (Dunton et al., 2010). DNA analysis indicated that Atlantic sturgeon collected in the vicinity of the WEA by the Northeast Fisheries Observer Program during March 2009 through February 2012 originated from four different DPS: the Gulf of Maine, New York Bight, Chesapeake Bay, and South Atlantic (Damon-Randall et al., 2013; Wirgin et al., 2015); however, the offshore area comprising the marine mixing unit of Atlantic sturgeon may comprise individuals from all five DPSs including the Carolina DPS. Atlantic sturgeon may use the WEA as overwintering and foraging areas.

Atlantic sturgeon use a wide variety of habitats. They require silt-free hardbottom substrates such as gradient boulder, bedrock, cobble-gravel, and coarse sand in freshwater rivers to spawn adhesive eggs (Greene et al., 2009). Eggs hatch in 94 to 140 hours at water temperatures of 15.0 to 24.5 °C. Larvae remain in deep river channels near spawning habitat upstream of the salt front. Juvenile sturgeon are found over sand, mud, cobble, rocks, and transitional substrates and remain in their natal estuary for one to six years before emigrating out of their natal estuarine habitats to coastal waters in fall and early winter (Doval and Berggren, 1983; Smith, 1985;

Greene et al., 2009). Sub-adult Atlantic sturgeon can migrate long distances in the marine environment to other estuaries. Sub-adult and non-spawning adult Atlantic sturgeon have been documented in nearshore Atlantic coastal shelf areas with moderately shallow (23-164 ft [7-50 m]) sand and gravel habitats (Stein et al., 2004a; Laney et al., 2007; Greene et al., 2009; Dunton et al., 2010). Atlantic sturgeon aggregate in areas off southwest Long Island, along the New Jersey coast, near Delaware Bay, off Chesapeake Bay, and Cape Hatteras (Stein et al., 2004a; Stein et al., 2004b; Dunton et al., 2010; Erickson et al., 2011; Damon-Randall et al., 2013). Seasonal depth distribution patterns were observed in these studies, with sturgeon occupying the deepest waters during the winter and the shallowest waters during summer and early fall (Dunton et al., 2010; Erickson et al., 2011; Damon-Randall et al., 2013). The lowest numbers of Atlantic sturgeon caught in coastal shelf areas occur during the summer (Dunton et al., 2010). Adult Atlantic sturgeon make seasonal migrations in late winter to early summer, to freshwater spawning habitats (Stein et al., 2004b). Following spawning, adults use marine waters either year-round or seasonally (Bain, 1997). Atlantic sturgeon appear to undergo large-scale southerly fall migrations and northerly spring migrations (Doval and Berggren, 1983; Dunton et al., 2010). Sturgeon use marine habitat for foraging before returning to natal rivers to spawn (Dunton et al., 2010). Diet prey items include polychaetes, amphipods, isopods, decapods, mollusks, and sand lance (*Ammodytes* spp.) (Scott & Scott, 1988; Johnson et al., 1997). Critical habitat has been proposed for all five of the Atlantic sturgeon DPS, but the proposed designation does not overlap with the New York proposed lease area (81 FR 35701).

Bluefin Tuna

Bluefin tuna is a large, epipelagic, highly migratory, piscivorous species that inhabits the warmer parts of the North Atlantic and its adjacent seas, particularly the Gulf of Mexico and Mediterranean Sea. In the western North Atlantic, bluefin tuna range from 55°N to 0° latitude and are considered a single stock (NMFS, 2009). Bluefin tuna seasonally migrate from spawning grounds in the Gulf of Mexico through the Straits of Florida to foraging grounds along the northeast U.S. coast. The species displays strong homing behavior and spawning site fidelity. Bluefin tuna prey items include squid, sand lances, herring, and mackerels (Chase, 2002). NMFS received a petition to list the species under the ESA in 2010. However, it was determined that the species did not warrant listing under the ESA in 2011 because of remaining uncertainties regarding the effects of the Deepwater Horizon oil spill and overfishing. The species was listed as a Species of Concern in the Western Atlantic, Eastern Atlantic, and Mediterranean Sea (NMFS, 2011a). Bluefin tuna may use the waters of the WEA as a foraging ground.

Dusky Shark

Dusky sharks have a worldwide distribution in warm temperate and tropical waters from the surf zone to offshore at depths from 0 to 1,312 ft (0-400 m) (Compagno, 1984a). They occur in the western Atlantic from southern Massachusetts and Georges Bank to the Caribbean, and the northern Gulf of Mexico to southern Brazil (Collette & Klein-MacPhee, 2002; Compagno, 1984a). Dusky sharks undergo seasonal temperature-related migrations northward in the summer and southward in the fall. This species is an apex predator and preys on squid, decapods, and fishes (Bowman et al., 2000). The species was listed as a Species of Concern in the Western Atlantic, Gulf of Mexico, and South Atlantic in 1997 (NMFS, 2011b). Commercial and recreational harvest was prohibited in 2000; however, this species is still routinely caught as bycatch in longline gears targeting tunas, groupers, and snappers. Dusky sharks are vulnerable to overfishing due to slow growth rate, late maturity, and low reproduction rate (NMFS, 2011b). A status review was conducted in 2014, and it was determined that listing under the ESA was not warranted at that time (79 FR 74684). Dusky sharks may use the waters of the WEA as a foraging ground.

Sand Tiger Shark

Sand tiger sharks are a large, coastal species found in tropical and warm temperate waters throughout the world. They occur along the U.S. Atlantic coast from the Gulf of Maine to Florida and throughout the northern Gulf of Mexico from the surf zone, shallow bays, and reefs to 627 ft (191 m) on the outer shelves (Compagno, 1984b). This species feeds on a variety of fishes, including herrings, croakers, bluefishes, bonitos, butterfishes, hakes, wrasses, sea robins, snappers, sea basses, skates, and small sharks (Compagno, 1984b; Bowman et al., 2000). Sand tiger sharks were designated a Species of Concern in the Western Atlantic in 2004. U. S. fishermen have been prohibited from harvesting this species since 1997; however, it is still caught as bycatch in a variety of fishing gears. This species is susceptible to overfishing as a result of its mating aggregations, slow growth rate, late maturity, and low fecundity (NMFS, 2010). Sand tiger sharks may use the waters of the WEA as a foraging ground.

Impact Analysis of Alternative A

The potential impacts associated with renewable energy site characterization activities, including G&G surveys; meteorological tower/buoy installation, operation, and decommissioning; and non-routine events on ESA-listed Atlantic sturgeon have been previously analyzed in the G&G Final PEIS (BOEM, 2014a), the *Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts* (BOEM, 2014b), and the *Revised Environmental Assessment for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts* (BOEM, 2013a). Consultations pursuant to Section 7 (a)(2) of the ESA for site assessment and site characterization activities offshore Massachusetts, Rhode Island, New York, and New Jersey are covered in the Atlantic OCS WEAs Biological Opinion (NMFS, 2013a). These EAs and ESA assessments are hereby incorporated by reference and relevant information is summarized below. These documents concluded the following for ESA-listed Atlantic sturgeon:

- Impacts from acoustic sound sources from HRG surveys and geotechnical exploration are expected to be **minor**. A boomer sub-bottom profiler is the only source expected to be produce sound within the hearing range of Atlantic sturgeon (Table 421). Atlantic sturgeon are expected to avoid HRG sources, any avoidance or disruptions to behavior are expected to be temporary.
- Impacts from vessel and equipment noise are expected to be **negligible**.
- Impacts from vessel traffic are expected to be **negligible**.
- Impacts from seafloor disturbances associated with bottom sampling and bottom-anchored monitoring buoys are expected to be **negligible**.

Table 4–21
Summary of Peak Source Levels for HRG Survey Activities and Operating Frequencies within Atlantic Sturgeon Hearing Range (from NMFS, 2013a).

Source	Pulse Length	Broadband Source Level (dB re 1 µPa at 1 m)	Operating Frequencies	Within Hearing Range of Atlantic Sturgeon ?
Boomer	180 µs	212	200 Hz – 16 kHz	Yes
Side-scan sonar	20 ms	226	100 kHz	No
			400 kHz	No
CHIRP sub-bottom Profiler	64 ms	222	3.5 kHz	No
			12 kHz	No
			200 kHz	No
Multi-beam depth sounder	225 µs	213.0	240 kHz	No

µPa = micropascal
µs = microsecond
dB = decibel

The conclusions of the Atlantic OCS WEAs Biological Opinion (NMFS, 2013a) stated that impacts for site characterization (G&G surveys) *may affect, but are not likely to adversely affect* the ESA-listed Atlantic sturgeon since effects are expected to be extremely unlikely or insignificant. These impacts would not likely jeopardize the continued existence of Atlantic sturgeon.

Atlantic sturgeon have been documented in the vicinity of the WEA in all months, with the highest occurrence during the fall. NMFS has generally recommended 150 dB RMS as the threshold for behavioral effects to ESA-listed fish species when evaluating pile installations, citing behavioral changes (startle and stress) that could alter forage areas, migration routes, and predator avoidance (CalTrans, 2015). The current noise exposure criteria for physiological effects to Atlantic sturgeon are 206 dB_{peak} and 187 dB SEL_{cum}. Modeled estimates of underwater noise levels for pile driving during meteorological tower installation ranged from 185 dB (RMS) to 200 dB (RMS) at the source (NMFS, 2013a). Meteorological tower installation noise could disturb normal behaviors (e.g., foraging and migration), mask biologically important sounds, cause temporary hearing threshold shifts, and cause injuries if an ESA-listed fish is present in the installation area during pile driving activities.

The “soft start” procedure for pile driving, which is an SOC required by BOEM (Appendix B), would minimize the possibility of exposure to injurious sound levels to a ESA-listed fish by prompting any fish to leave the area prior to exposure to stressful or injurious sound levels. Pile driving activities would be limited to the time necessary to drive the piles for each tower (approximately 3-8 hours per day over 3 days). Fish are expected to return to the area once pile driving activities are completed. Additionally, pile driving activities would be prohibited from November 1 through April 30 for the protection of marine mammals (Section 4.4.2.5 *Marine*

Mammals), thus limiting the potential underwater noise exposure when Atlantic sturgeon are most likely to occur in the action area. While the movements of an individual Atlantic sturgeon may be temporarily disrupted, major shifts in habitat use, distribution, and foraging success are not expected. Injury or mortality to any Atlantic sturgeon as a result of pile driving for meteorological tower installation is not anticipated. Pile driving which is required for meteorological tower installation could result in **minor** effects to Atlantic sturgeon.

Atlantic sturgeon could potentially be affected by habitat loss (foraging areas), suspended sediments, changes in prey abundance and distribution, and tower decommissioning. The installation of meteorological tower foundations and/or buoy anchor systems and the placement of associated scour control systems could result in increased suspended sediments in the immediate vicinity of the action, the direct mortality of benthic invertebrates, and the loss of benthic forage habitat in a small (200 ft^2-2 ac [19 m^2-0.8 ha]) area. The disturbance and loss of this habitat is not likely to have measurable effects on the foraging activity or migrating behavior of Atlantic sturgeon, therefore suspended sediments and loss of benthic habitat due to meteorological tower foundation and/or buoy anchor system installation are expected to be **negligible**.

Non routine events, such as collisions/allisions as discussed in Section 3.3.2 *Allisions and Collisions*, are considered unlikely. The accidental fuel spills that could occur if such an event were to happen are expected to be small (88 gallons [333 liters]) (Section 3.3.3 *Spills*). The effects of accidental fuel spills on Atlantic sturgeon were analyzed in the G&G Final PEIS (BOEM, 2014a) and the Section 7 (a)(2) consultation documents of the Atlantic OCS WEAs Biological Opinion (NMFS, 2013a); these documents concluded that impacts from accidental fuel releases on these two ESA-listed species are expected to be **negligible**.

The impacts on bluefin tuna, dusky shark, and sand tiger shark, all designated as federal species of concern, from meteorological tower/buoy installation, operation, and decommissioning, including the acoustic effects from pile driving, suspended sediments, habitat loss, and changes in species abundance and distribution are expected to be the same as other non-listed fish species, as described in Section 4.4.2.7 *Finfish, Invertebrates, and Essential Fish Habitat* above. The underwater noise generated by tower installation may result in temporary displacement and other behavioral changes, masking of important biological sounds, and temporary hearing threshold shifts. The SOCs required by BOEM (see Appendix B), including a “soft start” procedure for pile driving, would minimize the possibility of exposure to injurious sound levels to bluefin tuna, dusky shark, and sand tiger shark. Underwater noise impacts (from all sources) are expected to be **negligible** for these three federal species of concern.

Conclusion

Overall, impacts on ESA-listed fish as a result of the proposed action would be **minor**. In several relevant NEPA documents and ESA consultations,[21] BOEM has determined that impacts on ESA-listed fish from site characterization would be minor. Installation of a meteorological

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[21] G&G Final PEIS (BOEM, 2014a), BA (BOEM, 2012d), G&G Biological Opinion (NMFS, 2013b), and Atlantic OCS WEAs Biological Opinion (NMFS, 2013a)

tower would require pile driving, which could result in minor effects to Atlantic sturgeon. If a lessee proposes pile driving in a SAP, BOEM would initiate ESA Section 7 consultation with NMFS.

4.4.2.9 Military Use

Description of the Affected Environment

This section describes military uses in the vicinity of the WEA. Military activities can include various vessel training exercises, submarine and antisubmarine training, and U.S. Air Force exercises. The U.S. Navy, U.S. Army, USCG, and U.S. Air Force have major and minor military installations located along the coasts of New York and New Jersey (Table 4–22).

Vessels and aircraft that conduct operations incompatible with commercial or recreational transportation are typically confined to Military Operating Areas (OPAREAs) away from commercially used waterways and inside Special Use Airspace. Hazardous operations are communicated to all vessels and operators by USCG (via Notices to Mariners) and the FAA (via Notices to Airmen). The WEA falls into an area assessed by DOD for offshore wind mission compatibility, and would require site-specific stipulations regarding the installation of meteorological structures (Figure 4–18). There are also Danger Zones (used for military operations and may be closed to the public) and Restricted Areas (limited public access) within coastal and marine waters, as outlined in CFR and on Raster Navigational Charts (NOAA OCS, 2015). As shown on Figure 4–18, no Danger Zones or Restricted Areas occur in the WEA, although there is a Restricted Area/Danger Zone west of the WEA. USCG has two Weapons Training Areas offshore New York (not shown Figure 4–18), which USCG uses for proficiency training in law enforcement operations (USCG, 2013). One of these Weapons Training Areas covers a large portion of the WEA.

Table 4–22
List of Military Installations Located along the Coast of New York and New Jersey

Military Installation	Location	Department
Fort Hamilton Army Base	Brooklyn, NY	U.S. Army
Station New York	Staten Island, NY	USCG
Station Jones Beach	Freeport, NY	USCG
Station Fire Island	Babylon, NY	USCG
Station Shinnecock	Hampton Bays, NY	USCG
Station Montauk	Montauk, NY	USCG
Station Rockaway*	Rockaway, NY	USCG
Station King’s Point	King’s Point, NY	USCG
Station Eatons Neck	Northpoint, NY	USCG
Station Sandy Hook	Highlands, NJ	USCG
Station Manasquan Inlet	Point Pleasant, NJ	USCG

Military Installation	Location	Department
NWS Earle Navy Base	Colts Neck, NJ	U.S. Navy
McGuire AFB	New Hanover, NJ	U.S. Air Force
Fort Dix Army Base	Burlington, NJ	U.S. Army
NAES Lakehurst Navy Base	Lakehurst, NJ	U.S. Navy

* Seasonal
Sources: U.S. Military Bases, 2015; USCG, 2015c

AFB = Air Force Base
NAES = Naval Air Engineering Station
NWS = Naval Weapons Station

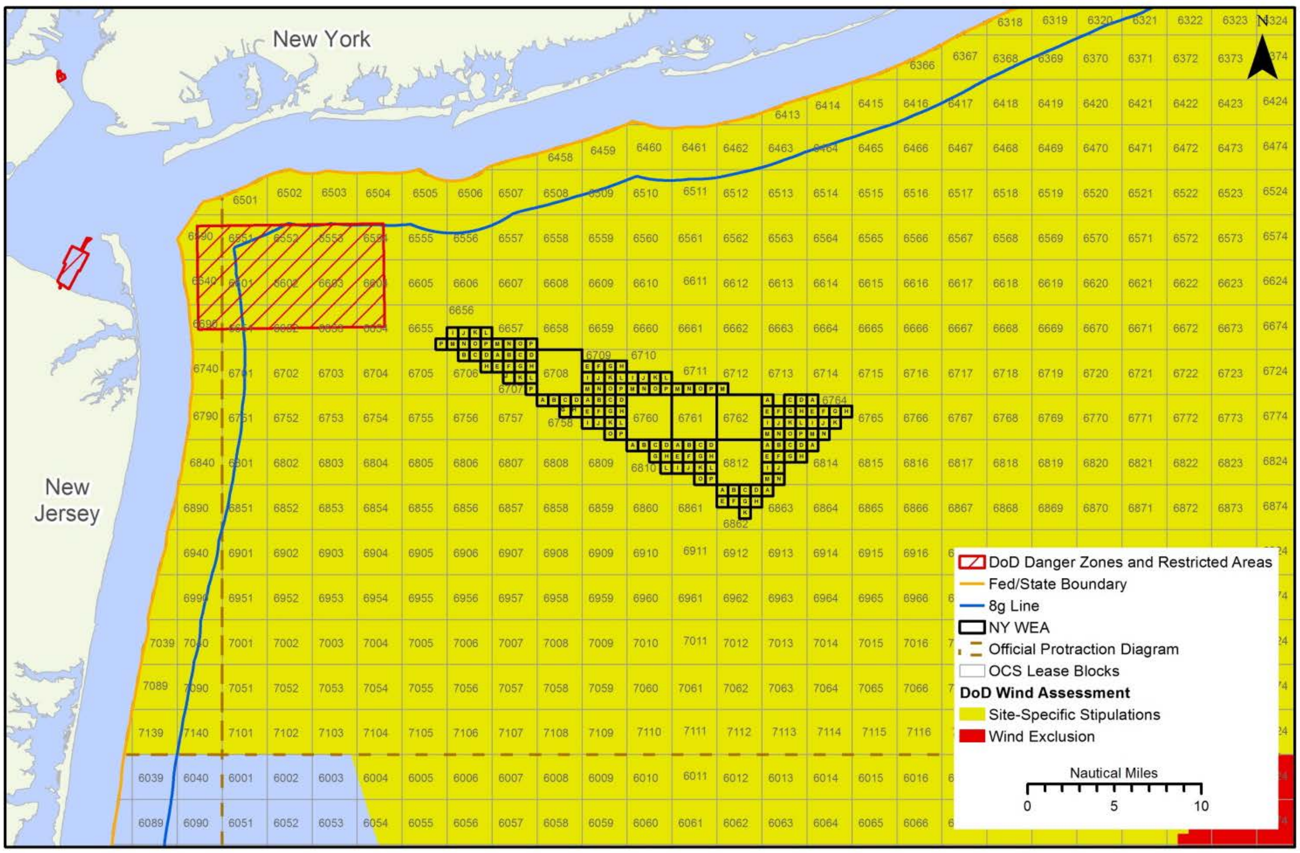

Figure 4-18 DOD Offshore Wind Mission Compatibility Assessment for Vicinity of the WEA

Impact Analysis of Alternative A

Vessels associated with the proposed action could interact with military aircraft and military vessels during site characterization and site assessment. Potential use conflicts with military OPAREAs, danger zones, restricted areas, and the USCG Weapons Training Area that overlaps the WEA are expected to be avoided by coordinating with military commanders and USCG prior to surveys. All authorizations for permitted site characterization and assessment activities would include guidance for military coordination with the relevant agency. Vessel and aircraft operators would be required to establish and maintain early contact and coordination with the appropriate military command headquarters or point of contact. Military activities have the potential to create temporary space-use conflicts on the OCS. Section 2.1.2.5 of the G&G Final PEIS (BOEM, 2014a) includes guidance for military coordination and is incorporated herein by reference. Although the G&G Final PEIS does not address the New York WEA specifically, the coordination procedures would be the same.

On April 3, 2012, the DOD Office of the Secretary of Defense presented an assessment of offshore military activities and wind energy development on the OCS offshore New York to the Task Force. The DOD has identified three categories of wind energy development areas: wind exclusion areas where wind energy development would be incompatible with existing military uses, areas with site-specific stipulations, and areas with no restrictions. The entire WEA falls within a DOD-designated area of site-specific stipulations.

To avoid or minimize potential conflicts with existing DOD activities, site-specific stipulations may be necessary for all OCS blocks within the WEA. Such stipulations may include a hold-and-save-harmless agreement where the lessee assumes all risks of damage or injury to persons or property if such injury or damage to persons or property occurs by reason of the activities of the United States, and/or a requirement that, when requested by the DOD, the lessee controls its own electromagnetic emissions and those of its agents, employees, invitees, independent contractors, or subcontractors when operating in specified DOD OPAREAs or warning areas.

Other examples of site-specific stipulations that may be required include the lessee entering into an agreement with the appropriate DOD commander when operating vessels or aircraft in a designated OPAREA or warning area, requiring that these vessel and aircraft movements be coordinated with the appropriate DOD commander, and/or a stipulation that DOD can request temporary suspension of operations or require evacuation on the lease in the interest of safety or national security. With implementation of DOD stipulations, impacts on military use are expected to be **negligible**.

Conclusion

Because site-specific coordination would be required to minimize multiple use conflicts on the OCS in and around the WEA, impacts on military use from the placement of a meteorological tower and/or buoys are expected to be **negligible**.

4.4.2.10 Navigation/Vessel Traffic

Description of the Affected Environment

This section describes navigation/vessel traffic in the vicinity of the WEA. Vessel traffic in the vicinity of the WEA is supported by a network of navigation features, including TSSs[22] (i.e.,

[22] TSSs are established in busy shipping areas where a lack of traffic regulation may result in accidents. TSSs are overseen by the International Maritime Organization. Within a TSS, there is typically at least one traffic lane in each direction, turning points, deep-water lanes, and separation zones between the main traffic lanes (IMO, 2015).

shipping lanes) and navigational aids. A navigational aid (NOAA weather buoy 44025) is located in sub-block 6813G of the WEA. NOAA weather buoy 44065 is 4 nm away off the northwestern end of the WEA. There are three TSSs leading to/from New York Harbor, each with two traffic lanes (one for inbound and one for outbound): 1) a west-east corridor off the southern coast of Long Island that includes the Ambrose to Nantucket and Nantucket to Ambrose navigation lanes; 2) a north-south corridor that includes the Ambrose to Barnegat and Barnegat to Ambrose navigation lanes; and 3) a northwest-southeast corridor that includes the Ambrose to Hudson Canyon and Hudson Canyon to Ambrose navigation lanes (Figure 4–19). The WEA lies between the Ambrose to Nantucket and the Hudson Canyon to Ambrose navigation lanes.

The Port of New York and New Jersey, which comprises five marine terminals and ports in the Upper New York Bay area, is the largest port on the East Coast and the third largest port in the United States (Port Authority of New York and New Jersey, 2015). Additionally, there are approximately 200 facilities within the area of responsibility of USCG’s Sector New York that receive or ship products through the approaches to New York and the New York TSSs. As noted in Section 3.2.3 *Port Facilities*, BOEM has identified several ports along the New York and New Jersey coast that vessels associated with the proposed action could be used for staging and for surveying and operations and maintenance activities. Vessels using the ports and navigation routes in the vicinity of the proposed lease area include cargo ships, such as tankers and bulk carriers (which almost exclusively stay in the TSSs); tug and barge units; passenger ferries; naval vessels; government research, enforcement, and search and rescue vessels; pilot boats; and fishing and recreational crafts.

USCG requires all vessels with a gross tonnage (GT) of 300 tons or more and all passenger ships with a GT over 150 tons, to carry AIS equipment to identify, locate, and electronically exchange information with other nearby ships (USCG Navigation Center, 2015). Figure 4-19 shows the vessel traffic density analyzed from a year of AIS data (2013). Vessel traffic is concentrated in the TSSs and along a corridor running parallel to the New Jersey coast within approximately 5 nm (9.3 km) of the shoreline. Although the majority of vessel traffic is concentrated in the traffic lanes, additional coastal vessel traffic, such as towing vessels, travel in a generally north-south or northeast-southwest direction across the TSSs and proposed lease area.[23]

Maritime commercial ship traffic is an important component of U. S. commerce. According to the U.S. Department of Transportation Maritime Administration (MARAD), during 2013, the Port of New York and New Jersey received approximately 285 million tons of U.S./foreign containers, equaling approximately 5,500 vessel calls (MARAD, 2013). Smaller ports generally include marinas and mostly support commercial fishing and recreational boating vessels with little to no freight traffic.

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[23] AIS on fishing vessels greater than 65 ft was not mandatory till March 2016. Vessel monitoring system data, which tracks fishing vessels to determine compliance with NOAA requirements, is provided in Appendix G.

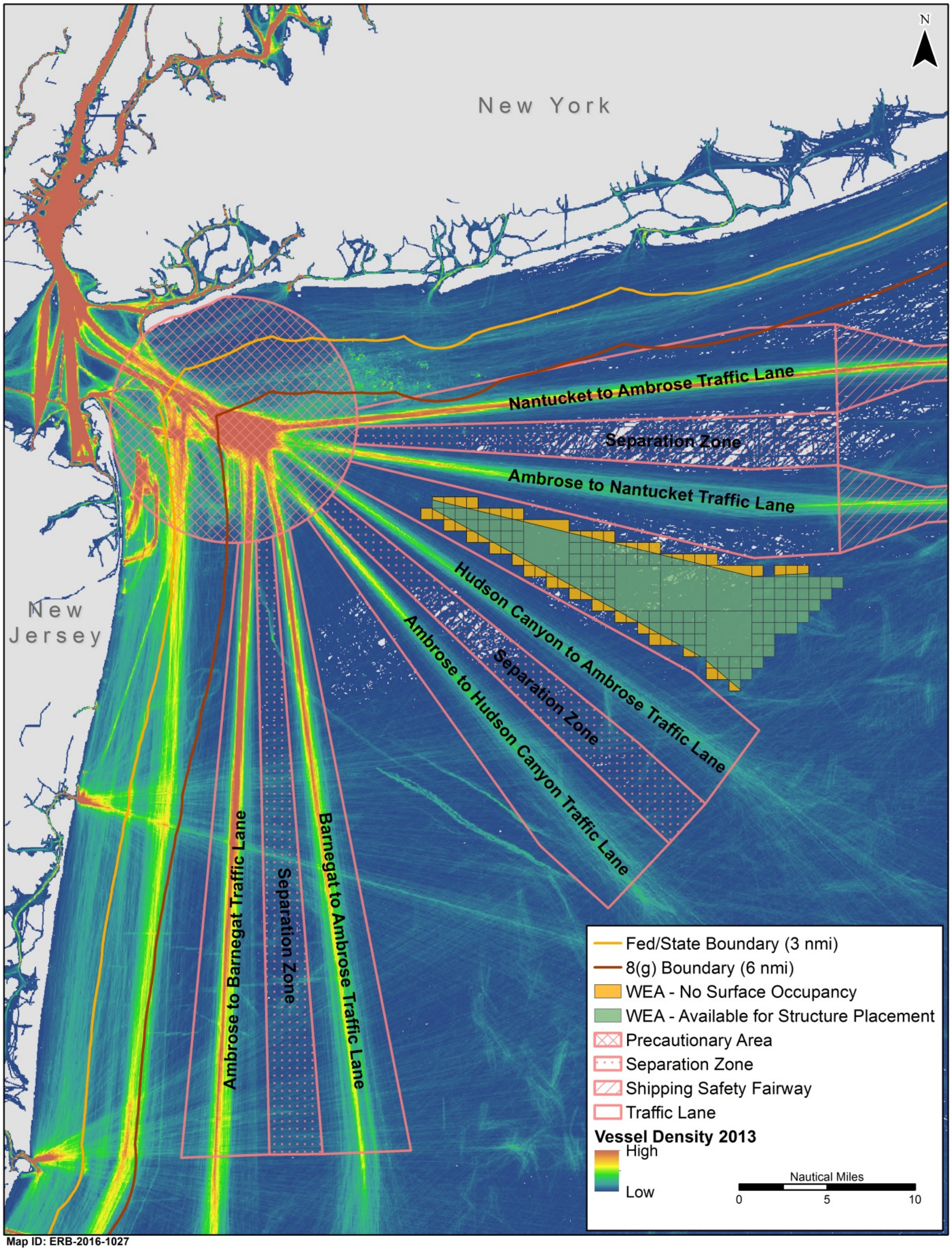


Figure 4-19 Vessel Density and TSSs in the Vicinity of the WEA

Impact Analysis of Alternative A

Routine activities (site characterization and assessment) and non-routine events associated with Alternative A have the potential to directly affect coastal and offshore vessel traffic.

Routine Activities

Increased vessel traffic associated with site characterization surveys and the construction, operation, and decommissioning of a meteorological tower and/or buoys would be anticipated as a result of Alternative A. BOEM estimates that the number of vessel round trips from routine activities would range from approximately 350 to 1,000 (Table 3–10, Section 3.2.4 *Vessel Traffic*). The vessel traffic anticipated as a result of Alternative A would add to the existing vessel traffic in the proposed lease area, as well as between the proposed lease area and shore.

BOEM assumes that one or two survey vessels could be active in the proposed lease area at any given time during site characterization. While meteorological tower and/or buoy installation, operations, and decommissioning activities are being conducted, BOEM anticipates there could be two to three vessels in the proposed lease area at any given time (due to vessels needed to tow and assist in buoy placement, or a specialized jack-up vessel used for installing foundation pilings for a tower or to perform routine maintenance). The additional vessel traffic increases the potential for interference with other marine uses in the area. However, because the estimate of one to three vessels at any given time in the proposed lease area associated with the proposed action is a relatively small amount of activity, and with proper scheduling and notification to the marine community, impacts can be minimized. BOEM anticipates that the vessel traffic associated with Alternative A would be **minor**.

Although the proposed lease area is not within designated routing measures such as a TSS, and Alternative A has been developed such that a meteorological tower and/or buoys would be set back at least 1 nm (1.9 km) from the edge of an adjacent TSS, the meteorological tower and/or buoys may still pose an obstruction to navigation. With the removal of the Cholera Bank sensitive habitat, less than one aliquot remains within 5 nm of the TSS entry/exit at the western tip of the proposed lease area (i.e., closest to New York harbor). Placement of a meteorological tower and/or buoys would be mitigated by USCG-required marking and lighting and would be considered PATON (defined as a buoy, light, or day beacon owned and maintained by any individual or organization other than USCG). PATON, which are regulated by USCG under 33 CFR 66, are designed to allow individuals or organizations to mark privately owned marine obstructions or other similar hazards to navigation. Use of these aids would minimize any potential adverse impacts on navigation from the placement of a meteorological tower and/or buoys; therefore, impacts on navigation are expected to be **minor**.

Non-Routine Events

As shown on Figure 4-19, the majority of vessel traffic in the region occurs:

- In TSS lanes;
- Following distinct patterns to approach/depart the TSS lanes; and
- In a corridor running parallel to the New Jersey coast.

The proposed lease area was developed so that placement of a tower and/or buoys would avoid the TSS lanes and the more heavily traveled approach/departure areas associated with those lanes. When BOEM considers an individual SAP, it will further consider vessel traffic patterns to make sure the tower and/or buoy placement would reduce the already small likelihood of vessel collision or allision with meteorological structures.

The additional vessel traffic associated with Alternative A—one to three vessels at any given time in the WEA and between the shore and the proposed lease area—would be **minor** compared with the existing vessel traffic. Therefore, vessel traffic under Alternative A would not appreciably increase the probability of vessel collisions or allisions in these areas. Vessels associated with installing, servicing, or decommissioning a tower and/or buoys would have a higher, but still extremely low potential, to collide than passing vessels. All vessel movements are associated with a risk of collision and subsequent loss of fuel. The water quality effects of non-routine events are described in Sections 3.3.2 *Allisions and Collisions* and 3.3.3 *Spills*.

Because large vessels such as tanker ships are expected to stay in the TSSs and not transit through the proposed lease area, except in emergency situations, BOEM does not anticipate a large fuel/oil spill resulting from tanker ships and other large vessels in the proposed lease area from collision with vessels associated with the proposed action or from an allision between a tanker and a meteorological tower or buoy. Additionally, in 2011, 98 percent of the oil and gas tanker stops at ports in the United States were by double-hulled vessels, which are much less likely to release oil from collision or allision than single-hulled tankers or other vessels (MARAD, 2013). Although impacts from a large fuel/oil spill would be adverse, because of their low likelihood, the potential for impacts would be **minor**. As concluded in the G&G Final PEIS (BOEM, 2014a), impacts on navigation and vessel traffic from a small diesel spill would be **negligible** because a small spill would only prohibit full use of a small area by other marine users for a short time.

Conclusion

Overall, BOEM anticipates that impacts to navigation and vessel traffic would be **minor**. Because the vessel activity associated with Alternative A is expected to be relatively small compared to existing vessel traffic at the ports, in the WEA, and between the shore and the WEA, impacts on navigation from the additional vessels would be minor. With the use of navigation aids, impacts on navigation from the placement of a meteorological tower and/or buoys are expected to be minor. In addition, because the WEA was designed to avoid the major shipping lanes, the risk of allisions with meteorological structures is extremely low; in the event of an allision, there would be limited damage. Impacts from small fuel/oil spills associated with site characterization surveys or site assessment activities are anticipated to result in minor disruptions to vessel traffic and navigation, and thus minor impacts.

4.4.3 Socioeconomic Resources

4.4.3.1 Cultural, Historical, and Archaeological Resources

Description of the Affected Environment

Historic properties are defined as any pre-contact or historic period districts, sites, buildings, structures, or objects included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Historic properties that could experience impacts from site characterization (i.e., HRG surveys and geotechnical sampling) and/or site assessment activities (i.e., installation of a meteorological tower and/or buoys) include:

- Offshore historic properties on or below the seafloor within portions of the WEA or cable routes to shore that could be affected by seafloor disturbing activities, and
- Onshore historic properties within the viewshed of survey activities, construction activities, or a meteorological tower and/or buoys.

The information presented in this section is based on existing and available information and is not intended to be a complete inventory of historic properties within the affected environment. The WEA has not been extensively surveyed and that is the reason, in part, that BOEM requires the results of historic property identification surveys to be submitted with a SAP and COP.

Offshore Historic Properties

The potential for encountering offshore historic properties within the affected environment is closely tied to several variables that encompass the end of the last ice age during the late Pleistocene ±17,000 before present (B.P.) to present day. The most important variables include:

- Global (eustatic) sea level response to collapse of the continental ice sheets,
- Ground level response to crustal unloading (isostatic rebounding from ice sheet melting),
- Migration of humans into the ice-free areas of the OCS during the Late Pleistocene through Holocene Periods,
- European exploration of the North America coastline, and
- Subsequent establishment of maritime colonies and associated trade ports.

Historic properties that could potentially be affected include:

- Sailing ships of discovery,
- Oceanic and coastal trading vessels,
- Fishing and vernacular watercraft,
- Maritime and communications infrastructure related to the development and growth of New York City, and
- Pre-contact and historic period archaeological sites.

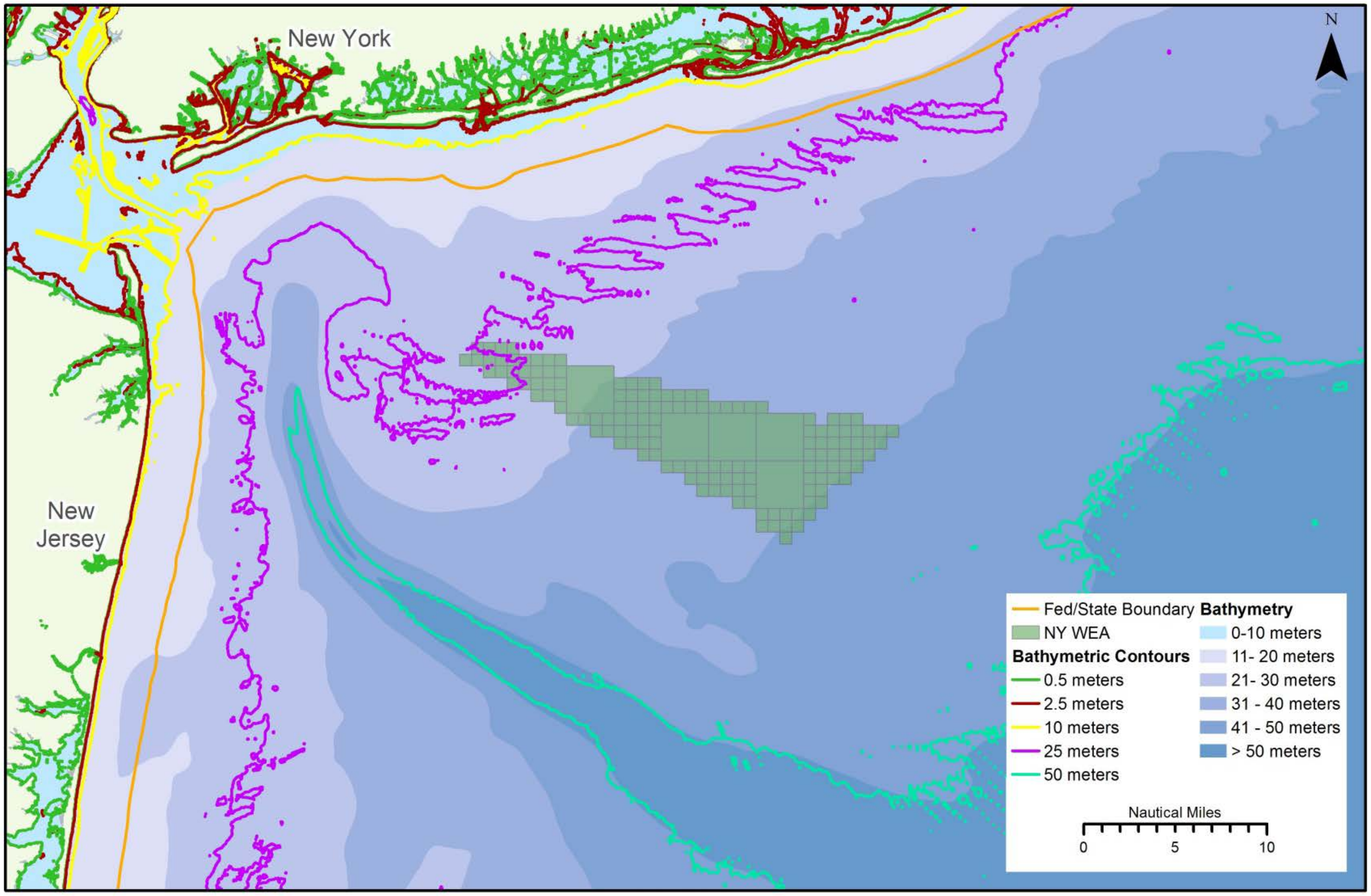
Pre-contact Archaeological Sites

During the Late Pleistocene, at the Last Glacial Maximum (20,000 B.P.), the glaciers that covered vast portions of the Earth’s surface sequestered massive amounts of water as ice and lowered global sea level approximately 394 ft (120 m). Corresponding with lower global sea level during the Late Pleistocene, the section of the OCS where the WEA is located was once exposed, dry land and was submerged by rising sea level during the Early Holocene. These previously exposed areas are identified as having a high potential for the presence of submerged archaeological sites (TRC, 2012) dating to the time periods during which they were exposed. While no pre-contact period archaeological sites have been identified on the OCS offshore New York at this time (Schuldenrein et al., 2013), known pre-contact archaeological sites are located onshore in formerly upland locations on western Staten Island (at Port Mobil and Wards Point), approximately 29 nm (53.7 km) west of the WEA.

Based on the present understanding of the archaeological record, early human populations developed distinct cultures and lifeways corresponding with three broadly-construed periods: Paleoindian (circa 15,000 to 10,000 B.P.), Archaic (10,000 to 3000 B.P.), and Woodland (3000 B.P. to 400 B.P.). Paleoindian society was semi-nomadic within a defined territory (TRC, 2012) using a broad spectrum of plants and animals for subsistence. Small to medium-sized fauna would have been the predominant focus for game, as the large megafauna (mammoth and mastodons) populations were declining in response to climatic changes (Schuldenrein et al., 2013). The transition to Early Archaic cultures is characterized by nomadic cultures becoming more complex and establishing sedentary societies, whereas the transition to Woodland cultures is based on the development of agriculture.

The Paleoindian period was a time of slowly moderating climate with cooler temperatures, increased precipitation, and rapid sea level rise. Several episodes of melting occurred (up to 11,000 B.P.) as a result of the North American ice sheet collapsing (TRC, 2012). As the sea level rose and isostatic rebound occurred, smaller drainages were captured and deeply incised drainages formed across portions of the OCS. These drainages formed highly localized productive estuarine environments that would have been utilized for food procurement, fresh water sources, and habitation as the marine transgression continued moving landward across the OCS. The enhanced sediment flows in these drainages associated with catastrophic flooding and increased precipitation would have provided localized burial of possible Paleoindian sites below the transgressive sediment reworking. The only known Paleoindian sites within the region are found onshore in formerly upland locations at Port Mobil and Ward’s Point on western Staten Island along the Arthur Kill (Schuldenrein et al., 2013).

By the early Archaic Period (10,000 B.P.), the climate had become warmer with less precipitation. Sea level had risen from −330 ft (−100 m) to −75 ft (−23 m) below present day levels (Schuldenrein et al., 2013). The −75 ft (−23 m) depth contour is located at the westernmost extent of the WEA, indicating that by the early Archaic period the WEA had likely been inundated (Figure 4-20). Prior to this inundation, the WEA was likely exposed dry land, although it would have been proximal to the shoreline and experiencing continued transgression with rapid burial of deeply incised drainages, ponds, or lagoons. By the Middle Archaic, sea level rise would have completely inundated the WEA and the shoreline would have migrated landward to approximately 33 to 40 ft (10–12 m) below present sea level (Schuldenrein et al., 2013). After inundation, the WEA would have been exposed to wave and current-based sediment transport and reworking during the Later Archaic to present day.



Note: The 25 m bathymetric contour, indicated in purple, approximates the former shoreline during the Early Archaic period and illustrates that by this time the majority of the WEA was inundated.

Figure 4-20 Sea Level Changes from the Archaic to Present Day

Based on sea level rise, the WEA has a high potential for the presence submerged archaeological sites dating from the Paleoindian through Early Archaic periods and very low to no potential for the presence of submerged archaeological sites more recent than the end of the Early Archaic (Table 4–23).

Table 4–23
Cultural Periods Potentially Present within the WEA

Cultural Period	Chronology in Years B.P.	Epoch	Sea Level ft (m)	Bathymetric Contour ft (m)
Paleoindian	15,000 to 10,000	Late Pleistocene to Early Holocene	−328 (100)	328 (100)
Early Archaic	10,000 to 8,000	Early Holocene	−328 to −75 (100 to 23)	75 (23)
Middle Archaic	8,000 to 6,000	Mid Holocene	−75 to −36 (23 to 11)	36 (11)
Late Archaic	6,000 to 3,000	Mid Holocene	−36 to −13 (11 to 4)	13 (4)

Source: Schuldenrein et al., 2013 B.P. = before present

Historic Archaeological Sites

The waters of the New York OCS are some of the heaviest trafficked shipping routes in the country. Every class or type of ship has transited through or operated in the vicinity of the WEA since the 17th century to the present day (Huie, 1941; Rattray, 1973; Bourque, 1979; Morris & Quinn, 1989; TRC, 2012). As the internal network of canals and rail developed and allowed the movement of goods to and from coastal cities, maritime technologies kept pace, becoming more complex with the advent of steam-, oil-, and internal combustion-powered vessels. An ever increasing amount of trade developed across the Atlantic, which moved through port cities such as New York. Of all the major ports for coastal and international commerce, none rivaled the Port of New York, which became the economic engine of the developing nation (Huie, 1941; Bourque, 1979). The volume of shipping that was transiting through the Port of New York from 1710 to 1780 during the Dutch and English colonial periods indicates there were well over 300 individual vessels transiting within the vicinity of the WEA, and that number grew to more than 1,500 vessels in the 1780s (Bourque, 1979).

Later, in the 19th century between 1821 through 1882 (Table 4–24), the volume of ships entering the Port of New York grew explosively (Huie, 1941). In 1821, 910 foreign ships entered the port, likely crossing the vicinity of the WEA. By 1882, this number had increased to 4,531 foreign ships (Huie, 1941). The reported marine casualties in the port of New York and the vicinity of the WEA indicate a growing number of potential shipwrecks (Table 4–25). This table is not a complete list and represents only those shipwreck events witnessed or reported by survivors.

The highest concentrations of reported shipwrecks in this area cluster around shipping channels and uncharted obstructions, as well as the Atlantic side of Long Island where sailing vessels foundered during storms as they tried to enter the port. Other sources put the number of marine casualties along the Atlantic coast at over 15,000 to 20,000 (TRC, 2012). Of the entire reported vessel losses, 10 to 20 percent are estimated to have sunk in the open waters of the OCS

Table 4–24
Foreign Shipping in New York Harbor

Year	Steamships	Ships (Sail)	Barks (Sail)	Brigs (Sail)	Schooners (Sail)
1821	0	260	4	315	331
1844	3	471	351	929	451
1859	268	713	872	1,269	885
1865	455	625	1,420	1,184	1,042
1877	1,074	389	2,234	1,076	1,451
1882	1,945	407	1,857	896	1,371

Source: Huie, 1941

Table 4–25
Shipping Losses in New York Waters

Year	Reported Vessel Losses
1600–1650	6
1651–1700	2
1701–1750	3
1751–1800	32
1801–1850	157
1851–1900	514

Source: Rattray, 1973

(TRC, 2012). Shipwrecks potentially located in the WEA could date as far back as the 16th century with ships of discovery, but the bulk of the potential losses are more likely to be from the 19th to mid-20th century (Table 425).

There are nine shipwrecks reported within the boundaries of the New York WEA, two of which have dates for sinking; the remaining seven do not have dates associated with them (TRC, 2012). One of the nine is simply identified as an unknown vessel and has no further data to suggest construction, rig, or purpose. Additionally, the locational reliability of these reported shipwrecks is considered to be low and, if present, they may be up to 3 mi (4.8 km) or greater from the plotted positions. These vessels potentially meet several of the criteria for eligibility on the NRHP.

Onshore Historic Properties

The types of historic properties expected within the onshore affected environment include districts, sites, buildings, structures, or objects within the viewshed of site characterization and site assessment activities. An overview of the nature and scope of onshore historic properties that could be affected by site characterization and site assessment activities is presented in *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al., 2012).

Table 4–26
Shipwrecks Reported within the New York WEA

Record	Vessel	Year Sunk	History
7791	*Irma C*	Unknown	Identified as Irma C
7815	*Florence*	Unknown	Identified as Florence
7706	*Three Sisters*	Unknown	Identified as Three Sisters
1533	*Burnside*	1913	24 NO. 8391; schooner, 855 GT, sunk April 20, 1913 by marine casualty, accuracy within 1 mi (1.6 km)
1542	*Tarantula*	1918	24 NO.120; subchaser, 160 GT, sunk October 28, 1918, by marine casualty, accuracy 1 to 3 mi (1.6 to 4.8 km) Recorded April 1, 1923.
7774	*Happy Days*	Unknown	Identified as Happy Days
7721	*Durley Chine*	Unknown	Identified as Durley Chine
7732	*Skippy*	Unknown	Identified as Skippy
7741	*Unknown*	Unknown	No further information available

GT = gross tonnage

The affected environment for onshore historic properties is a 0.25 mi (0.40 km) onshore buffer extending along the coastline between Ocean Grove, New Jersey, and the northeast tip of FIIS, located in Long Island, New York. This area corresponds to onshore areas potentially within the viewshed of site characterization and site assessment activities. A buffer of 0.25 mi (0.40 km) was determined to represent the potential inland extent of the onshore viewshed as open views of the ocean beyond this distance are likely to be obstructed by buildings and other development. This area also corresponds to baseline data on historic properties archived in the New York State Office of Parks, Recreation, and Historic Preservation SPHINX system, and is documented in *Evaluation of Visual Impact on Cultural Resources/Historic Properties: North Atlantic, Mid-Atlantic, South Atlantic, and Florida Straits* (Klein et al., 2012). Klein et al. (2012) documented 40 known NRHP-listed and potentially eligible properties within the analysis area that are considered in this assessment (Figure 4–21). Additional historic properties that have been documented since the time of this 2012 study or that have not yet been identified through historic property identification survey may also be located in this area.

Impact Analysis of Alternative A

Impacts to cultural, historical, and archaeological resources in the discussion below are categorized by reasonably foreseeable impacts to offshore and onshore historic properties.

Routine Activities

Site Characterization Activities

Offshore Historic Properties

Site characterization activities include both HRG survey (e.g., shallow hazard, geological, and archaeological surveys) and geotechnical sampling techniques. Geophysical surveys do not come in contact with the seafloor and, therefore, have no ability to impact offshore historic properties. Geotechnical sampling activities, conducted to inform the design and installation of renewable energy structures or cables, disturb the seafloor and therefore have the potential to impact historic properties located on or below the seafloor. Coring, sediment grab sampling, and other direct sampling techniques (e.g., CPTs, deep borings), in addition to anchoring, anchor chain sweep from moored or anchored support vessels, use of jack-up barges, or other equipment used in conducting geotechnical sampling all have the potential for damaging or destroying historic properties located on or under the seafloor. These potential impacts can be reduced to **negligible** through the completion of geophysical surveys in the WEA consistent with BOEM's *Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585*. Geophysical surveys, in part, serve to identify offshore historic properties. If geophysical surveys are completed by a lessee prior to conducting geotechnical/sediment sampling, historic properties can be identified and bottom disturbing activities can be located in areas where historic properties are not present. BOEM would therefore require a lessee to conduct geophysical surveys consistent with the *Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585* prior to conducting geotechnical sampling, and if a potential offshore historic property is identified, the lessee would be required to avoid it.

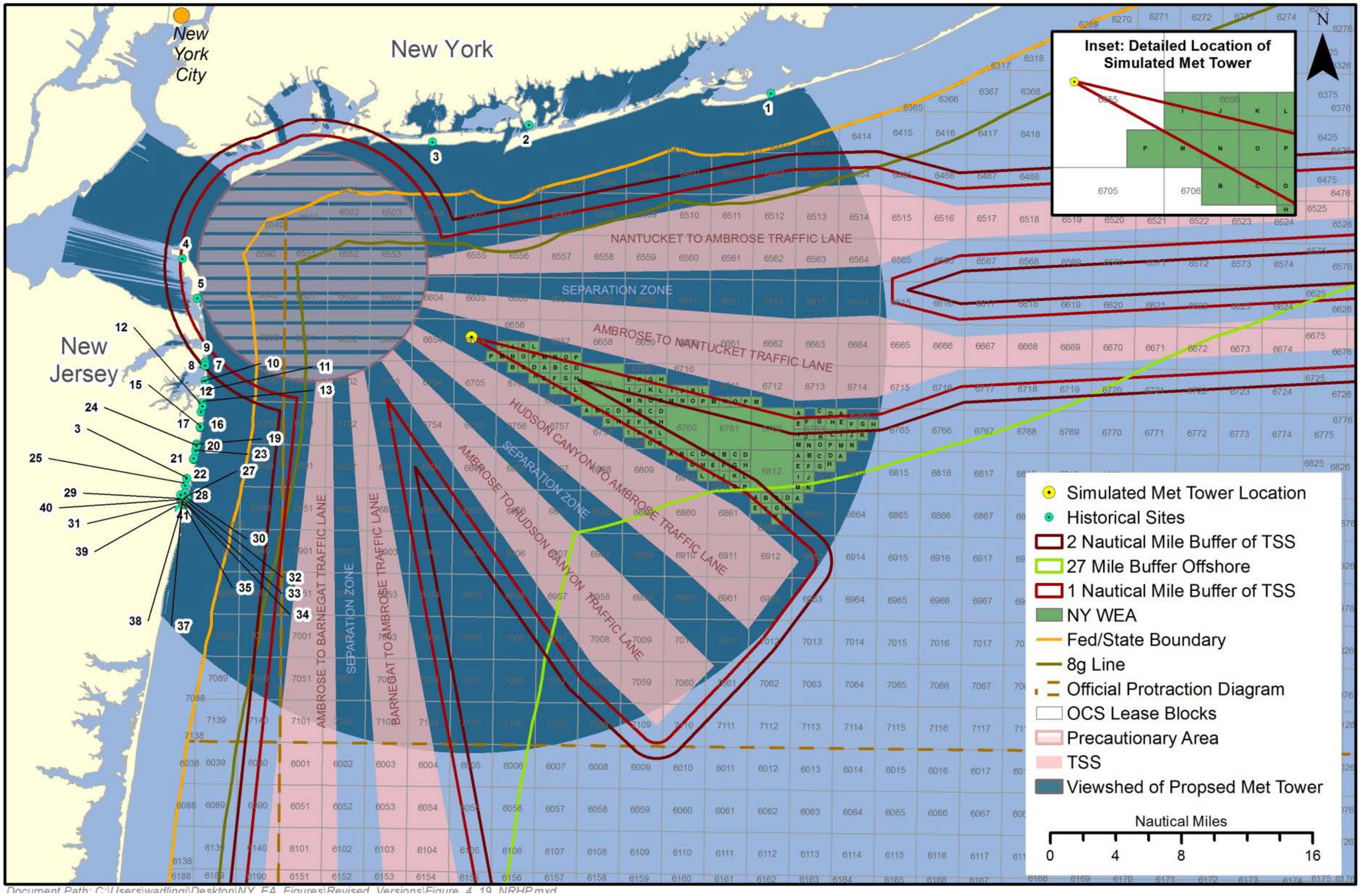


Figure 4-21 NRHP-Listed and Potentially Eligible Properties (key to the figure is on the next page)

Key to Figure 4-21:

ID Historical Sites

1 Fire Island Light Station
2 Jones Beach State Park, Causeway and Parkway System
3 House at 226 West Penn St.
4 Fort Hancock and Sandy Hook Proving Ground Historic District
5 Fort Hancock U.S. Life Saving Station
6 U.S. Lifesaving Station #3
7 Washington E. Connor Stable
8 First Methodist Church
9 St. Luke's A.M.E. Church
10 U.S. Life Saving Station #4
11 Monmouth Beach Bath and Tennis Club
12 The Reservation/Navaho Lodge
13 Edgar A. West Building
14 The Reservation Historic District
15 Theodore Moss House
16 Theodore Moss House
17 L.J. Phillips House
18 U.S. Life Saving Station #5, and Takanassee Beach Club Historic District
19 St. Michael's Roman Catholic Church
20 Ocean Avenue Bridge
21 Elberon Hotel Garage
22 Church of the Presidents
23 James M. Brown House
24 Deal Esplanade District
25 Allenhurst Residential Historic District
26 George Wurt's Summer Home
27 Howard Johnson's Pavilion
28 Baronet Theatre
29 Sunset Lake Hisoric District
30 Waterfront Resort Historic District
31 Library Square Historic District
32 Berkeley-Carteret Hotel
33 The Stone Pony
34 Jersey Apartments
35 Asbury Park Casino and Carousel
36 Asbury Park Convention Hall
37 Metropolitan Hotel
38 Palace Amusements Building
39 Ocean Grove Camp Meeting Association Historic District
40 Britwoods Court
41 Willis Apartments

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The following elements, designed to avoid impacts to offshore historic properties from site characterization activities, would be included in a commercial lease issued for the WEA:

- The Lessee must provide the results of an archaeological survey with its plans.
- The lessee may only conduct geotechnical exploration activities, including geotechnical sampling or other direct sampling or investigation techniques, which are performed in support of plan (i.e., SAP and/or COP) submittal, in areas in which an archaeological analysis of the results of geophysical surveys has been completed for that area.
- The analysis must be completed by a qualified marine archaeologist who both meets the *Secretary of the Interior's Professional Qualifications Standards* (48 FR 44738–44739) and has experience analyzing marine geophysical data.
- The qualified marine archaeologist's analysis of the geophysical data must include a determination of whether any potential archaeological resources are present in the area of geotechnical sampling, including consideration of both pre-contact and historic period archaeological resources.
- If present in the area, the lessee's geotechnical sampling activities must avoid any potential archaeological resources by a minimum of 164 ft (50 m). The avoidance distance must be calculated by the qualified marine archaeologist from the maximum discernible extent of the archaeological resource.
- The qualified marine archaeologist must certify in the lessee's archaeological reports included with a SAP or COP that geotechnical exploration activities did not affect potential historic properties identified as a result of the HRG surveys.
- In no case may the lessee's actions affect a potential archaeological resource without BOEM's prior approval.

In addition, BOEM would require that the lessee observe the unanticipated finds requirements at 30 CFR 585.802. The following elements would be included in a commercial lease issued within the WEA:

- If the lessee, while conducting site characterization activities in support of plan (i.e., SAP and/or COP) submittal, discovers a potential archaeological resource such as the presence of a shipwreck or pre-contact archaeological site within the project area, the lessee must:
    - Immediate halt of seafloor-disturbing activities in the area of discovery;
    - Notify the lessor within 24 hours of discovery;
    - Notify the lessor in writing by report within 72 hours of its discovery;
    - Keep the location of the discovery confidential and take no action that may adversely affect the archaeological resource until the lessor has made an evaluation and instructs the applicant on how to proceed; and
    - Conduct any additional investigations as directed by the lessor to determine if the resource is eligible for listing in the NRHP (30 CFR 585.802(b)). The lessor will direct the lessee to conduct such investigations if: (1) the site has been affected by the lessee's project activities; or (2) impacts on the site or on the area of potential

effect cannot be avoided. If investigations indicate that the resource is potentially eligible for listing in the NRHP, the lessor will tell 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, under Section 110(g) of the NHPA, the lessor may charge the lessee reasonable costs for carrying out preservation responsibilities under the OCSLA (30 CFR 585.802(c-d)).

Because a lessee would be required to conduct geophysical surveys prior to conducting geotechnical sampling, and would be required to follow the lease stipulations regarding avoidance and unanticipated discovery protocols for submerged historic properties, impacts from site characterization on offshore historic properties are expected to be **negligible**.

In some cases, geotechnical testing methods may also provide a useful strategy of confirming the presence or absence of features of archaeological interest and for gathering information that informs the archaeological interpretation of HRG data. If a lessee intends to impact a potential offshore historic property for the purpose of historic property identification or NRHP testing and evaluation, the lessee would be required to provide written notification describing these activities to BOEM for approval under the elements of lease issuance outlined above. BOEM would review this information under Section 106 of the NHPA and the stipulations of the Programmatic Agreement, discussed below. Impacts to submerged historic properties from vibracores or other direct samples collected, by or under the supervision of a Qualified Marine Archaeologist, for the purposes—at least in part—of historic property identification or NRHP eligibility testing and evaluation are expected to be **negligible.**

Onshore Historic Properties

Vessel traffic from site characterization activities could be visible from onshore historic properties. As noted in Section 4.4.3.2 *Navigation/Vessel Traffic*, BOEM anticipates that there would be one to three vessels at any given time in the WEA and between the shore and the WEA associated with the proposed action. Survey vessels in the WEA would appear small in scale or would fall below the horizon, thereby reducing the likelihood that vessels are seen from onshore locations. Similarly, lighting associated with survey vessels operating under night conditions would appear small in scale and isolated, consistent with existing nautical lighting visible on the horizon. However, the increased ocean vessel traffic from these survey activities would be indistinguishable from existing ocean vessel traffic, and these impacts would be temporary. Additionally, based on the distance of survey activities from any onshore historic properties, the impacts to the characteristics of these properties that contributed to their eligibility for listing in the NRHP are expected to be **negligible**.

Site Assessment Activities

Offshore Historic Properties

Although installation of a meteorological tower and/or buoys would affect the seafloor, the lessee's SAP must be approved by BOEM prior to installation. To assist BOEM in complying with the NHPA and other relevant laws (30 CFR 585.611(a), 30 CFR 585.611(b)(6)), the SAP must contain a description of the historic properties that could be affected by the activities proposed in the plan. Under its Programmatic Agreement, BOEM will consult with the New

York SHPO and other appropriate parties prior to approval of a SAP to ensure potential effects on historic properties are avoided, minimized, or mitigated under Section 106 of the NHPA.

The seafloor impacts associated with installation of a meteorological tower and/or buoys include:

- Disturbance resulting from foundation installation;
- Dropping and dragging anchors from construction vessels; and
- Mooring chain sweeping.

Impacts on archaeological resources in these activity areas could result in destruction of all or part of the historic properties or loss of their archaeological context. Should the archaeological surveys reveal the possible presence of an archaeological site in an area that may be affected by activities proposed in a SAP, BOEM would likely require the lessee to avoid the potential site or 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. If avoidance of the historic property is not possible, BOEM would continue Section 106 consultation under the Programmatic Agreement to resolve adverse effects. Although site assessment activities have the potential to affect historic properties either on or below the seabed, 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 to damage historic properties low. Therefore, impacts on offshore historic properties from site assessment activities are expected to be **negligible**.

Onshore Historic Properties

Because of the distance of the WEA from shore, it is anticipated that meteorological buoys would not be visible from onshore areas and would have no impact on onshore historic properties.

Under daytime conditions, if a lessee installed a meteorological tower at the closet point of the leased area that is available for meteorological structure placement to the shoreline (at the western end of the WEA where it intersects the 1 nm [1.9 km] buffer), approximately 11.5 nm (21 km) from the shoreline, the tower may be visible, although it would be difficult to detect by the casual observer when viewed from onshore historic properties. Assuming no daytime avoidance lighting on the meteorological tower (see discussion of avoidance lighting per FAA [2015] in Section 4.4.4.6 *Visual Resources*), if the tower was detected by an observer on the shore, it would appear small in scale relative to the broad horizon of the seascape, and visual contrast would be weak.

During nighttime conditions, avoidance lighting on the tower could be visible from onshore historic properties; however lighting would be discrete and isolated and appear consistent with existing nautical lighting on the horizon. Lighting would appear similar to lights visible from existing vessel traffic. Visibility of the meteorological tower, and related viewshed impacts, would attenuate with distance due to the influence of atmospheric haze and the reduction in scale of the tower relative to the surrounding seascape. No portion of the meteorological structure or lighting would be visible if the tower was placed beyond 23.5 nm (44 km), because the entire tower would fall below the horizon when viewed from the shore. Consequently, visual impacts to onshore historic properties resulting from the proposed action would be **minor.**

Conclusion

Overall, impacts to cultural, historical, and archaeological resources would be **minor.** Impacts to submerged historic properties from site characterization activities are expected to be **negligible** given the geophysical surveying requirements and lease conditions discussed above. Impacts to submerged historic properties from installation of a meteorological tower and/or buoys are expected to be **negligible** as avoidance would likely be required by BOEM. If avoidance of potential historic properties is not feasible, BOEM will continue its Section 106 consultation to resolve adverse effects.

Vessel traffic associated with survey activities would be indistinguishable from existing vessel traffic and short-term. Therefore, impacts to onshore historic properties from site characterization activities are expected to be **negligible**.

A meteorological tower is not expected to be detected by the casual observer when viewed from onshore historic properties under daytime conditions. Nighttime lighting would be discrete and isolated and appear consistent with existing nautical lighting on the horizon and is not expected to adversely impact the character of onshore historic properties. Therefore, overall impacts on onshore historic properties from installation of a meteorological tower are expected to be **minor**.

4.4.3.2 Demographics and Employment

Description of the Affected Environment

This section presents an overview of major socioeconomic characteristics and trends to provide a context from which to assess impacts of the proposed action. The counties chosen for analysis are those with ports and the immediate surrounding area that may be used by a lessee in the future. Section 3.2.3 *Port Facilities* describes in detail the rationale for identifying the ports. The demographic and economic characteristics and trends are presented at the county level; ports are located in five counties in New Jersey and three counties in New York.

Within the State of New Jersey, the ports are located in the counties of Hudson, Union, Essex, Middlesex, and Monmouth. The populations of these counties range from around 550,000 persons to 835,000 persons (U.S. Census Bureau, 2016a). With the exception of Monmouth County where population decreased by a very small percentage (−0.2%) between 2010 and 2014, the remaining four counties have experienced modest increases in population during this time period (Table 4–27). Within New York State, two out of the three counties in which the ports are located are in New York City, and the remaining county is located on Long Island. These include Kings County (Brooklyn), Richmond County (Staten Island), and Suffolk County. Kings County had the largest increase in population (4.7%) between 2010 and 2014, whereas the population in Suffolk County increased by only 0.6 percent during this time period. Richmond County experienced an increase of 1.0 percent between 2010 and 2014 (U.S. Census Bureau, 2016b).

Table 4–27
Population and Unemployment of New York and New Jersey Coastal Counties with Large Ports

Port Location	County, State	County-wide Population (2014 estimate)	Unemployment Rates (2009-2013 Estimates)	Percentage Change in Population (2010 to 2014)
Bayonne	Hudson County, NJ	669,115	10.9%	5.5%
Brooklyn	Kings County, NY	2,621,793	10.9%	4.7%
Elizabeth	Union County, NJ	552,939	11.0%	3.1%
Newark	Essex County, NJ	795,723	13.9%	1.5%
Staten Island	Richmond County, NY	473,279	7.9%	1.0%
Erie Basin	Kings County, NY	2,621,793	10.9%	4.7%
Perth Amboy	Middlesex County, NJ	836,297	9.0	3.3%
Kismet Harbor	Suffolk County, NY	1,502,968	7.4%	0.6%
Ocean Beach Harbor	Suffolk County, NY	1,502,968	7.4%	0.6%
Shark River	Monmouth County, NJ	629,279	9.0%	–0.2%
Manasquan	Monmouth County, NJ	629,279	9.0%	–0.2%

Source: U.S. Census Bureau, 2016a; ; U.S. Census Bureau, 2016b; U.S. Census Bureau, 2016c

As shown in Table 4–27, unemployment rates within the counties range between 7.4 percent in Suffolk County, New York, to 13.9 percent in Essex County, New Jersey (U.S. Census Bureau, 2016b). The rate of unemployment in three of the five New Jersey counties–Hudson, Union, and Essex counties–was higher than the state average unemployment rate of 10.1 percent. In New York, only Kings County had a higher unemployment rate (10.9%) than the state average (9.2%). For both states, the educational services and health care and social assistance sector is the single largest employment sector, employing between 23 and 28 percent of the total workforce (U.S. Census Bureau, 2016d). In terms of future employment, within New Jersey, the educational and health services sectors and the trade, transportation, and utilities sector are expected to see the highest rates of growth over the next 8 to 10 years (NJDOL, 2013). Within New York State, similar trends are exhibited based on projections up to 2022 by the New York State Department of Labor (NYSDOL, n.d.). Employment in the professional and business services sector is expected to grow by 23 percent during this time period. The construction sector is also expected to see increased employment in this area over the same time period.

The National Ocean Economics Program publishes datasets on employment and establishments compiled from the Bureau of Labor Statistics on economic activity that typically takes place in the ocean or is supportive of such activity in some shape or form (NOEP, 2016). The industrial sectors for which the data are compiled include living resources, marine construction, offshore minerals, tourism and recreation, and transportation. Based on 2012 data, the five New Jersey counties employ approximately 58,000 persons and the three New York counties employ nearly 59,000 persons, respectively, supporting the ocean economy industry sectors. In New Jersey, the study area counties employed about 4 percent of their total labor force in these ocean-based sectors and approximately 5 percent in the study area counties of New York

State; both percentages are relatively high when compared to the total employment in each respective state.

Impact Analysis of Alternative A

Routine Activities

The potential impacts on demographics and employment that could occur as a result of the site characterization and assessment were previously analyzed in the G&G Final PEIS (BOEM, 2014a), and it was concluded that impacts from site characterization and assessment activities were expected to be **negligible**. Although the WEA does not fall within the geographic region covered by the G&G Final PEIS, the types of activities addressed in the G&G Final PEIS would have similar impacts on demographics and employment in the New York and New Jersey coastal areas.

Temporary increases in employment from proposed action activities, such as surveying, tower and buoy fabrication, and construction would occur in various local economies associated with onshore- and offshore-related industry in the coastal counties of New York and New Jersey. Additionally, the G&G Final PEIS (BOEM, 2014a) found that the small number of workers directly employed in site characterization surveys (10-20 people; BOEM, 2012b) would be insufficient to have a perceptible impact on local employment and population.

BOEM expects any beneficial impacts on employment, population, and the local economies in and around the ports to be short-term and imperceptible, depending on the distribution of activities among ports and over time, and therefore impacts would be **negligible**. Although the approximate number of workers directly employed would be measureable, benefits to the local economy would be difficult to measure, and the overall impact to local economy, and therefore to demographics and employment, would be **negligible**.

Non-Routine Events

The G&G Final PEIS (BOEM, 2014a) analyzed potential impacts on demographics and employment that could occur as a result of accidental fuel spills, and concluded that impacts from fuel spills would be **negligible**. Based on the analysis reported in that document and the similarity to activities for the proposed action, BOEM anticipates that fuel spills would have **negligible** impacts to the demographics and employment of the New York and New Jersey coastal counties.

Conclusion

BOEM anticipates that the proposed action would have beneficial, short-term impacts to demographics and employment in the coastal counties of New York and New Jersey, but impacts would be imperceptible and are expected to be **negligible**.

4.4.3.3 Environmental Justice

Description of the Affected Environment

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (Subsection 1-101).

EO 12898 also requires that each federal agency:

- Conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons and populations from participation in, denying persons and populations the benefits of, or subjecting persons or populations to discrimination under such programs, policies, and activities because of their race, color, or national origin (Subsection 2-2).
- Work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public (Subsection 5-5(c)).

The following section presents an evaluation of the demographic composition of minority and low-income persons living within the study area counties. Population and income characteristics from the 2010 U.S. Census of Population and Housing were analyzed to identify populations of concern with respect to potential environmental justice issues. The following information was collected at the county level.

- Racial and Ethnic Characteristics—The population in each census block of the study area counties was characterized using the following racial categories: White Hispanic, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Other, and Persons of Hispanic Origin. These categories are consistent with the affected populations requiring study under EO 12898 and are described below.
- Percentage of Minority Population—As defined by the U.S. Census Bureau, the minority population includes all non-Whites and White-Hispanic persons.
- Low-Income Population—The percentage of persons living below the poverty level, as defined in the census, was one of the indicators used to determine the low-income population in a given county.

In New Jersey, based on the demographic characteristics of the study area counties presented in Table 4–28, Hudson, Union, Essex, and Middlesex Counties exhibited higher percentages of minority persons than the state-wide average of 43.2 percent (U.S. Census Bureau, 2016a). In New York, only Kings County exhibited a higher percentage of minority persons than the statewide average of 43.5 percent (U.S. Census Bureau, 2016b). In terms of persons below the poverty level, Hudson and Union Counties in New Jersey and Kings County in New York have a higher share of persons below the poverty level than the state averages of 11.1 and 15.9 percent, respectively (U.S. Census Bureau, 2016a; U.S. Census Bureau, 2016b).

Table 4–28
Percent of Minority Persons and Persons Below Poverty for New York and New Jersey Coastal Counties with Large Ports

Port Location	County, State	Minority Percentage of County[(1),(2)]	Persons Below Poverty in County (2014)
Bayonne	Hudson County, NJ	70.8%	17.7%
Brooklyn	Kings County, NY	64.3%	23.4%
Elizabeth	Union County, NJ	57.7%	11.1%
Newark	Essex County, NJ	67.8%	16.7%
Staten Island	Richmond County, NY	37.4%	14.5%
Erie Basin	Kings County, NY	64.3%	23.4%
Perth Amboy	Middlesex County, NJ	54.6%	8.3%
Kismet Harbor	Suffolk County, NY	30.7%	7.7%
Ocean Beach Harbor	Suffolk County, NY	30.7%	7.7%
Shark River	Monmouth County, NJ	24.3%	8.2%
Manasquan	Monmouth County, NJ	24.3%	8.2%

Source: U.S. Census Bureau, 2016a; U.S. Census Bureau, 2016b

(1) Minority Persons computed as the sum of the following Ethnic Groups: Hispanic White, Black or African American Alone, American Indian and Alaska Native Alone, Asian Alone, Native Hawaiian and Other Pacific Islander Alone, and Two or More Races.

(2) Percentage of Minority Persons in New Jersey was 43.2% and in New York was 43.5% based the 2010 U.S. Census.

The presence of minority or low-income persons alone does not trigger EO 12898. The EO only applies if the effects of the project are adverse and affect a low-income or minority population disproportionately compared to the project's effect on the overall population.

The G&G Final PEIS (BOEM, 2014a) also considered potential environmental justice impacts on fishing communities, because these are often low-income. The G&G Final PEIS (BOEM, 2014a) concluded that fishing communities in the Mid- and South-Atlantic coastal states do not generally have a minority or low-income presence greater than the country as a whole. However, individual fishing communities could be minority or low-income populations. Although the WEA does not fall within the geographic region covered by the G&G Final PEIS, the types of activities addressed would have similar impacts on minority or low-income populations in the New York and New Jersey coastal areas. Because identification of individual minority or low-income fishing communities would not affect the environmental justice impact analysis at the current level of analysis, no further detail on fishing communities is provided in this EA. Site-specific project environmental reviews would be expected to identify individual minority and low-income fishing communities and assess any disproportionately high human health and environmental effects that these communities may face.

Impact Analysis of Alternative A

No high and adverse human health or environmental effects that would disproportionately affect low-income and minority persons would occur as a result of site characterization or site assessment. Therefore, there would be **no impacts** on environmental justice as a result of the proposed action.

Conclusion

Because no disproportionately high and adverse human health effects would occur as a result of the proposed action, there would be **no impacts** on minority or low-income populations.

4.4.3.4 Recreation and Tourism

The analysis area for recreation and tourism includes areas within 0.25 mi (0.4 km) of the coastline of Suffolk, Nassau, Queens, and King Counties in New York and Monmouth County in New Jersey.

Description of the Affected Environment

The coastal areas of New York and New Jersey are characterized by an abundance of coastal recreation and tourism opportunities. A detailed account of these opportunities within the analysis area is provided by BOEM (2012a), which is incorporated in this section by reference. These counties are characterized by tourism economies dependent on ocean-related recreation and tourism for employment and business (Table 429) (BOEM, 2012a).

Table 4–29
Percentage of Ocean-Related Jobs Related to Recreation and Tourism by County

County	Percent of Ocean-Related Jobs Related to Tourism
Monmouth, NJ	92.6%
Kings, NY	93.9%
Nassau, NY	94.4%
Suffolk, NY	87.7%
Queens, NY	77.5%

Source: NOAA, 2012

Though many recreation and tourism opportunities exist in inland portions of these counties, the assessment in this EA focuses on those areas situated along the shoreline that may depend on coastal settings. An overview of coastal recreation and tourism opportunities is provided below by County.

Monmouth County, New Jersey – Monmouth County is characterized by 27 mi (43 km) of shoreline along the Atlantic Ocean (Monmouth County Tourism, 2015). Coastal recreation opportunities include public beaches, boardwalks, a harbor, marinas, boatyards, yacht clubs, state parks, trails, and historic sites (Monmouth County Tourism, 2015). The white sand beaches provide recreational opportunities such as swimming, picnicking, and sunbathing, while the waters within and outside the bay attract fishermen, scuba divers, surfers, and wind surfers. Sandy Hook, part of the Gateway National Recreation Area, is the County's most popular attraction, drawing over 2 million visitors per year (NPS, 2015b). The national landmarks of Fort Hancock and the Sandy Hook Lighthouse are located on the Sandy Hook peninsula. The Twin Lights historic monument, located on the hillside overlooking the shoreline, attracts thousands of history enthusiasts each year (Friends of Twin Lights, 2015).

Kings County, New York – Kings County is characterized by minimal coastline along the Atlantic Ocean, as the majority of the County borders the East River or is within the Upper or Lower New York Bay. Coastal recreation and tourism opportunities include public beaches (Brighton Beach, Coney Island Beach, and Manhattan Beach), harbors, marinas, boatyards, and yacht clubs (New York City Department of Parks and Recreation, 2015). The beaches are accessible by New York City's subway system and are generally only visited by local residents. A popular local coastal resident and tourist areas of interest is Coney Island, a beachside amusement park (New York City Department of Parks and Recreation, 2015).

Nassau County, New York – Nassau County borders Long Island Sound to the north. The southern shoreline faces the Atlantic Ocean and is characterized by sand beach, wetlands, or industry. Jones Beach, located on the southern shoreline, is a 6.5 mi (10.5 km) long public beach (Nassau County, 2015). This recreation area is included in the NRHP (NPS, 2016a). An average of six to eight million people visits Jones Beach annually (NYSDPRHP, 2016). Several wildlife sanctuaries and state parks are present in the wetlands along the southern coast. Coastal recreation and tourism activities include surfing, swimming, sunbathing, and beachcombing. The Long Beach Boardwalk, built in 1907, is regarded as a "quintessential surf town" by the Nassau County Industrial Development Agency (Nassau County, 2015).

Suffolk County, New York – Suffolk County is located between Long Island Sound to the north and the Atlantic Ocean to the south. Coastal recreation and tourism opportunities include public beaches, harbors, marinas and boatyards, and yacht clubs (Long Island Convention and Visitors Bureau and Sports Commission, 2015). Numerous national parks and wildlife refuges exist within the County including the FIIS (NPS, 2015a). The FIIS was established "for the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes, and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population" (16 U.S.C. § 459e). The area attracts beachgoers ranging from surfers to nature enthusiasts who are drawn to the wildlife, natural areas, scenic views, and secluded beach (NPS, 2015a).

Queens County, New York – The majority of the coastline is characterized as industrial, though sand beaches are present along the southern shore. The County has one public beach—Rockaway Park—two harbors, five marinas, and nine yacht clubs (New York City Department of Parks and Recreation, 2015). The Gateway National Recreation Area is located in Queen County, and includes the Sandy Hook Unit, located in Highlands, New Jersey, and two units in New York City: the Jamaica Bay and Staten Island Units (NPS, 2016b). This National Recreation Area was established to "preserve and protect for the use and enjoyment of present and future generations an area possessing outstanding natural and recreational features" (16 U.S.C. § 460cc). The Jamaica Bay Wildlife Refuge, part of the Gateway National Recreation Area, is characterized by extensive salt marsh, upland fields and woods, several fresh and brackish water ponds, and an open bay (NPS, 2015b).

Impact Analysis of Alternative A

The analysis focuses on the following impact-producing factors from both site characterization and assessment to measure potential impacts to recreation and tourism opportunities:

- Vessel traffic during site characterization and site assessment
- Trash and debris from vessels
- Viewshed-related impacts associated with site characterization and site assessment from additional vessels, and nighttime lighting on the vessels that could be seen both from shore and from recreational boaters
- Viewshed-related impacts from the meteorological tower, including nighttime lighting
- Fuel spills

The assessment of potential impacts resulting from site assessment activities was based, in part, on information presented in the G&G Final PEIS (BOEM, 2014a). Where applicable, this information is incorporated by reference and summarized below. Viewshed-related impacts were assessed per methods described in Section 4.4.4.6 *Visual Resources*.

Routine Activities

Vessel Traffic

BOEM assumes that for staging during site assessment the lessee would use a large port with sufficient berth space to accommodate vessels and to host fabrication of a meteorological tower and/or buoy. Smaller vessels, such as those related to the maintenance of the meteorological tower, may use a smaller commercial port close to the WEA as described in Section 3.2.3 *Port Facilities*. As noted in Section 4.4.3.2 *Navigation/Vessel Traffic*, BOEM anticipates that there would be one to three vessels at any given time in the WEA and between the shore and the WEA associated with the proposed action. The impact of this additional vessel traffic associated with Alternative A would be **negligible** for recreational boating activities given the existing vessel traffic.

Impacts from site characterization and site assessment on recreational fishing are discussed in Section 4.4.4.5 *Commercial and Recreational Fisheries*. Increased vessel traffic associated with the proposed action is expected to result in **negligible** impacts to recreational boating activities given the location of the WEA away from popular recreational spots that tend to be closer to shore.

Trash and Debris

As discussed in detail Section 4.4.4.1 *Cultural, Historical, and Archaeological Resources* under onshore historic properties, the primary impact-producing factor associated with vessels used in support of the proposed action would be the potential for generation of trash and debris. Trash and debris, if accidentally released, could wash up on beaches and into harbors, bays, and coastal marshes and other recreation and tourism destinations. Presence of trash/debris could adversely affect the aesthetic quality of the setting and alter the perception of affected areas, particularly for those areas valued for beach and near shore recreation (e.g., Gateway National Recreation Area, Jones Beach State Park), or those considered pristine wilderness (e.g., FIIS). However, because of restrictions that prohibit the release of trash and debris provided by existing regulations (MARPOL 73/78 Annex V) impacts to recreation and tourism resulting from trash and debris are expected to be **negligible**.

Viewshed-Related Impacts from a Meteorological Tower

Potential impacts to recreation and tourism settings resulting from the visual contrast of the meteorological tower and/or buoys and associated nighttime lighting would be **minor**, as described in Section 4.4.4.6 *Visual Resources.*

Non-Routine Events

The likelihood of a fuel spill during surveys is expected to be remote (Section 3.3.3 *Spills*). As noted in the G&G Final PEIS (BOEM, 2014a), potential impacts to recreation and tourism would depend on the location of a spill, meteorological conditions at the time of the spill, and the speed with which cleanup occurred. Should a spill occur, access to recreation and tourism destinations could be temporarily limited by cleanup and response vessel activity. However, a spill would likely be relatively small (88 gallons [333 liters]) (Section 3.3.3 *Spills*) so a large-scale spill response involving multiple cleanup vessels is not expected. Therefore, impacts on recreational resources from a small diesel fuel spill are expected to be **minor**.

Conclusion

Impacts to recreation and tourism resulting from routine and non-routine activities would be **minor.** Impacts would result primarily from the potential for small scale spills, and from vessel traffic associated with installation of a meteorological tower and/or buoys.

4.4.3.5 Commercial and Recreational Fisheries

Description of the Affected Environment

The New York proposed lease area is located in the New York Bight (extending from Cape May, NJ, to Montauk Point, NY) and home to fish targeted by commercial fishermen. There are known fishing locations, such as Cholera Banks, Middle Ground, Anglers Bank, and the Flats, that are adjacent to the proposed lease area (Figure 4–8). The history of Cholera Bank as a fishing area as documented by Freeman and Walford (1974) is that before the early 1800's boats rarely had to go outside the range of Sandy Hook Light to catch black sea bass, a favorite fish then in great abundance. As fishing pressure in Lower Bay and along the shore increased, the yield followed the usual course of overexploitation. The catch per fisherman, and eventually the total catch, decreased so that fishermen were forced to go offshore to seek concentrations of fish. By random searching, they slowly discovered the various grounds where fish congregate. One of the better grounds was found in 1832 when a boat dropped anchor on a rocky spot that proved to abound with large sea bass. The captain quickly signaled other boats to share his good fortune. Because it was such a good ground, the fishermen decided to give it a name, and because it was the time of a great cholera epidemic, they called it Cholera Bank. Although the original location of this ground (Figure 4–9) lies about 17 mi east of Sandy Hook, boat captains now refer to another part of the reef, 5 mi to the northeast, as Cholera Bank. Located on the same submarine reef are two grounds west of Cholera, Middle Ground and Angler Bank, and one to the east, appropriately called East of Cholera (Figure 4–9). Since these grounds are defined as being located so far west or east of Cholera Bank, their positions change when Cholera Bank's does (Freeman & Walford, 1974). The description of fish and EFH is found in Section 4.4.2.7 *Finfish, Invertebrates, and Essential Fish Habitat* and Benthic Resources are discussed in Section 4.4.2.3.

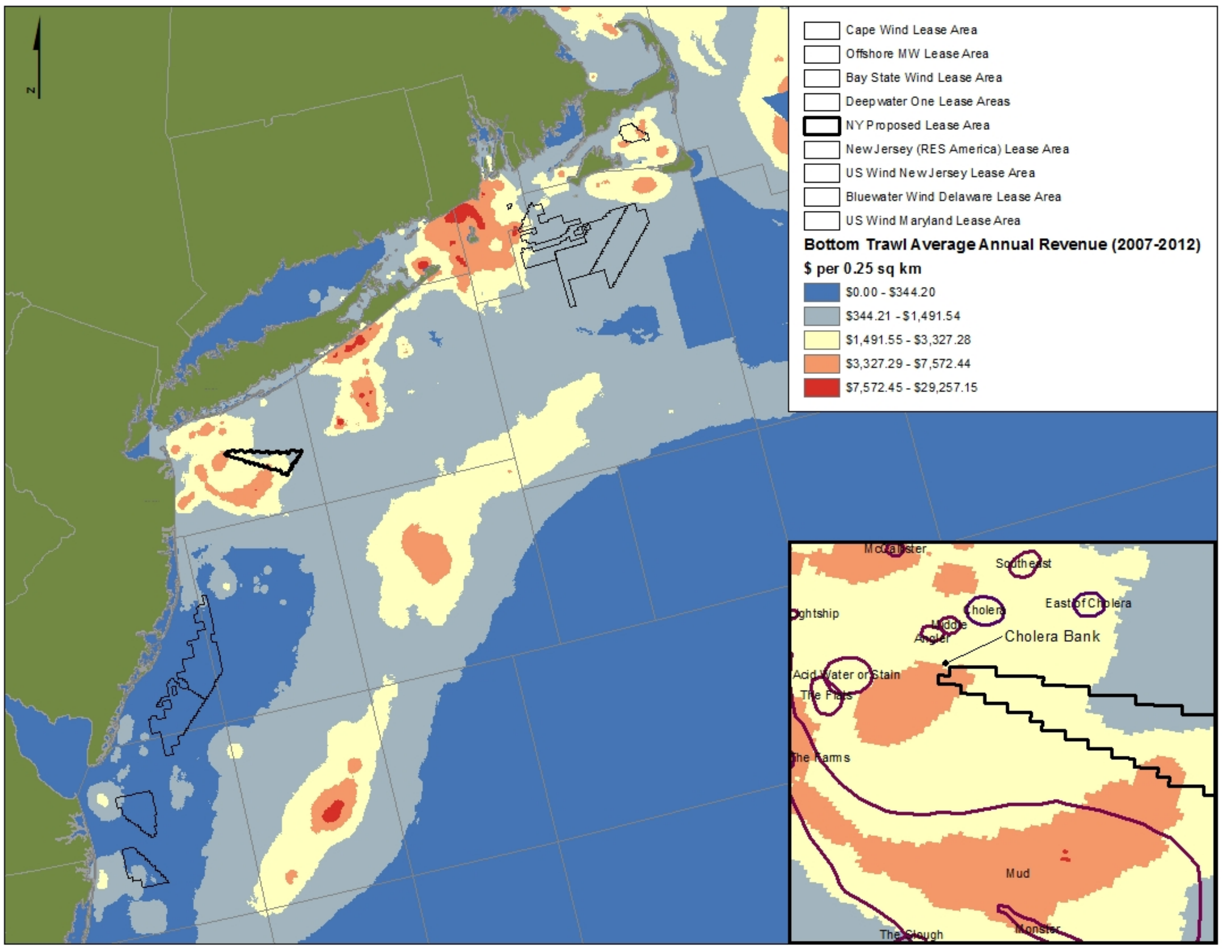

Figure 4-22 **Average annual commercial fishing revenue from vessels using bottom trawl 2007-2012 (Kirkpatrick et. al. 2015). Inset shows close-up image with known fishing areas.**

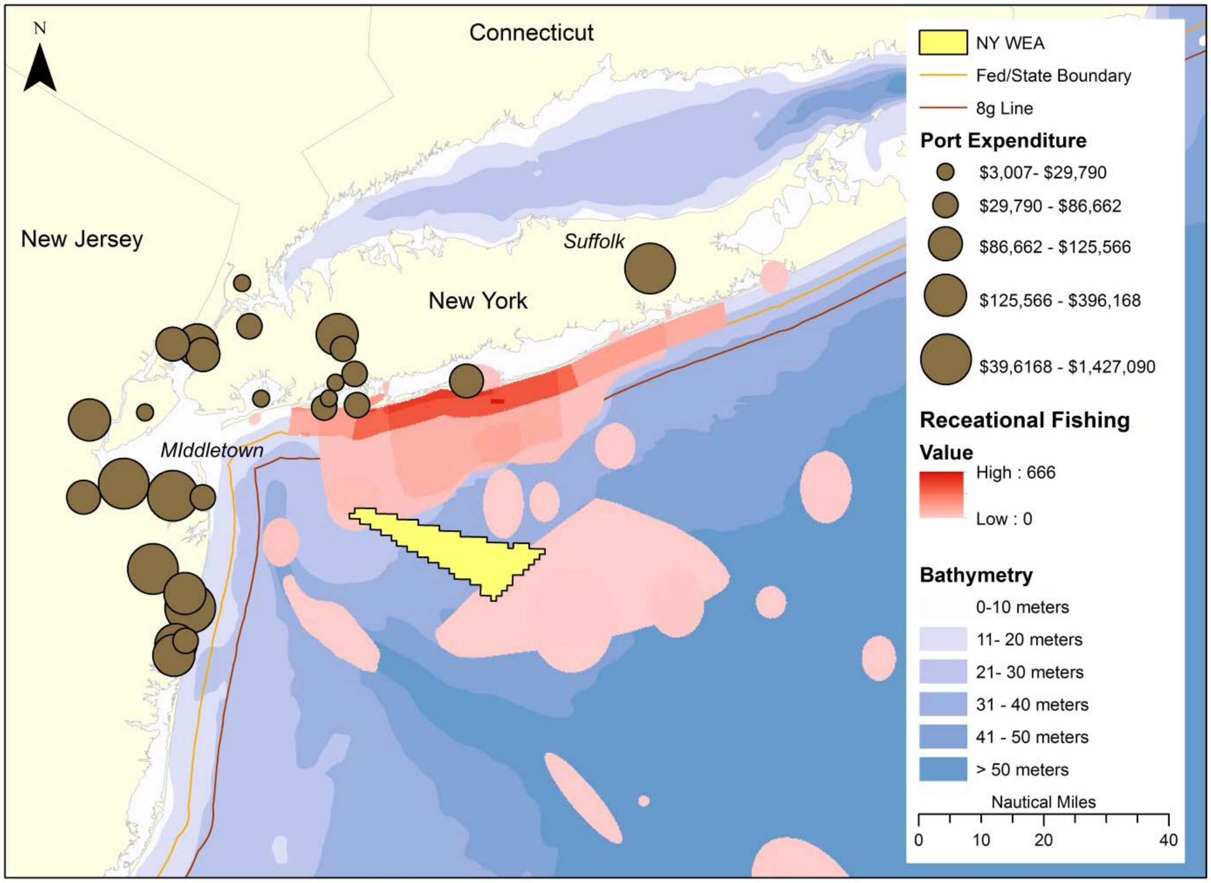

Figure 4-23 Recreational Fishing Activity and Port's Expenditures in Relation to the WEA

Source: NYSDOS, 2015
Notes: Recreational fishing days spent per year in various regions were compiled to identify major recreational fishing areas. Fishing day data were collated by New York State's Department of State and NOAA's Coastal Services Center (CSC). New York and New Jersey ports' expenditures exposed to the WEA are reflected by the size of the points. Ports' map locations are approximated using the towns' or counties' general latitudes and longitudes.

Commercial Fisheries

In 2012, commercial fishermen in the Mid-Atlantic Region landed 751 million lbs of finfish and shellfish, earning $488 million in landings revenue (NOAA NMFS, 2014). Commercial fisheries indirectly support related industries, such as seafood distributers and restaurants. BOEM contracted with NMFS to characterize the commercial fishing industry in the New York Call Area (2% larger than the proposed lease area). NMFS developed a statistical model to predict the spatial footprint of a fishing trip by merging vessel trip reports with data collected by at-sea fisheries observers. NMFS then linked these locations to seafood dealer reports to create revenue-intensity maps as a visual representation of the fishing harvest (DePiper, 2014). Appendix G includes the full data available on commercial fisheries revenue from the New York WEA (Part 1) and the 2 percent smaller proposed lease area (Part 2).

According to the NMFS fishing revenue study, commercial fishermen sourced an average of $3.59 million annually from the New York Call Area from 2007 to 2012 (Kirkpatrick et al., 2015.). The revenue exposure for all fisheries under the proposed action is $3.34 million, an approximately 7 percent reduction in revenue exposure by removing Cholera Bank from leasing.

Based on analysis of NMFS data of the original WEA, input derived from outreach efforts with the fishing industry, and public comments, BOEM determined that the fisheries that use the area the most, based on the percentage of total national revenue for the fishery, are the Atlantic sea scallop (0.8%) and the squid, mackerel, butterfish (SMB) fisheries (0.5%). Other top species of commercial importance with distributions that overlap the WEA include monkfish (0.1%), Atlantic herring (0.1%), black sea bass, summer flounder, and scup (0.1%). The following FMP's showed fishing effort in the proposed NY lease area but at levels less than 0.1 percent of average annual landings: Atlantic surfclam and ocean quahog, skate, small mesh multispecies, and large mesh multispecies. In 2016, BOEM obtained additional revenue data for individual FMPs for 2013-2015. Only the FMP revenue data sets for 2013 to 2015 are currently available for inclusion in this EA. Revenue information for those years has been added to the mackerel, squid, butterfish, and Atlantic sea scallop sections below. As noted in Section 4.4.2.7, *Essential Fish Habitat*, the area has EFH, and thus at least one life stage for more than 35 commercial fish species.

The average annual scallop revenue represents more than 90 percent of the total fishing revenue sourced from the New York Call Area (Figure 1–5). From 2007 to 2015 the scallop revenue from the New York Call Area ranged from $494,326 in 2007 to $6 million in 2011 (Appendix G Figure G–1). The average annual scallop revenue from the proposed lease area for 2007-2012 was $2.98 million, which represents less than 1 percent of the total Atlantic sea scallop revenue from the Atlantic seaboard. Much of the total scallop revenue is from regulated access areas farther offshore, such as on Georges Bank, Hudson Canyon, and the Delmarva access areas. However, it should be noted as scallop access area trips become reduced due to the rotational harvest management, or areas close entirely to allow biomass to increase, areas such as the proposed lease area could experience additional fishing pressure.[24] Between 2007 and 2012, a total of 373 individual scallop permits fished in the New York WEA. These vessels were primarily home ported in New Bedford, Massachusetts; Cape May, New Jersey; Newport News, Virginia; Point Pleasant, New Jersey; and New London, Connecticut. These vessels derived an average of 0.6 percent of their total revenue from the WEA over the 6-year period. The scallop fishery revenue exposure is 2 percent less under the proposed action than it would be if the entire area was leased.

[24] This information was provided in a comment letter from the Fishery Survival Fund (FSF)'s in response to the June 2016 EA.

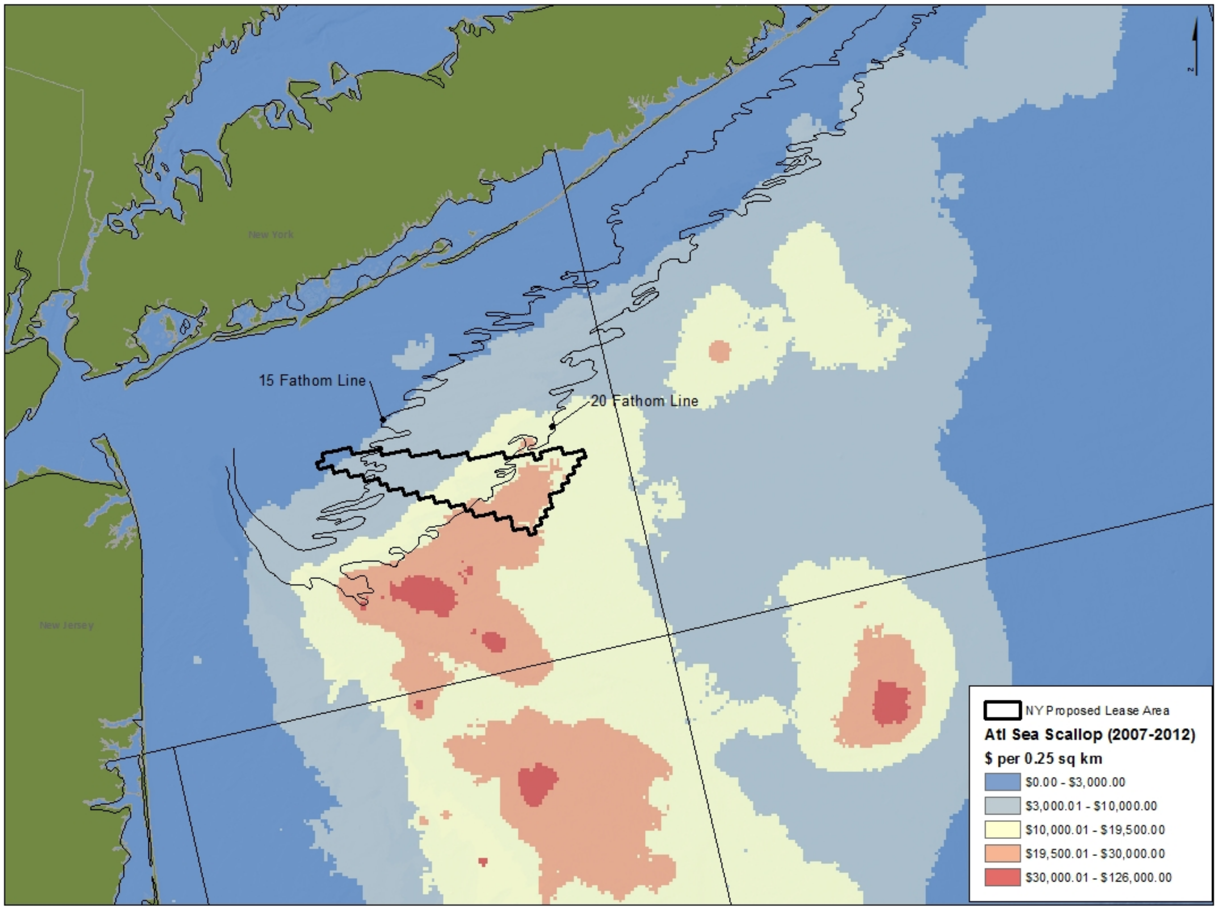

Figure 4-24 Scallop Landings in the Vicinity of the New York Proposed Lease Area

The New York Call Area's annual SMB fishery revenue ranged from $49,179 in 2015 to $319,686 in 2012 (Figure G–2 in Appendix G) The 2 percent reduction of the proposed lease area removing Cholera Bank due to potential impact to sensitive habitat has resulted in a 5 percent decrease in average annual revenue exposure to the squid fishery. The new revenue range is $49,400 in 2015 to $297,946 in 2012 (Tables G–5 and G–6 in Appendix G).

These values from the proposed lease area equate to 0.13 and 0.69 percent of the total squid value landed from the Atlantic in those low and high years, respectively (Kirkpatrick et al., 2015; DePiper, 2016). However, landings from NMFS statistical area 612 within which the proposed lease area is located, provide between 1 to 16 percent of the total annual catch based on NMFS landings data from 2000-2014 (Table G–5). The squid fishery operates in and around the New York Call Area primarily between May and September (the second trimester quota period is May 1–August 31). The fishery is highly variable regarding where the squid will occur and where they will be caught. Although the entire New York Call Area is used as a squid fishery, the primary area fished by the squid fleet is in waters less than 16 fathoms (30 m) closer to Cholera Bank. According to NMFS records, and as further supported by industry comments, Statistical Area 612 experiences targeted squid fishing by between 50 to 60 vessels in a given month (primarily June and July). Squid is primarily landed in Rhode Island, where approximately 50 percent of the total squid landings in the Northeast United States between 2000 and 2010 occurred (Cornell Cooperative Extension Program, 2011). Squid vessels based out of Montauk and Greenport NY also target squid in the proposed lease area.

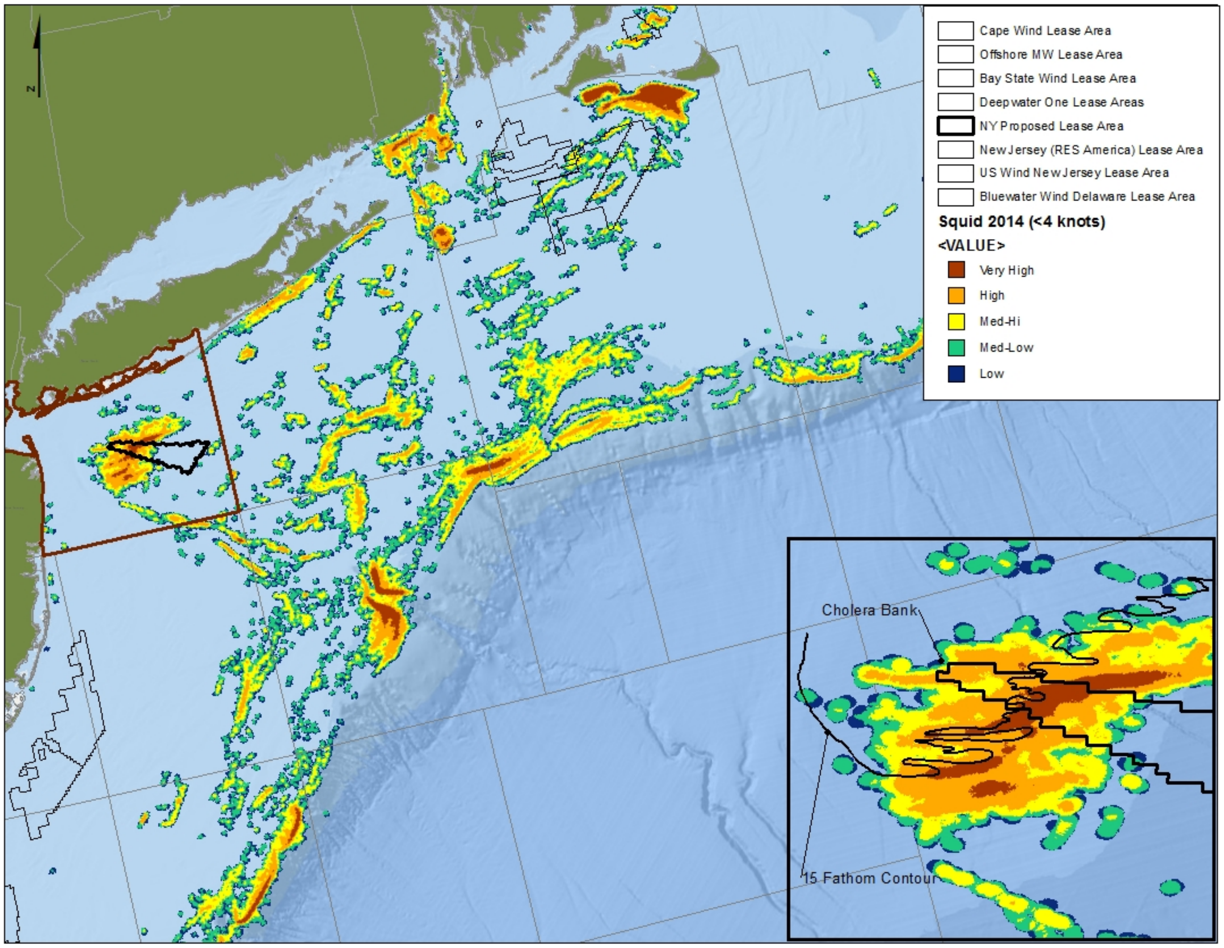

Figure 4-25 2014 vessel monitoring system (VMS) data for squid trips operating under 4 knots. Map depicts level of fishing effort within NMFS statistical area 612 compared to the NY proposed lease area. In 2014 8% of coastwide landings came from NMFS Statistical Area 612 (Source NMFS, BOEM, Northeast Ocean Data Portal).

As noted previously, other fisheries that operate in the proposed lease area primarily target demersal finfish, such as monkfish and summer flounder, using trawl gear and to a lesser extent, gillnets. Mid-water species such Atlantic mackerel, chub mackerel, bluefish, and Atlantic herring are also harvested from the proposed lease area primarily using trawl, mid-water trawl, and seine fishing gear. A small amount of lobster fishing using lobster traps occurs in the proposed lease area, as well as a limited amount of fishing for ocean quahog using hydraulic dredge gear in portions of the proposed lease area. See Appendix G for more detail on these fisheries' level of activity based upon the original New York WEA. Between 2007 and 2012 a total of 212 individual trawl and 18 mid-water trawl vessels accessed the New York WEA (Appendix G Table G–3). Average annual revenue exposure for all trawl fisheries under the reduced lease area is $414,941, a 5 percent reduction in revenue exposure from the original New York WEA (Table G–6 and Figure G–3 in Appendix G).

Recreational Fisheries

Waters off New York and New Jersey are home to substantial recreational fishing activities (Figure 4–23). The WEA is adjacent to and overlaps with some reported recreational fishing ground (Figure 48 and 4–23). The major recreational fishing areas along the south coast of Long Island are roughly 10 to 25 nm (19 to 46 km) from the WEA (Figure 4–8 and 4–23). NMFS described the recreational fishery as lightly overlapping the New York Call Area (Kirkpatrick et al., 2015). As noted previously, five aliquots in the Cholera Bank area have been removed from leasing consideration. The State of New Jersey designated Cholera Bank as a prime fishing habitat, and a sport and commercial fishing ground (Long & Figley 1981).

Impact Analysis of Alternative A

Site characterization and site assessment activities would result in underwater noise from survey activity and the installation of piles to support the meteorological tower. The direct impact of these noise sources on fish is analyzed in Section 4.4.2.7 *Finfish, Invertebrates, and Essential Fish Habitat*. The analysis in that section concludes that impacts of low frequency sound on fish and fish populations, including SOCs such as the "soft-start" provision for pile driving, is anticipated to be negligible. BOEM does not anticipate adverse impacts from noise associated with installation of piles on fish populations that are targeted by commercial and recreational fishing groups. However, noise generated from low frequency sound, like pile driving and some survey equipment, may result in decreased catch rates of fish while the noise producing activity is occurring. Decreased catch rates may be most acute in hook and line fisheries since behavior changes may reduce the availability of the fish to be captured in the fishery (Skalski et al., 1992; Lokkeborg et al., 2012).

Routine Activities

Site assessment activities would result in underwater noise from installation of piles to support the meteorological tower. The impact of this noise source on fish is analyzed in Section 4.4.2.7 *Finfish, Invertebrates, and Essential Fish Habitat*. The analysis in that section concludes that, with the pile driving "soft-start" provision, underwater noise impacts on fish would be expected to be negligible. Based on this analysis, BOEM does not anticipate adverse impacts from noise associated with installation of piles on fish populations that are targeted by commercial and recreational fishing groups. However, noise generated from low frequency sound, like pile driving, may result in decreased catch rates of fish while the construction activity is occurring. Decreased catch rates may be most acute in hook and line fisheries since behavior changes may reduce the availability of the fish to be captured in the fishery (Skalski et al., 1992; Lokkeborg et al., 2012).

The increase in vessel traffic associated with installation, maintenance, and decommissioning of a meteorological tower and/or buoys could potentially deter commercial and recreational fishermen from using the area around the tower or buoys while work-related vessels are in the area. To avoid collisions and gear entanglement with vessels, commercial and recreational fishermen may temporarily move to other locations. As noted by BOEM (2014b; 2014d), the tower and buoys could provide previously unavailable habitat for species that prefer structured and hardbottom habitats, creating a temporary increase in these types of fish in the area of the tower or buoy while the structure is in place. This could have a temporary beneficial effect to commercial and recreational fisheries, depending on the species of interest and the fishing gear used. In general, commercial fisheries in areas adjacent to the proposed lease area are more economically productive than the commercial fisheries in the proposed lease (Kirkpatrick et al., 2015; DePiper, 2016), so the temporary increased vessel traffic associated with site assessment is expected to be **minor**. Similarly, most coastal recreational fishing for New York and New Jersey takes place away from the proposed lease area (Figure 4–23), and impacts of increased vessel traffic are anticipated to be **negligible**. In BOEM's final SAP guidelines (www.boem.gov/Final-SAP-Guidelines/) BOEM specifically references the best management practices (BMP) that were adopted in 2007. The Fisheries BMPs recommend that lessees work with fishermen to minimize conflicts and review planned activities with potentially affected fishing organizations. More recently, BOEM has developed guidelines to lessees for providing information in their plans regarding fisheries impacts. These guidelines (http://www.boem.gov/Social-and-Economic-Conditions-Fishery-Communication-Guidelines/) include recommendations for developing a fisheries communication plan (FCP), including designating a fisheries liaison and fisheries representative. BOEM believes these measures will greatly reduce the potential for the types of impacts identified above. Therefore, BOEM will add a lease stipulation in Addendum C of the New York lease, requiring the lessee to develop a fisheries communications plan and identify a fisheries liaison who will act as the main point of contact with the commercial fishing industry.

Impacts from seafloor disturbances are anticipated to be **negligible** to **minor** for commercial and recreational fisheries. As described Sections 4.4.2.3 *Benthic Resources* and 4.4.2.7 *Finfish, Invertebrates, and Essential Fish Habitat*, mollusks, such as scallops, would likely be adversely affected in the immediate area of the tower foundations and/or buoy moorings and suffer from suspended sediment during the construction process. BOEM anticipates that impacts on commercial fishing from seafloor disturbances would be **minor** and impacts on recreational fishing from seafloor disturbance would be **negligible**.

Non-Routine Events

Accidental oil spills from damaged gear or machinery (e.g., vessels, generators, pile driving hammers) associated with site assessment could directly affect commercial and recreational fisheries by contaminating fish and gear and interfering during cleanup and recovery operations, or indirectly affect fisheries by temporarily degrading fishing habitat. Spills could result from severe weather damage to vessels or the tower/buoys, from vessel collisions/allisions, or during generator refueling. However, as noted in the G&G Final PEIS (BOEM, 2014a), the impact of a spill on commercial and recreational fishing activity would largely depend on the size of the spill. The effects would be detrimental to commercial and recreational fisheries if they led to declines in target species. While such spills are hard to predict, based on the structures and vessels associated with the activities, the potential for oil spills, and the size of these spills, the impact to commercial recreational fisheries from non-routine events is expected to be **negligible**.

Conclusion

Overall, impacts to commercial and recreational fisheries under Alternative A would be **minor**. Impacts would range from negligible to minor depending on the fishery and proposed action activity. Minor impacts are expected based on: 1) the low level of vessel traffic activity associated with site characterization and site assessment activities; 2) the fact that one meteorological tower and/or two buoys would be installed over a relatively large geographic area; 3) the relatively small spatial area and limited duration of sound produced from routine activities and events; and 4) the low likelihood of potential impacts from pollution. Communication and coordination between a lessee and affected fishermen can greatly reduce the potential for conflict during vessel movement and meteorological tower/buoy installation activities.

4.4.3.6 Visual Resources

The analysis area for visual resources includes a 27 mi (43 km) buffer around the WEA. The 27 mi (43 km) buffer was selected because it represents the distance at which the tip of a meteorological tower measuring 394 ft (120 m) would drop below the horizon, thereby precluding any potential view of the structure. The onshore analysis area was then cropped at 0.25 mi (0.4 km) inland from the shoreline (Figure 4–27). The analysis was restricted to within 0.25 mi (0.4 km) of the shoreline based on the likelihood for potential views of the project area to be blocked by vegetation, buildings, or other structures. This area includes portions of Long Island, New York, and New Jersey.

Description of the Affected Environment

The landscape character of the analysis area is a combination of beaches, communities, and industry. In general, the seascape appears large in scale, panoramic, and dominated by the broad horizontal plane of the Atlantic Ocean. Dominant colors in the landscape include the varied blue tones of the ocean and sky, the pale tan of the sandy beach, and the greens of upland vegetation. The horizon appears pale tan/white as a result of the atmospheric haze and sea spray. No major structures exist on the horizon, though commercial and recreational boat traffic is common.

Throughout the analysis area, observers experience the seascape from both a stationary and mobile observer position. Observer geometry relative to the WEA is typically at grade, where seascape views are intermittently blocked by dunes, coastal vegetation, and structures. Superior observer positions occur from lighthouse decks situated throughout the analysis area. Views from these locations are not obstructed, and are limited only by the curvature of the earth and light refraction.

Key Observation Points (KOPs), considered representative of the varied character of the seascape and typical observer experience, were established within the analysis area to establish baseline conditions within the affected environment (Figure 4–26). The KOPs were selected based on consideration of the following criteria: proximity to the WEAs, availability of open views of the ocean and horizon, high public use and visitation, historical significance and sensitivity of the sites, and inclusion of views available from both the ground and elevated vantage points. Landscape character and observer experience at each of the KOPs is described in Appendix F.

Impact Analysis of Alternative A

Potential impacts to visual resources were assessed for site characterization activities (i.e., surveys) and site assessment (i.e., the construction and operation of a meteorological tower and/or buoys).

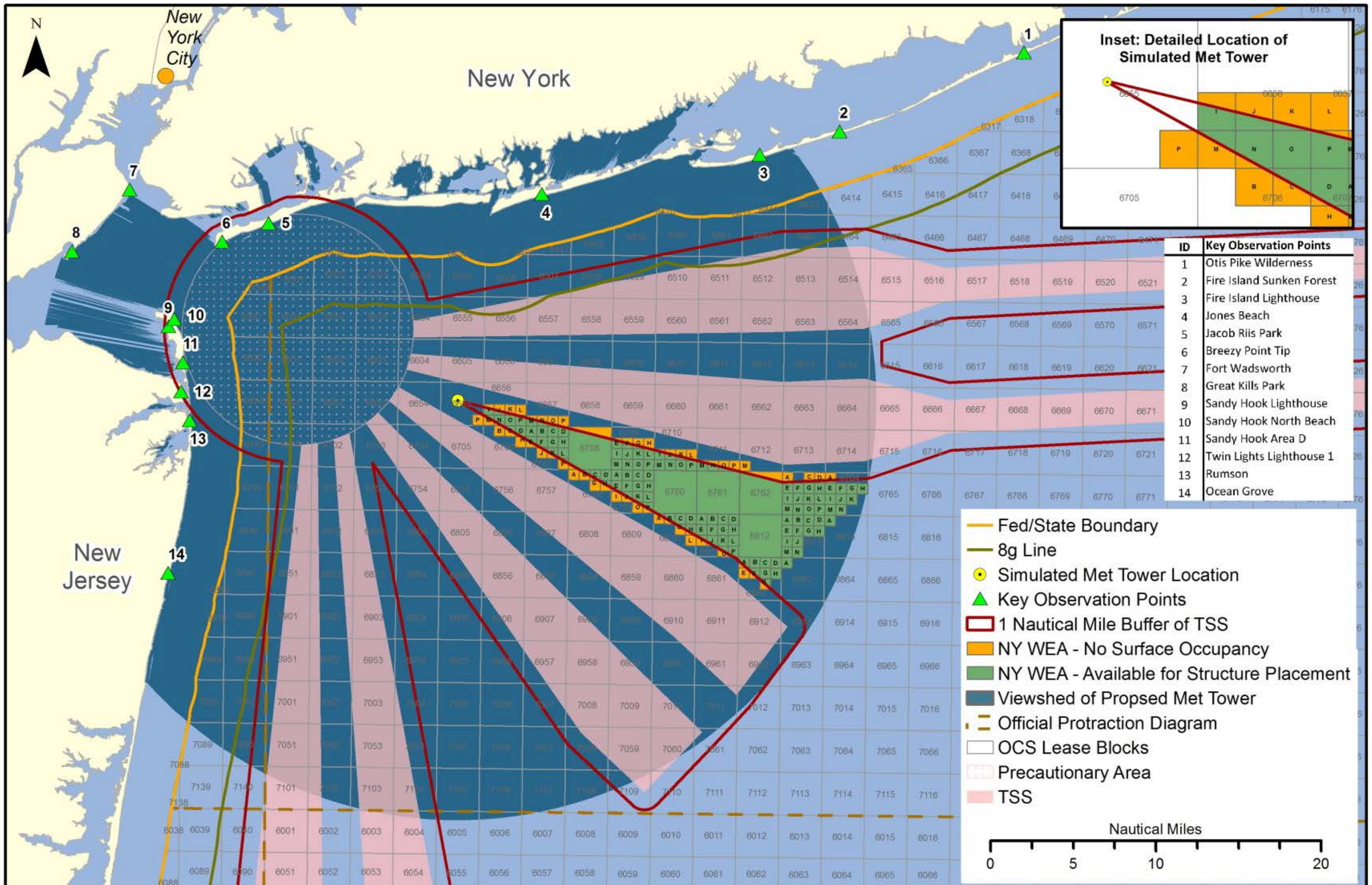

Figure 4-26 Meteorological Tower Viewshed and Key Observation Points

Methodology

Impacts to scenic quality and landscape character were evaluated from 14 KOPs located in coastal areas of New York and New Jersey (Figure 4–26) using the Bureau of Land Management's Contrast Rating System (BLM, 1986). Impacts to scenic quality and landscape character were evaluated from 14 KOPs located in coastal areas of New York and New Jersey (Figure 4–26) using the Bureau of Land Management's Contrast Rating System (BLM, 1986). The Contrast Rating System describes adverse effects to visual resources as a function of the visual contrast between the proposed action and the existing landscape character. Visual contrast is classified as follows:

- **None:** Project features are not visible or perceived.
- **Weak:** Project features can be seen but do not attract attention.
- **Moderate:** Project features begin to attract attention and dominate the characteristic landscape.
- **Strong:** Project features demands attention, would not be overlooked, and are dominant in the landscape.

Visual contrast of site characterization and assessment activities was assessed for day and night conditions. This assessment was based, in part, on information presented in the G&G Final PEIS (BOEM, 2014a), which analyzed impacts to visual resources that may result from site characterization activities.

BOEM assumed the following in the visual analysis:

- The height of the meteorological tower measured 394 ft (120 m) above mean sea level, including a 49 ft (15 m) high antenna mounted at the top of the structure.
- The closest viewer receptor would be Jones Beach, approximately 11.5 nm (as represented by KOP 4 (Figure 4–26).
- Construction and operational nighttime lighting of a meteorological tower would be designed in accordance with FAA (2015), as described in detail in Appendix D.

For the purpose of photosimulations, the meteorological tower was placed at the western-most tip of the WEA, 13.5 nm (25 km) from the shoreline. This location assumes the highest potential visibility of the meteorological tower from a shoreline viewer location. Subsequent to development of the photosimulations, the lease area was further refined in September 2016 to include removal of the 5 westernmost aliquots of OCS Block 6655 as sensitive biological habitat (Section 2.1). Under the proposed action the closest location to land that a meteorological tower could be installed is 11.5 nm (21 km).

Per FAA (2015), two lighting scenarios could be applied to the meteorological tower:[25]

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[25] USCG may require PATON lighting for marine vessel navigational safety, but the required 5 nm visibility radius from the structure would not be visible from shore (Orr et al., 2013).

- **Lighting Option 1**: Red lights (L-864), mounted at the top and incrementally along the structure, with the structure painted with red/white bands; or,
- **Lighting Option 2**: A duel lighting system that includes red lights (L-864) for nighttime, and medium intensity, white lights (L-865) for daytime and twilight use. This option would remove the requirement for painting the structure.

Photosimulations of a meteorological tower 13.5 nm (25 km) from the shoreline, viewed from the closest KOP (Jones Beach, KOP 4 on Figure 4–26), are provided in Appendix F. The photosimulations use lighting standards described in Lighting Option 1. Visibility of the meteorological tower, and related viewshed impacts, would be reduced if the tower was installed at a greater distance from the shoreline.

Routine Activities

The extent to which routine activities associated with site characterization and assessment are visible from shoreline and/or inland locations would depend to some extent on the relationship between the height of the structure (meteorological tower or buoy; vessel) and its distance from the shoreline, as curvature of the earth could cause the structure to drop below the horizon when viewed from KOPs. For example, assuming a height of 394 ft (120 m), the tip of the meteorological tower would drop below the horizon at a distance of 23.5 nm (43.5 km) (Figure 4–27). Survey vessels characterized by a lower height would drop below the horizon at a closer distance than that described for the meteorological tower.

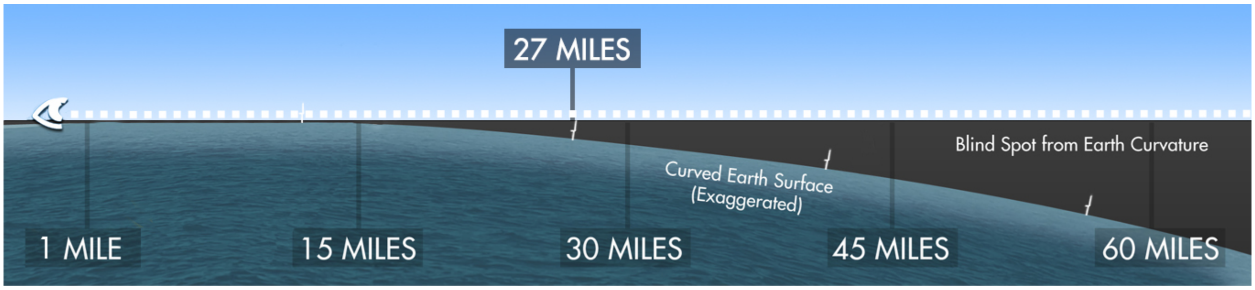

Figure 4–27 Distance at Which the Proposed Meteorological Tower Would Drop Below the Horizon Based on a Height of 394 ft (120 m)

Site Characterization Activities

Site characterization activities would result in additional vessel traffic between the shore and the WEA and therefore new sources of offshore nighttime lighting on the vessels if surveys are conducted at night. BOEM anticipates that only one to three vessels would be active within the WEA at any given time for site characterization. Given the relatively low stature (height) of these vessels, it is likely that vessels within the WEA and the TSSs would not be visible from the shoreline or inland locations, as vessels would drop below the horizon due to curvature of the earth. Consequently, survey vessels and related traffic would not be visible or perceived (no visual contrast). Impacts to visual resources from site characterization activities would be **negligible**.

Site Assessment Activities

Meteorological buoys are not expected to be visible or perceived from the shoreline because their height above the water surface would be low in stature, thus falling below the horizon when viewed from KOPs.

Under Alternative A, the meteorological tower could be placed at a minimum of 13.5 nm (25 km) offshore from the nearest viewer receptor (KOP 4, Jones Beach; Figure 4–26). Under daytime conditions, the meteorological tower could be seen but would be difficult to detect (weak visual contrast). If the meteorological tower was viewed from a higher elevation vantage point (such as a lighthouse observation deck) it would be easier to detect; however the tower would not attract attention or appear dominant in the view (weak visual contrast) (Appendix F, Photosimulations). Potential visibility of the tower would decrease with distance from the shore due to the influence of atmospheric haze and the reduction in scale of the tower relative to the surrounding seascape.

Should Lighting Option 2 (red lights for nighttime and medium intensity, white lights for daytime and twilight use) be applied, the daytime lighting could increase visual contrast of the tower to a moderate level, thereby increasing overall viewshed related impacts experienced under daylight conditions. Nighttime lighting under Lighting Option 2 could be visible from shore, but would not dominate the view (weak visual contrast). Lighting would appear discrete and isolated, consistent with existing nautical lighting. Thus, impacts to visual resources from site assessment activities would be **minor**.

Non-Routine Events

There would be **negligible** impacts from non-routine events such as allisions/collisions and spills on the visual resources of the WEA.

Conclusion

BOEM anticipates that the overall impacts to visual resources from the proposed action would be **minor** because a meteorological tower may be detected under daytime and nighttime conditions. BOEM does not anticipate that meteorological buoys could be seen from the shoreline. A meteorological tower may be visible if installed at the closest point possible to the shoreline, approximately 13.5 nm (25 km) from KOP 4 (Jones Beach on Long Island). If detected, the structure would appear small in scale relative to the broad horizon of the seascape, and visual contrast would be weak. Nighttime lighting on the meteorological tower would appear similar to lights visible from existing vessel traffic. No lighting would be visible if the tower was placed beyond 23.5 nm (44 km), because the entire meteorological tower would fall below the horizon.

Vessel activity in the WEA and TSSs associated with site characterization and site assessment activities is not likely to be visible or perceived from land-based KOPs because: (1) the distance of the activity from the shoreline and the likelihood vessels would be below the horizon, and (2) the small increase in vessel traffic anticipated as a result of the proposed action relative to existing levels.

4.5 Alternative B – Leasing of the Wind Energy Area Except for Cholera Bank Sensitive Habitat, While Restricting Site Assessment Structure Placement within 2 Nautical Miles of a TSS

Under Alternative B, BOEM would not allow construction or placement of site assessment structures (i.e., a meteorological tower and/or two buoys) within 2 nm (3.7 km) of the two TSSs that border the WEA (Figure 2-2). The area available for leasing, and the area that would likely be surveyed, is the same area as considered under Alternative A (Section 2.2 *Alternative B* for further details).

The area available for site assessment facilities under Alternative B is approximately 37 percent of the area of the Alternative A; however, BOEM assumes that all survey activities would take place over the entire proposed lease area and potential cable routes. While site assessment activities (installation of up to one meteorological tower and/or two buoys) would occur in a smaller area than in Alternative A, the level of those activities would be the same as Alternative A, therefore, the vessel traffic and impacts associated tower and/or buoy installation, operations and maintenance, and decommissioning would be similar to Alternative A.

Given that the scope of the activities described above for Alternative B would occur within the same geographic area as those described in Section 4.4 for Alternative A, the affected environment for these alternatives are effectively the same; therefore, it is not repeated below.

4.5.1 Physical Resources

4.5.1.1 Air Quality

Reducing the area available for the placement of site assessment facilities would not change impacts to air quality, therefore, all assumptions for air quality listed in under Alternative A in Section 4.4.1.1 *Air Quality*) are the same for Alternative B. Results from the Alternative A analysis (Section 4.4.1.1) indicate that emissions from the proposed action would not be expected to lead to a violation of the NAAQS. Thus, total emissions and any effects on air quality would be the same for Alternative B, and are not expected to lead to any violation of the NAAQS. Although the emissions estimates from site characterization and site assessment activities are measurable, they would not be distinguishable from other air emissions onshore or offshore; therefore, emissions associated with Alternative B would be **negligible**.

4.5.1.2 Water Quality

BOEM anticipates that overall impacts to water quality under Alternative B would be **minor**. Site characterization and site assessment activities and non-routine events (such as spills) under Alternative B would be similar to those described for Alternative A and impacts to water quality from Alternative B would be minor, localized and transient. Alternative B would have similar vessel traffic to Alternative A and the potential for a release/spill associated with vessels conducting site characterization and site assessment activities under Alternative B would be no different than Alternative A.

4.5.2 Biological Resources

4.5.2.1 Birds

Although impacts on birds would range from negligible to minor, depending on the survey activities being conducted and the type of site assessment facility installed, overall, impacts to birds under Alternative B would be **minor**. As described for Alternative A in Section 4.4.2.1 *Birds*, BOEM anticipates negligible impacts from vessel traffic, loss of water column habitat, benthic habitat, and associated prey abundance, surveying activities, and noise associated with decommissioning of a tower and/or buoys. BOEM anticipates minor impacts on birds from noise impacts during construction and from the risk of collision with a meteorological tower. Like Alternative A, BOEM's SOCs for birds (Appendix B, Section B.6) are included in Alternative B.

4.5.2.2 Bats

Impacts to bats under Alternative B would be the same as those described for Alternative A; therefore, impacts on bats under Alternative B would be **negligible**. Like Alternative A, the SOCs for birds (Appendix B, Section B.6), including lighting restrictions and prohibition on guy wires, are included in Alternative B.

4.5.2.3 Benthic Resources

Overall impacts from Alternative B to benthic resources would be **minor**. The distribution of benthic habitats within the WEA is relatively mixed, and thus, overall the reduced area available for site assessment activities associated with Alternative B is not expected to affect a substantially different composition of habitat types. Like Alternative A, the sensitive benthic habitat known as Cholera Bank would be outside the area permitted for the construction or placement of a meteorological tower and buoys. The 2 nautical mile TSS buffer would result is less area, 33,683 ac less than Alternative A, available for meteorological tower and meteorological buoy installation, and associated physical disturbance to benthic habitat. This area is concentrated in the western portion of the proposed lease area and along the north and south flanks. However, the amount of benthic habitat and organisms affected from installation of a meteorological tower and/or two buoys would be the same as Alternative A. Thus, little to no difference in impacts between Alternatives A and B is expected. Under both alternatives, the primary benthic species affected would be soft-bottom invertebrates other than corals.

4.5.2.4 Coastal Habitats

Overall, the impacts to coastal habitats from Alternative B would be **negligible**. Impacts to coastal habitats from site characterization and site assessment activities, and thus the use of existing port facilities, and vessel traffic associated with site characterization and site assessment would be similar to impacts described for Alternative A. Indirect impacts expected from wake-induced erosion, increased turbidity, vessel collisions and spills under Alternative B would be similar to impacts described for Alternative A (characterized as negligible).

4.5.2.5 Marine Mammals

Although impacts to marine mammals would range from **negligible** to **moderate**, depending on the survey activities being conducted and the type of site assessment facility installed, overall, impacts to marine mammals under Alternative B would be moderate due to potential acoustic impacts during pile driving activities. The prohibited construction or placement of site assessment structures (i.e., a meteorological tower and/or two buoys) within 2 nm (3.7 km) of the two TSSs that border the WEA could decrease the risk of a collision or allision and any resultant fuel spill that could impact marine mammals. However the risk of fuel spills occurring and contacting a marine mammal are low. The impacts to marine mammals from Alternative B are not expected to measurably increase or decrease from the impacts described for Alternative A. Any impacts related to site assessment and site characterization activities are expected to be no different under Alternative B compared to Alternative A. Like Alternative A, BOEM's SOCs related to site characterization surveys (Appendix B, Section B.3) and site assessment (Appendix B, Section B.4) to minimize the potential for impacts to marine mammals are included in Alternative B.

4.5.2.6 Sea Turtles

Although impacts on sea turtle would range from negligible to minor, depending on the survey activities being conducted and the type of site assessment facility installed, overall, impacts to sea turtles under Alternative B would be **moderate**. The prohibited construction or placement of site assessment structures (i.e., a meteorological tower and/or two buoys) within 2 nm (3.7 km) of the two TSSs that border the WEA could decrease the risk of a collision or allision and any resultant fuel spill that could impact sea turtles. However the risk of fuel spills occurring and contacting a sea turtle are low. The impacts to sea turtles from Alternative B are not expected to measurably increase or decrease from the impacts described for Alternative A. Any impacts related to site assessment and site characterization activities are expected to be no different under Alternative B compared to Alternative A. Like Alternative A, BOEM's SOCs related to site characterization surveys (Appendix B, Section B.3) and site assessment (Appendix B, Section B.4) to minimize the potential for impacts to sea turtles are included in Alternative B.

4.5.2.7 Finfish, Invertebrates, and Essential Fish Habitat

Site characterization and site assessment activities under Alternative B would be similar to those described for Alternative A. Therefore, overall impacts to finfish, invertebrates, and EFH under Alternative B would be similar to the impacts described under Alternative A, which BOEM determined to be **minor** overall. Impacts from noise associated with pile driving and a potential fuel spill are expected to be minor; all other impacts such as increases in suspended sediment, loss of benthic habitat, displacement, or alteration of water column habitat, are expected to be negligible. Under this alternative there may be less noise exposure and direct physical disturbance from piling of a meteorological tower foundation or buoy installation to fish and invertebrates, such as squid, present in the western part of the proposed lease area. However, the difference in distribution of fish and invertebrates and EFH across the proposed lease area is not great enough to result in a different impact level than that analyzed in Alternative A.

4.5.2.8 ESA-Listed Fish Species

Overall, impacts to ESA-listed fish species would be **minor**. As with Alternative A, installation of a meteorological tower would require pile driving, which could result in minor effects to Atlantic sturgeon other site assessment activities are expected to have negligible impacts on these species. Impacts to ESA-listed fish as a result of the site characterization would be negligible.

4.5.3 Military Use and Navigation/Vessel Traffic

4.5.3.1 Military Use

As with Alternative A, site-specific coordination with DOD would be required to minimize multiple use conflicts on the OCS in and around the WEA. The level of site characterization and assessment activities would also be the same as Alternative A; therefore, impacts on military use under Alternative B are also expected to be **negligible**.

4.5.3.2 Navigation/Vessel Traffic

Under Alternative B, the same amount of vessel traffic would be associated with site assessment activities as Alternative A. Adherence by these vessels to navigation regulations would minimize navigational risk. Alternative B accommodates the USCG's MPG recommendation of a 2 nm (3.7 km) buffer from the outer edge of a TSS for permanent structures to allow larger ships to maneuver and to stop and anchor in emergency situations (USCG, 2016). In addition, USCG recommended a 5 nm (9.3 km) buffer from the entry/exit of the TSS lanes, which was not included in Alternative B. USCG identified structures placed beyond these suggested buffers as having a medium risk for allision. Under Alternative B, there would be lower risk for allision within 2 nm (3.7 km) of the TSSs. Similar to Alternative A, a meteorological tower and/or buoys would be mitigated by USCG-required marking and lighting. Impacts on navigation due to increase in vessel traffic and the addition of a meteorological tower and/or buoys are expected to be **minor.**

4.5.4 Socioeconomic Resources

4.5.4.1 Cultural, Historical, and Archaeological Resources

Overall, impacts to cultural, historical, and archaeological resources under Alternative B would be **minor**. The area that may be affected by site characterization activities would be the same as Alternative A, and BOEM would require the survey and avoidance measures outlined in Section 4.4.4.1 to reduce impacts to offshore cultural resources. Impacts from site assessment activities resulting in disturbances to the seafloor would be the same as Alternative A (which BOEM determined to be negligible). Minor visual impacts would occur to onshore cultural resources from the visibility of a meteorological tower in the WEA; however, impacts would be slightly less because a tower would be placed an additional nautical mile further offshore compared to Alternative A and therefore would be more difficult to visually detect from onshore areas compared to Alternative B.

4.5.4.2 Demographics and Employment

Impacts on demographics and employment under Alternative B would be **negligible**. The intensity of impacts on demographics and employment associated with survey and assessment activities under Alternative B would be the same as for Alternative A. As with Alternative A, there would be short-term beneficial impacts on employment.

4.5.4.3 Environmental Justice

As with Alternative A, no high and adverse human health or environmental effects that would disproportionately affect low-income and minority persons would occur under Alternative B, and there would be **no impacts** on environmental justice.

4.5.4.4 Recreation and Tourism

Impacts on recreation and tourism from Alternative B would be **negligible**. Impacts on nearby coastal areas would be slightly less than under Alternative A since the closest point to shore that a meteorological tower could be installed would be about 1 nm (1.9 km) farther offshore compared to Alternative A (due to the 2 nm [3.7 km] TSS buffer). Since the same level of site characterization and assessment activities would occur, impacts from the generation of trash and debris and from accidental diesel fuel spills would be the same as under Alternative A.

4.5.4.5 Commercial and Recreational Fisheries

Impacts to commercial and recreational fisheries under Alternative B would be **minor**. The amount of vessel traffic associated with site characterization is anticipated to be the same as Alternative A, for which BOEM determined would be minor to commercial and recreational fisheries. Although the area available for site assessment activities is reduced, the overall level of impact to commercial and recreational fisheries as described under Alternative A would remain unchanged. BOEM determined these impacts to be minor. Like Alternative A, the sensitive habitat known as Cholera Bank would be outside the area permitted for the construction or placement of a meteorological tower and buoys. Under Alternative B there is 33,683 ac less than Alternative A available for the placement of a meteorological tower or buoy. Thus there would be similar reduction in the amount of overlap between fishing areas and area available for the placement of a meteorological tower or buoy. However, the amount of area and time to install site assessment facilities is equivalent to Alternative A.

4.5.4.6 Visual Resources

Because the closest point that a meteorological tower could be installed in the WEA would be about 1 nm (1.9 km) farther offshore compared to Alternative A (due to the 2 nm [3.7 km] TSS buffer), effects on visual resources from Alternative B would be slightly less than for Alternative A. Because impacts on visual resources under Alternative A are expected to be minor, impacts under Alternative B would also be **minor.**

4.6 Alternative C – No Action

Under the No Action Alternative, BOEM would not issue a commercial wind energy lease and no site assessment activities would be approved in the WEA offshore New York. This would eliminate vessel traffic associated with site assessment (construction and installation of a meteorological tower and/or buoys). Site characterization surveys do not require BOEM approval[26] and could still be conducted under Alternative C; however, a potential lessee is not likely to undertake these activities without the possibility of a commercial wind energy lease. However, the impacts from other activities as described in Section 4.7.2 would still occur.

The affected environment for Alternative C is the same as the affected environment described under Alternative A in Section 4.4. The impacts of unrelated actions expected under the No Action Alternative are fully described within the cumulative analysis in Section 4.7.2. To streamline this document, the information from these analyses are referenced and not repeated below.

4.6.1 Physical Resources

Under the No Action Alternative, no activity approved by BOEM would require the use of emission-producing vehicles such as pile drivers associated with installation of a meteorological tower, or survey vessels, or vessels associated with installation, operation, and decommissioning of a tower or buoys; therefore, there would be **no impacts** from these activities on air quality. Impacts from other activities on air quality would remain the same (Section 4.7.2).

Under the No Action Alternative, no activity approved by BOEM would affect water quality such as turbidity during installation and decommissioning of a meteorological tower or buoy, or fuel spills or waste discharges from vessels. Therefore, there would be **no impacts** from these activities on water quality. Impacts to coastal and marine water quality in the vicinity of the proposed lease area from other activities would remain the same (Section 4.7.2).

4.6.2 Biological Resources

Under the No Action Alternative, the proposed action would not be approved by BOEM; therefore, no activities such as vessel traffic, acoustic disturbances from pile driving associated with installation of a meteorological tower, or fuel spills that could result in impacts on birds, bats, benthic organisms, coastal habitats, marine mammals, sea turtles or fish would occur. Consequently, there would be **no impacts** from these activities on biological resources. Although site characterization surveys do not require BOEM approval, they may still be conducted. For example, NYSERDA is currently conducting digital aerial surveys for birds, bat, marine mammals, sea turtles, and fish in the New York Bight, which includes the proposed lease area (NYSERDA, 2016). Under this alternative, the collection of data related to protected species that could be used to assist in future analyses of offshore activities, development of additional

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[26] At this time, BOEM does not issue permits for site characterization activities that are conducted on unleased or ungranted areas of the OCS as it does for oil and gas and minerals under the authority of section 11 of the OCSLA.

avoidance and minimization measures, as well as gaining a better understanding of habitat utilization in the New York Bight, may or may not occur. The impacts from other activities would remain the same as described in Section 4.7.2.

4.6.3 Military Use and Navigation/Vessel Traffic

Under the No Action Alternative, there would be no military space-use conflicts with activities approved by BOEM, and no vessel traffic above existing conditions. Therefore, there would be **no impacts** from the proposed activities on these resources. Impacts from other activities to vessel traffic and navigation would remain the same (Section 4.7.2).

4.6.4 Socioeconomic Resources

Under the No Action Alternative, there would be no activities approved by BOEM that disturb the seafloor, and therefore no impacts on offshore cultural, historical, or archaeological resources. There would be no additional vessel traffic above existing conditions and no installation of a meteorological tower, and thus no potential impacts to the viewshed; therefore, there would be no visual-related impacts from a meteorological tower on onshore historic properties or recreation and tourism. Demographics and environmental justice would not be affected. The negligible increase in employment opportunities associated with site characterization and assessment activities would not occur. Therefore, there would be **no impacts** from these activities on socioeconomic resources. However, the impacts from other activities would remain the same as described in Section 4.7.2.

4.7 Cumulative Impacts

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 of the proposed lease area, regardless of which agency or person undertakes the actions (40 CFR 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a given period. This EA identifies potential cumulative impacts over the life of the proposed action, which BOEM anticipates could reasonably occur between 2017 and 2023.

BOEM used a localized geographic scope to evaluate cumulative impacts for resources that are fixed in nature (i.e., their location is stationary such as benthic and archaeological resources), or for resources where impacts from the proposed action would only occur in waters in and around the New York proposed lease area (e.g., water quality). This includes potential activities that would occur on the Atlantic OCS offshore New York, New Jersey, Rhode Island, and Massachusetts as well as activities that would take place in state waters (Figure 4–28). However, the geographic boundaries for the analysis for marine mammals, sea turtles, fish/fishing, and birds include the entire U.S. East Coast given their migratory nature. Given the broader geographic scope for these resources, BOEM also considered the impacts associated with the

Virginia Offshore Wind Technology Advancement Project, given that the project was recently approved by BOEM.[27]

Activities that would result in impacts and impact-producing factors associated with the proposed action are summarized below.

Activities that would result in impacts and impact-producing factors associated with the proposed action are summarized below.

Onshore activities supporting the proposed action that could result in impacts include tower and/or buoy staging, and loading and launching of support vessels. Potential impact-producing factors associated with these activities include vessel traffic, trash and debris, operational discharges from vessels, fuel spills, and viewshed effects from a meteorological tower. Effects associated with vessel traffic and vessel use are the primary contributor to potential onshore cumulative effects.

Offshore activities supporting the proposed action that could result in impacts include vessel traffic during site characterization, site assessment, and the installation and decommissioning of a meteorological tower and/or buoys. Potential impact-producing factors associated with these activities include underwater acoustic disturbances from vessels and installation activities (i.e., pile driving); vessel discharges; bottom disturbance during geotechnical surveying and sampling, anchoring, and structure placement; collision risk from an increase in vessel traffic and structure placement; and space-use conflicts. Impacts from installation and decommissioning would be a short-term (between 1 to 10 weeks for installation and approximately 1 week for decommissioning of a tower), while impacts associated with ongoing vessel traffic throughout the 5-year site assessment term of the proposed action, would have a longer duration.

[27] More information is available on BOEM's website at http://www.boem.gov/VOWTAP/.

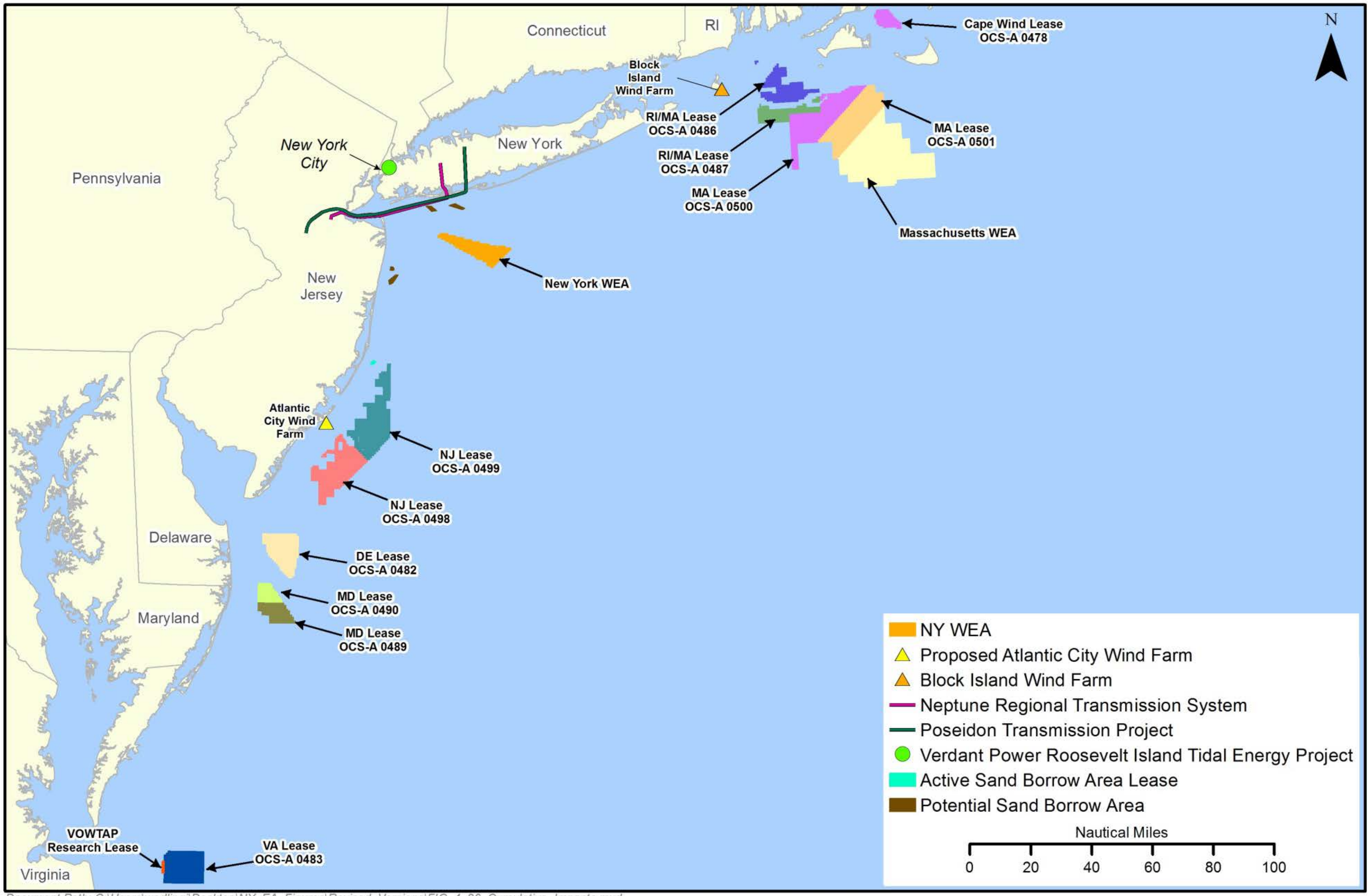

Figure 4-28 Cumulative Activities and Projects

4.7.1 Past, Present and Future Reasonably Foreseeable Activities and Projects

This section includes a list of the projects that BOEM has identified as potentially contributing to cumulative impacts when combined with impacts from the proposed action over the geography and time scale described above. Cumulative projects and activities, which are discussed below, include seven types of actions: (1) wind energy development (site characterization surveys, site assessment, construction and operation of wind turbines); (2) hydrokinetic projects; (3) undersea transmission lines and gas pipelines; (4) marine minerals use and ocean dredged material disposal; (5) military use; and (6) marine transportation, (7) fisheries management, and (8) global climate change. 28 shows some of the reasonably foreseeable cumulative actions in the vicinity of the WEA, which are discussed in this section.

4.7.1.1 Wind Energy Development Including Site Characterization and Assessment Activities

Under the renewable energy regulations, the issuance of leases and subsequent approval of wind energy development on the OCS is a staged decision making process (Section 1.1.1) and occurs over several years with varying impacts. This section describes the wind energy development activities being conducted in other BOEM lease areas and in waters over state-submerged lands.

Site Characterization Surveys and Site Assessment Activities

A holder of a BOEM OCS lease can evaluate the meteorological conditions, such as wind resources, with the approved installation of meteorological towers and/or buoys. Further, a lessee is required to provide the results of site characterization activities (shallow hazard, geological, geotechnical, biological, and archaeological surveys) with its SAP or COP. The reasonably foreseeable consequence of issuing these leases is site characterization. For those lessees with submitted SAPs (see below), site assessment activities are also considered in this cumulative analysis.

BOEM has issued commercial leases in the following areas on the Atlantic OCS:

- Massachusetts Lease Areas: BOEM issued two commercial wind energy leases in April 2015; one to RES America Developments, Inc. for Lease Area OCS-A 0500 (187,523 ac [75,888 ha]) and another to Offshore MW LLC for Lease Area OCS-A 0501 (166,886 ac [67,536 ha]). The lessees were required to submit their SAPs by April 1, 2016. On June 12, 2015, BOEM approved the assignment of Lease Area OCS-A 0500 from RES America Developments, Inc. to DONG Energy. DONG Energy has since renamed its American subsidiary and the project Bay State Wind. Both Bay State Wind and Offshore MW LLC have requested, and BOEM has approved, 12 month extensions of the preliminary terms to April 1, 2017. Bay State Wind and Offshore MW conducted their SAP surveys in the late summer and early fall of 2016.
- Massachusetts/Rhode Island Lease Areas: In September 2013, BOEM issued commercial wind energy leases OCS-A 0486 and OCS-A 0487 (north and south, respectively) to Deepwater Wind New England, LLC. For the north lease area,

Deepwater Wind submitted a SAP on April 1, 2016, for the installation of a meteorological buoy. As of April 2014, Deepwater Wind informed BOEM that they do not intend to conduct site assessment activities in the south lease area.

- New Jersey Lease Areas: BOEM issued two commercial wind energy leases in March 2016 for the 343,833 ac (139,145 ha) WEA offshore New Jersey; one to RES America Developments, Inc. for Lease Area OCS-A 0498 for the southern part of the WEA, and one to US Wind, Inc. for Lease Area OCS-A 0499 in the northern part of the WEA. The lessees are required to submit a SAP by March 2017. However, US Wind has requested and BOEM has approved an extension of 12 months, to submit their SAP by March 2018.
- Delaware Lease Area: In November 2012, BOEM issued commercial wind energy lease OCS-A 0482 to Bluewater Wind Delaware, LLC (Bluewater). Bluewater submitted a SAP on November 29, 2013, for the installation and operation of two buoys (Guardian surface and WindSentinel) offshore Delaware.
- Maryland Lease Areas: In December 2014, BOEM issued commercial wind energy leases OCS-A 0489 and OCS-A 0490 (north and south respectively) to US Wind Inc. US Wind Inc. submitted a SAP on November 20, 2015, for the installation and operation of a meteorological tower. As of August 2016, US Wind Inc. began conducting surveys of the potential cable route offshore Maryland.
- Virginia Lease Area: In November 2013, BOEM issued a commercial wind energy lease OCS-A 0483 to the Virginia Electric and Power Company (dba Dominion Virginia Power). Dominion submitted a SAP on May 1, 2014, for the installation and operation of a WindSentinel buoy. Dominion plans to deploy the WindSentinel buoy offshore Virginia in 2019.

Activities and potential impacts associated with BOEM OCS leases identified above would be similar to those considered under the proposed action in this EA.

Construction and Operation of Wind Turbines

This EA will not consider the cumulative impacts of the potential construction of wind energy facilities in the Massachusetts/Rhode Island, New Jersey, or Massachusetts lease areas, nor within the New York proposed lease area. BOEM takes this approach based on several factors.

As stated in Section 1.4.2, *Scope of Analysis*, BOEM has received no project proposals (in the form of a COP) for the above-listed leases or potential leases. Given the nascent nature of the offshore wind industry and market uncertainties, it is speculative at this time whether projects will be proposed within these areas. Second, even assuming that projects are proposed, the parameters of such project are unclear. BOEM has considered the experiences of the wind industry offshore northern Europe, which has seen rapidly changing technology and numerous project designs. The project design and the resulting environmental impacts are often geographically and design specific, and it would therefore be premature to analyze environmental impacts related to potential approval of any future COP at this time (Musial & Ram, 2010; Michel et al., 2007). Since none of the lessees have submitted a COP on the above leases, this cumulative analysis does not consider commercial-scale development in the adjacent

OCS leases. Additional analyses under NEPA would be required before any future decision is made regarding construction of wind energy facilities on the OCS.

Therefore, BOEM limits its cumulative analysis to the construction and operation of two 30 MW and less wind farms that have been proposed in State waters, installation and operation of offshore wind projects in the mid-Atlantic and Northeast that have been constructed or permitted.

- Cape Wind, Massachusetts: In 2010, BOEM issued Lease OCS-A 0478 to Cape Wind Associates, LLC for approximately 46 mi^2on the OCS in Nantucket Sound to install 130 grid-connected wind turbines. In 2014, BOEM approved a revised COP and completed its review of the Facility Design Report and Fabrication and Installation Report. The lessee has satisfied almost all of BOEM's regulatory requirements to move forward with the construction and operation of the proposed project. In July 2014, the lessee submitted a request for a two-year suspension of the operations term of its commercial lease. BOEM approved the lease suspension and issued a suspension order pursuant to 30 CFR 585.418. No construction or installation activities may occur during the suspension period, which expires on July 24, 2017.

  The four phases of construction include: manufacturing turbines, installing upland (land) cable, installing offshore electric cabling, and constructing the wind farm in Nantucket Sound (Cape Wind Associates, LLC, 2012b). Two phases of construction would contribute to increased vessel traffic: installing offshore electric cabling and constructing the wind farm. Cables from individual turbines would connect to an electrical service platform, which would connect to the Northeast electrical grid via two undersea cables. The service platform would also serve as an offshore maintenance facility.

- Block Island Wind Farm, Rhode Island: Deepwater Wind has installed five 6 MW wind turbines approximately 3 mi offshore Block Island, Rhode Island. The wind farm will be in-service and generating power in the fourth quarter of 2016 (Deepwater Wind, 2015). An associated transmission line, National Grid's sea2shore cable connection between Block Island and mainland Rhode Island, passes through federal waters. In December 2014, BOEM executed a right of way grant for the Block Island Transmission System and approved Deepwater Wind's GAP for the project, with modifications. The installation of the cable is complete along with the cable protection measures installed in September 2016. (Deepwater Wind 2016c).

- Atlantic City Wind Farm, New Jersey: The Atlantic City Wind Farm has been proposed by Fishermen's Energy of New Jersey in a two-phase approach. The first phase would be in State waters 2.8 mi (4.5 km) off the coast of Atlantic City, and would consist of five wind turbines with generation capacity of 25MW.The first phase received nearly all permits and licenses in 2011 and 2012. Construction of the project has not yet commenced.

- Virginia Offshore Wind Technology Advancement Project: On March 24, 2016, BOEM approved the Research Activities Plan (similar to a COP) for the installation and operation of two 6 MW turbines and associated cabling to shore. Construction of the project has not yet commenced. Chapter 5.2 of the PEIS (MMS, 2007a) discusses cumulative impacts on environmental and socioeconomic resources associated with offshore renewable energy. The main impacts associated with construction and operational activities are listed below.

Construction: The largest impacts are likely to come from installation of the wind turbine and electric service platform foundations and the submarine power cables. These impacts include:

- Moderate impact from noise due to short term, localized pile driving activities could occur during foundation installation;
- Disturbance of the seafloor could result in negligible to major impacts on water quality and seafloor habitat under and adjacent to the foundations and cables;
- Negligible to moderate impacts to coastal habitats (e.g., wetlands, barrier beaches) from transmission cable installation and construction of onshore facilities; and
- Minor to moderate air quality impacts, mainly from fugitive dust emissions as well as emissions of SO_2 and O_3 precursors.

Operation: Minimal maintenance vessel activity and underwater disturbance during operations is expected. Potential impacts include:

- Negligible to minor impacts from vessel traffic that could can cause noise or lead to collisions with marine mammals or sea turtles;
- Small, minor-impact spills of fuel, lubricating oil, or dielectric fluids. A larger spill of dielectric fluid stored on an electric service platform or of fuel or lubricating oil from a vessel could cause moderate to major impacts but is highly unlikely. Impacts from a spill as a consequence of a vessel collision could be moderate to major;
- Minor impacts due to marine and coastal birds as well as migrating inland birds may experience turbine collisions; endangered species would be the most impacted; and
- Impacts to visual resources may occur.

In general, most impacts would be negligible to moderate for construction and operation of wind energy facilities assuming that reasonable siting and mitigation measures are followed. Vessel activity on the OCS related to a wind facility is relatively low, with only a few support vessels in operation at any one time during the highest activity period (construction). Potential impacts are the highest during the construction phase because this phase involves the highest amount of vessel traffic, noise generation, and air emissions.

4.7.1.2 Hydrokinetic Projects

There is a potential hydrokinetic energy project proposed in New York state waters (outside of BOEM jurisdiction), the Verdant Power Roosevelt Tidal Energy Project, for which a pilot commercial license was issued by the Federal Energy Regulatory Commission in January 2012 (Verdant Power Inc., 2015). Verdant Power may install up to 30 underwater turbines in the East Channel of the East River (near New York City) under this license. The project will have a phased approach and include environmental monitoring.

Reasonably foreseeable impacts of hydrokinetic projects could include (EPRI, 2012; Cada et al., 2007):

- Alteration of river/ocean bottom habitats during installation and operation;

- Creation of structural habitat in open waters or obstruction of movements/migrations of aquatic animals;
- Suspension of sediments and contaminants from deployment and operation, and erosion/scour around anchors, cables, and other structures;
- Alteration of hydraulics and hydrologic regimes (movement of devices would cause localized shear stresses and turbulence that may be damaging to aquatic organisms);
- Impacts to fish, other aquatic organisms, diving birds, and marine mammals from rotor strikes, entanglement in submerged cables, or impingement on screens used to protect the machine or reduce strikes; and
- Electromagnetic fields associated with these devices may attract, deter, or injure aquatic animals.

4.7.1.3 Undersea Transmission Lines and Pipelines

The existing undersea Neptune Regional Transmission System line, which is an operational high voltage direct current transmission line that extends from Long Island to New Jersey, was completed in June 2007 and runs approximately 50 mi (80 km) underwater (Neptune Regional Transmission System, 2016). As discussed in Section 4.7.1.1, all submarine cabling associated with the Block Island Wind Farm has been completed as of Fall 2016 (Deepwater Wind, 2016c). The Poseidon Transmission Project is a proposed high voltage direct current transmission line that extends from South Brunswick, New Jersey, to Long Island, New York (Poseidon Transmission Project, 2016a). Forty mi (64 km) of the project is a submarine cable located in Raritan Bay, within state waters of the Atlantic Ocean, and New York Bay (NYS PSC, 2015). In-water construction activities will occur during discreet periods between June 1 and December 31. Given the time of year restrictions and the need for certain installation activities to occur uninterrupted (e.g., HDD and hydraulic jet plow), it is projected that cable installation activities will occur 24 hours per day/seven days per week in most areas (ESS, 2013). The in-service date was expected to be 2020 (Poseidon Transmission Project, 2016b). In May 2016, Transcontinental Gas Pipeline Company, LLC pre-filed with FERC a proposed expansion (Northeast Supply Enhancement Project) to its existing Lower New York Bay Lateral natural gas pipeline (Transco, 2016). The project includes a new 22 mi (35 km) lateral pipeline, within state waters, that would connect New Jersey and the New York's Rockaway Peninsula. Construction could begin in June 2018 with the pipeline in service by Fall 2019.

Reasonably foreseeable impacts of new transmission and pipeline projects could include (DWBITS, 2012; FERC, 2014):

- Increased vessel traffic and associated effluent discharges, air emissions, and noise;
- Increases of accidental releases of trash and marine debris;
- Intermittent underwater noise associated with construction;
- Temporary disturbance of benthic habitat from installation;
- Impacts to existing telecommunication cables; and
- Temporary sediment disturbance during installation.

4.7.1.4 Marine Minerals Use and Ocean Dredged Material Disposal

The precursor agency to BOEM—the MMS—identified and evaluated five potential borrow areas in the New York Bight area for beach replenishment (Byrnes et al., 2004). BOEM's Marine Minerals Program currently has one lease for a sand borrow area offshore New Jersey for the Long Beach Island, New Jersey, project (Lease Number OCS-A-0505). The proposed lease area does not overlap any of the potential sand borrow areas, including those areas identified by NJDEP as significant sand resource areas, but cable route site characterization activities could occur in the vicinity of the borrow areas. The USACE New York District has indicated potential future sand resource needs in Rockaway Beach, Long Beach, and Fire Island, New York, and Sandy Hook, New Jersey. BOEM is also currently conducting offshore surveys to identify new sources of sand in federal waters, between 3 and 8 nm (5.5 and 14.8 km) offshore New York and New Jersey. Impacts from sand removal (i.e., seafloor disturbances) could contribute to cumulative impacts when combined with the proposed action.

EPA Region 2 is responsible for designating and managing ocean disposal sites for materials offshore in the region of the proposed lease area. USACE issues permits for ocean disposal sites and all ocean sites are for the disposal of dredged material permitted or authorized under the Marine Protection, Research and Sanctuaries Act. There are several dredged material disposal sites in nearshore waters off New York and New Jersey that are no longer used for disposal and one active site (the Historic Area Remediation Site) located roughly 10 nm (18 km) west of the western tip of the proposed lease area (EPA, 2016b).

Reasonably foreseeable impacts of OCS sand mining and dredge material disposal include:

- Increased seafloor disturbance, turbidity, and benthic habitat alterations;
- A risk of direct physical impacts to sea turtles;
- Increased vessel traffic and associated effluent discharges, air emissions, and noise;
- Accidental releases of trash and marine debris;
- A risk of petroleum product spills; and
- Increased coastal and dune habitat (which creates nesting habitat for threatened birds and turtles).

4.7.1.5 Military Use

Military activities can include various vessel training exercises, submarine and antisubmarine training, and U.S. Air Force exercises. The U.S. Navy, U.S. Army, USCG, and U.S. Air Force have major and minor military installations located along the coasts of New York and New Jersey. USCG has a Weapons Training Area that covers a large portion of the New York WEA.

Potential impact-producing factors include:

- Acoustic stressors (e.g., sonar, explosives, air guns, noise from weapons, vessels and aircraft);
- Energy stressors (e.g., electromagnetic devices, high energy lasers);
- Physical disturbances and strike stressors (e.g., increased vessel traffic, military expended materials);

- Entanglement stressors (e.g., fiber optic cables and guidance wires); and
- Ingestion stressors (e.g., military expended materials).

4.7.1.6 Marine Transportation

The number of one-way vessel trips associated with shipping in the WEA area was reported to be 30,768 domestic and foreign vessel trips in the Lower entrance channels of New York Harbor, New York, and 5,115 vessel trips in Newark Bay, New Jersey, in 2014 (a total of 35,883 one-way trips) (USACE, 2015). Other vessels using these ports include military vessels, commercial business craft (tug boats, fishing vessels, and ferries), commercial recreational craft (cruise ships and fishing/sight-seeing/diving charters), research vessels, and personal craft (fishing boats, houseboats, yachts and sailboats, and other pleasure craft). Over the cumulative assessment time period, BOEM assumes that shipping and marine transportation activities would increase above the present level, due in part to the expansion of the Panama Canal, which is near completion and will allow larger vessels to travel through the canal. Vessels that were previously unable to get through the canal and would dock on the U.S. West Coast and have their goods transported via truck or rail across the United States, will now be able to go through the Panama Canal and dock directly at U.S. East Coast ports, resulting in an increase in vessel traffic and the size of vessels on the East Coast of the United States. Several U.S. East Coast ports, including the Port Authority of New York and New Jersey, have been deepening harbors and expanding cargo-handling facilities to accommodate and attract the larger vessels. The inaugural transit through the expanded Panama Canal occurred in June 2016 (Canal de Panamá, 2016).

Reasonably foreseeable impacts associated with increased oceanic transportation include:

- Increase in vessel traffic, including associated effluent discharges, air emissions, and noise;
- Increase in use of underused capacity at ports and creation of jobs;
- More accidental releases of trash and marine debris;
- Increased risk of fuel spills from commercial vessels; and
- Increased vessel strikes.

4.7.1.7 Fisheries Management

NMFS implements regulations managing commercial and recreational fisheries in federal waters, including those within which the New York WEA is located. Although there are several fisheries that operate in the New York WEA, the two principal fisheries that have expressed concern with activities in the vicinity of the WEA are the Atlantic sea scallop fishery and the longfin squid fishery. Management measures for the Atlantic sea scallop fishery are developed by the New England Fisheries Management Council and those for squid are developed by the Mid-Atlantic Fisheries Management Council. The governing statute for federal fisheries management is the Magnuson-Stevens Fishery Conservation and Management Act. This statute requires that fisheries be managed sustainably. The latest report from NMFS, which includes a summary of the stock status for various species, indicates that the Atlantic sea scallop fishery is not overfished (biomass is above threshold) and overfishing is not occurring (fishing mortality is below threshold) (NMFS, 2016a). Although the overfishing status for longfin squid is designated as “unknown” in the report, the stock is not currently overfished. Although the annual quota for longfin squid is rarely exceeded, the fishery does regularly harvest its allowable quota in the second trimester (May to August) each year (NOAA Fisheries, 2016). Thus, harvest is constrained by regulation during that period. Reasonably foreseeable impacts from federally-regulated commercial fishing include:

- Fish mortality;
- Regulated fishing effort; and
- Vessel traffic.

4.7.1.8 Global Climate Change

Section 7.6.1.4 of the Programmatic EIS (MMS, 2007a) describes global climate change with respect to assessing renewable energy development. The potential impacts of global climate change to protected species that occur within the proposed action area are discussed in detail in NMFS Biological Opinion (NMFS, 2013c). The following is a summary of the above-mentioned information and incorporates updated information.

The temperature of the earth’s atmosphere is regulated by a balance between the radiation received from the sun, the amount reflected by the earth’s surface and clouds, the amount of radiation absorbed by the earth, and the amount re-emitted to space as long-wave radiation. GHGs keep the earth’s surface warmer than it would otherwise be because they absorb infrared radiation from the earth and, in turn, radiate this energy back down to the surface. While these gases occur naturally in the atmosphere, there has been a rapid increase in concentrations of GHGs in the earth’s atmosphere from human sources since the start of industrialization, which has caused concerns over potential changes in the global climate. The primary GHGs produced by human activities are CO_2, CH_4, nitrous oxide (N_2O), and halocarbons (MMS, 2007a).

The heavy use of fossil fuels from the nineteenth century onwards, in addition to other human activities, has artificially increased the amount of GHGs within the Earth’s atmosphere. The associated increase in global temperature has led to reduced sea-ice cover, rising sea levels and changing weather patterns, with wide-ranging effects. Global sea surface temperatures have warmed 0.75°C since 1860 and are now 0.5°C above the 1971 to 2000 average (NOAA, 2016). Water below the surface is also experiencing strong warming trends in some parts of the world, including the western Atlantic (Nieves et al., 2015; NASA, 2016).These changes in the climate system have a wide-ranging environmental influence, some of which is represented in the list below:

- Increased energy within the climate system may be generating stronger storm systems (Wang et al., 2006; Trapp et al., 2007; Screen & Simmons, 2013; Kunkel et al., 2013)
- Stronger storms due to climate change could result in increased sediment erosion, deposition, and bottom disturbance that may be harmful to benthic organisms including sea scallops (New Hampshire Fish and Game, 2015)
- Enhanced sea level rise from the thermal expansion of water and the melting of continental ice sheets may negatively impact nesting and spawning sites of some animals, such as sea turtle species (Daniels et al., 1993; Fish et al., 2005; Baker et al., 2006)

- The seasonal timing and patterns of temperature are being altered by climate change, affecting ecological relationships and species distributions (Drinkwater et al., 2003; Richardson et al., 2008)
- Ocean acidification from increased CO_2 be absorbed by the ocean affecting habitat availability, prey availability, species distribution and migration, community structures, reproductive success, and susceptibility to disease for a variety of marine organisms (Macleod, 2009)

These ongoing effects will have no impact on a meteorological tower in the five year time period of this project.

Detecting and measuring climate change and its impacts require data with adequate resolution stretching back multiple decades. In a marine environment, sources of data are often limited to what passing vessels recorded in regards to ambient conditions and their economic activities. Fishery data collected by the NMFS over the past 50 years reveal a gradual shift of fishery species towards higher latitudes and greater depths (Pinsky et al., 2013; OceanAdapt, 2016). This may be part of an ecological shift affecting any species with a predator or prey relationship with these fishery species.

4.7.2 Reasonably Foreseeable Cumulative Impacts

The impacts associated with Alternative B and the No Action Alternative would overall be less than, or identical to, the impacts for Alternative A. Therefore, this cumulative impacts analysis evaluates the cumulative impacts of Alternative A (the proposed action) when added to other past, present and reasonably foreseeable projects and activities listed in Section 4.7.1, *Existing and Future Reasonably Foreseeable Activities and Projects*. In addition, the past and existing activities contributing to the baseline conditions described in the *Description of the Affected Environment* sections in Section 4.4 would continue to contribute to the impacts levels described and analyzed for the resource areas discussed below.

Air Quality Including Greenhouse Gas Emissions

The spatial extent of potential cumulative air quality impacts onshore includes the New Jersey and New York coastal areas closest to the WEA. Offshore, the spatial extent includes state waters and federal waters within approximately 25 mi (40 km) of the shoreline (which includes the New York WEA) given that under the Clean Air Act, air quality emissions within 25 mi (40 km) of a state's seaward boundaries are subject to the same federal and state requirements as those that would apply if the source were located onshore.

Onshore within the analysis area, sources include transportation-related sources, which make up the largest percentage of the onshore NO_X and CO emissions. Emission contributions of NO_X and CO are associated with minor transportation/freight movement highways that service the smaller ports and cities, and the numerous railway corridors along the coast that run north-south or terminate at the coastal port cities. The major contributors to emissions of ammonia (NH_3), PM_{10}, and $PM_{2.5}$ are area sources associated with population centers/activities. Area sources include home heating units, solvent utilization (architectural coatings/painting, auto refinishing, metal/wood refinishing, de-greasing, dry cleaning), petroleum storage and transport (gas stations, fuel terminals), solid waste and wastewater treatment facilities, landfills, small boilers, restaurants, outdoor grills, road dust, agricultural operations, and open burning. Major contributors of SO_2 emissions are from large industrial point sources, such as electric generation units and other smaller industrial sources situated in a variety of locations along the Atlantic coast. The on-road, non-road, and area source sectors are equal contributors to anthropogenic VOC emissions, while forests, wetlands, crops, and other vegetation are contributors to biogenic VOC emissions along the Atlantic coast. Population growth and infrastructure expansion would continue to increase these pollutant sources.

Offshore there are a variety of anthropogenic pollutant sources associated with commercial marine vessels, recreational boating, military activities, and commercial fishing operations. The largest contributors to criteria pollutant emissions are commercial marine vessels. Figure 4–19 depicts commercial marine vessel traffic density within the analysis area. The colored areas are individual traces of marine vessel traffic paths with the "warmer" colors in the figure depicting higher vessel density and corresponding higher emissions, especially offshore of New York and New Jersey. Commercial marine vessels burning diesel or other fuel oil would primarily emit larger quantities of NO_X, CO, and SO_2 emissions and smaller quantities of VOCs, PM_{10}, $PM_{2.5}$, and NH_3 emissions.

Warming of the earth's climate system is occurring, and most of the observed increases in global average temperatures since the mid-20th century are very likely due to the increase in anthropogenic GHG concentrations (USGCRP, 2014). In general, the cumulative activities would contribute to GHG emissions, with the proposed action contributing a negligible amount (i.e., approximately 1,500 metric tons per year (see Table 4–1 in Section 4.4.1.1 of this EA). The additional GHG emissions anticipated from Alternative A, over the 5-year period, would have a negligible incremental contribution to existing GHG emissions and, therefore would have an exceedingly minor effect on the environment via contributions to climate change.

Over the life of the proposed action, local impacts to air quality are likely to be small, incremental, and difficult to discern from effects of other pollutant sources. Onshore, transportation-related pollutant sources are the largest contributor to air quality impacts. Population growth and infrastructure expansion would continue to increase these pollutant sources. Offshore, the largest contributors to pollutant emissions are commercial marine vessels. Although the emissions estimates from the proposed action (site characterization and site assessment activities) are measurable, they would not be distinguishable from other air emissions onshore or offshore. The additional air emissions from up to approximately 1,000 vessel round trips associated with the proposed action would be relatively small compared with the existing and projected future vessel traffic in the vicinity's heavily used waterways and ports, and would not represent a substantive incremental contribution to cumulative impacts on air quality. Therefore, cumulative activities considered in this analysis are anticipated to result in **minor** impacts to air quality and GHG emissions, with the proposed action resulting in a negligible incremental contribution, when combined with the past, present and reasonably foreseeable future activities.

Water Quality

The reasonably foreseeable impacts to water quality in New York, New Jersey, Rhode Island, and Massachusetts state waters and federal waters of the OCS come from vessel discharges, sediment disturbance, and potential spills associated with the cumulative activities identified in Section 4.7.1. Water quality could be affected by increased concentrations of suspended sediments in locations specific to site characterization surveys (shallow hazard, geological, geotechnical, and archaeological surveys), site assessment activities (installation and decommissioning of meteorological towers and/or buoys), the construction of wind turbines, hydrokinetic turbine construction and operation, undersea transmission line installation, deepening of ports in preparation for larger vessels associated with expansion of the Panama Canal, and marine minerals use and dredged material disposal.

Accidental spills or releases of oils and/or chemical fluids could also occur during construction, operation, and decommissioning of structures in the offshore environment. Elevated suspended sediment concentrations and increased turbidity would occur within the immediate vicinity of the cable routes and renewable energy development projects. Accidental releases and spills are unlikely; all onshore and offshore project facilities are designed with appropriate spill containment systems. All project activities would be implemented under a series of storm water management, erosion control, oil spill response, and marine trash and debris plans. Therefore, the potential that an accidental spill or release of trash and debris would have a cumulative effect on water quality is very low.

In the *National Coastal Condition Report IV*, EPA assessed the overall water quality and sediment quality of Northeast coastal waters, including the portions of the New York and New Jersey coasts within the affected environment for this EA, as “fair” (EPA, 2012). The majority of pollutants to marine water quality originate onshore; however, the proposed lease area is far enough from shore that oceanic circulation and water volume would disperse, dilute, and biodegrade many contaminants that originate from shore (BOEM, 2012b). The incremental contribution of the proposed action to cumulative impacts on coastal and marine water quality is anticipated to be minor, with any changes being small in magnitude, highly localized, and transient. The overall cumulative activities considered in this analysis are anticipated to cause **minor** impacts on coastal and marine water quality.

4.7.2.1 Biological Resources

The geographic boundaries for the cumulative analysis for birds, bats, marine mammals, sea turtles, and fish include the entire U.S. East Coast given their migratory nature. For benthic resources and coastal habitats, cumulative impacts would be more localized and BOEM’s analysis centers on the waters in and around the proposed lease area and the surrounding nearshore waters and coastlines of New York and New Jersey.

Birds

Birds in the vicinity of the proposed lease area and surrounding nearshore waters and ports were and continue to be subject to a variety of anthropogenic stressors, including collisions with manmade structures, commercial and recreational boating activity, pollution, disturbance of marine and coastal environments, hunting, habitat degradation and loss (including displacement by invasive species), predation (e.g., cats, foxes, owls, hawks), and climate change (NABCI, 2011). Migratory birds are also affected by these factors, but over a much broader geographical area. The proposed action may affect birds through tower allisions, accidental spills, noise, and other disturbances. However, because surveying activities, meteorological tower and/or buoy installation, and decommissioning activities are of short duration, and because the proposed action would result in the installation of one tower and/or two buoys over a widespread geographic area, the overall impact of the proposed action on birds would be minor.

The impacts to birds from other reasonably foreseeable activities (including those discussed above in Sections 4.7.1.1–4.7.1.7) are expected to occur from site characterization and site assessment activities associated with BOEM OCS leases such as construction and pile driving noise, lighting, vessel traffic, collisions with meteorological towers, and loss of habitat and associated prey. These effects would be the same as for the proposed action and would be minor. Bird species are known to strike operating wind turbines. Although the permitted offshore wind energy facilities Block Island, Fisherman's Energy, and Cape Wind (Section 4.7.1.1) are either not built or not yet in operation, these projects are much closer to shore and closer to relatively more avian resources than the proposed project. Nevertheless, "minor long-term impacts on birds as whole are expected" as a result of the Cape Wind Energy Project (Section 6.2.7 in MMS, 2009b). Compliance with the regulations and coordination with appropriate wildlife protection agencies would ensure that project activities would be conducted in a manner that would greatly minimize or avoid impacting these species or their habitats (Chapter 5, *Consultation and Coordination*). Therefore, the proposed action would result in a negligible incremental contribution when combined with the past, present and reasonably foreseeable future activities. The overall cumulative activities considered in this analysis are anticipated to cause **minor** impacts to avian resources.

Bats

Bats in the vicinity of the proposed lease area were and continue to be subject to a variety of anthropogenic stressors, including collisions with manmade structures along the coastlines and inland areas of New York and New Jersey. Instances of bat collisions with towers where and continue to be reported infrequently at terrestrial sites. However, the scarcity of bats in the offshore environment further reduces the potential for a collision with a comparatively small and isolated meteorological tower that is at least 13.5 nm (25 km) offshore under the proposed action. The SOCs for birds (Appendix B) may also reduce potential impacts on bats.

Other reasonably foreseeable activities (Section 4.7.1), may impact bats in the vicinity of the proposed lease area, primarily from collisions with installed meteorological towers, buoys, and wind turbines. The distribution and scarcity of bats in the offshore environment reduces the potential for a collision and impacts to bats from these projects would be negligible. Therefore, the proposed action would result in a negligible incremental contribution to bats when combined with the past, present and reasonably foreseeable future activities, and overall cumulative activities considered in this analysis are anticipated to cause **negligible** impacts to bats.

Benthic Resources

Benthic resources in the WEA and surrounding nearshore waters and the coastlines of New Jersey and New York are affected by ground-disturbing activities on the seafloor. Placement of anchors, piles, scour protection, piers, rock riprap, and dredging can displace, cover, or smother benthic organisms. Permanent structures such as piles and riprap result in conversion of soft sediment necessary for benthic habitat. Although conversion of soft sediment and benthic habitat is common along the coastline, it is less common offshore where the WEA is located. Sediment disturbance and conversion as a result of the proposed action would occur in the offshore environment where there is benthic habitat adjacent to the area being disturbed (i.e., near the tower foundation or buoy mooring). Over the entire Mid-Atlantic Bight, from approximately Nantucket Shoals to Cape Hatteras, on the continental shelf, there are roughly over 20 million ac of soft-bottom sand habitat similar to the proposed lease area. In areas of temporary disturbance, benthic resources typically recover in one to three years. BOEM has determined that the overall impact on benthic resources from the proposed action would be minor.

The impacts to benthic resources from other reasonably foreseeable activities discussed in detail in Section 4.7.1 are expected to occur primarily from installation and decommissioning of structures such as, meteorological towers, buoys, undersea transmission lines, hydrokinetic turbines and wind turbines, as well as geotechnical/sub-bottom sampling, dredging of minerals borrow areas, and commercial fishing.

Installation and decommissioning of structures in state and federal waters and geotechnical/sub-bottom sampling may cause displacement, injury, or direct mortality of benthic organisms, loss or alteration of habitat from scouring and suspension/redeposition of sediments, spills from collisions/allisions, and generator refueling operations. These effects were determined individually to range from negligible to minor; the overall impact of these activities on benthic resources would be minor.

Although disturbance of the seafloor during construction of the Cape Wind Energy project could result in negligible to major impacts on benthic resources under and adjacent to the foundations and cable, in general, most impacts to benthic resources from this project would be negligible to moderate for all phases of development across the environment where those resources occur, assuming proper siting and mitigation measures are followed.

Hydrokinetic projects may affect benthic resources through direct mortality of benthic organisms, loss/alteration of benthic habitat, suspension of sediments and contaminants, and alteration of hydrologic regimes. However, no hydrokinetic projects are currently proposed within the area that would be affected by the proposed action.

Commercial fishing will result in the direct mortality of benthic resources. Groundfish trawls, scallop dredges, and hydraulic clam dredges all operate in the New York WEA. These gears all result in temporary bottom disturbance from the interaction between the gear and the seafloor. Fishing impacts to the seafloor are assessed and managed under Federal fishery management plans.

Thus, the only impact producing activity that would affect benthic resources in the same spatial and temporal timeframe as the proposed action are those from fishing. The overall availability of benthic habitats to marine fauna, such as the soft-bottom, sandy substrate present in the proposed lease area, is largely unchanged across the over 20 million ac on southern New England and the Mid-Atlantic Bight continental shelf, when considering of past, present, and reasonably foreseeable future actions. Thus, the cumulative impacts to benthic resources are anticipated to cause **minor** impacts to benthic resources, with the proposed action resulting in a negligible incremental contribution, when combined with the past, present and reasonably foreseeable future activities.

Coastal Habitats

The analysis area for coastal habitats includes the nearshore waters, tidal flats, salt/brackish and freshwater marshes along the coastlines of New York and New Jersey. Much of the New York and New Jersey shoreline and most of the coastal habitats have been impacted by human activities such as development, maritime activities, beach replenishment, or shore-protection structures such as groins and jetties (MMS, 2007a). Because the proposed action would be supported by existing port facilities and the proposed action would generate a minor amount of additional vessel traffic, BOEM has determined that the overall impact on coastal habitats from the proposed action would be negligible.

In addition to the proposed action, impacts to coastal habitats could occur from transmission line cable installation, construction of onshore facilities associated with wind energy development, hydrokinetic projects, transmission lines, and marine transportation. These projects may affect coastal habitats through increased suspension of sediments and contaminants and alteration of hydrologic regimes; impacts from cumulative activities are anticipated to be negligible to minor with appropriate site selection, project design, and mitigation measures. Effects from marine transportation would include wake erosion, increased turbidity in nearshore waters, and accidental petroleum product spills and releases of trash/debris; with implementation of mitigation measures and adherence to vessel speed, impacts from cumulative marine transportation on coastal habitats would be negligible.

The cumulative activities considered in this analysis are anticipated to cause **negligible** impacts to coastal habitats, with the proposed action resulting in a negligible incremental contribution, when combined with the past, present and reasonably foreseeable future activities.

Acoustic Environment

It is assumed that underwater noise from vessel traffic and other anthropogenic sources within the project area are increasing, based on the documented increases in marine background noise worldwide (McDonald et al., 2006). Commercial vessel traffic is recognized as a major contributor to background ocean noise, and recreational boating can have localized effects on increased noise along coastal areas. Other moderate noise impacts might be realized in association with military activities (e.g., sonars and explosives) in non-project areas where highly migratory marine mammals and sea turtles may occur. Most noise such as vessel and aircraft noise has temporary and localized impacts that are negligible, but in some oceanic regions, where vessel and air traffic levels are higher (e.g., near busy port areas), they may have moderate impacts on marine mammals and sea turtles. The annual number of vessel trips expected to occur in the waters surrounding the WEA is 30,768, excluding non-commercial vessel traffic. Annual vessel trips associated with the proposed lease (an average of 142-213 round trips annually) will amount to an approximate 0.46 to 0.70 percent increase in the current level of vessel traffic and associated underwater noise levels. This negligible increase in vessel traffic and associated underwater noise could last for approximately five years. Pile driving during site assessment activities will be a source of additional underwater noise. However, acoustic impacts associated with the proposed activities under Alternative A are expected to be spatially localized, occur intermittently, and be short-term in duration. Implementation of mitigation measures such as time area closures, monitoring, and clearance of acoustic exclusion zones are expected to minimize potential impacts from acoustic sources. The proposed lease sale will possibly result in a minor incremental increase in underwater noise levels, while the short-duration activities are occurring. Short-term, **minor** to **moderate** impacts to marine mammals and sea turtles may occur while the underwater sounds are present. The acoustic impacts associated with the proposed activities under Alternative A are therefore not expected to increase the level of impacts beyond the current levels of impact anticipated in the waters surrounding the

WEA. No long-term incremental or synergistic impacts are expected to occur from site characterization and site assessment activities.

Marine Mammals

Past and current impacts on marine mammals involve a variety of anthropogenic impacts, including collisions with vessels (ship strikes), whaling, entanglement with fishing gear, noise from human activities, pollution, disturbance of marine and coastal environments, climate change, effects on benthic habitat, waste discharge, and accidental fuel leaks or spills. Many marine mammals migrate long distances and are affected by these factors over very broad geographical scales. A detailed description of the current status of marine mammals in the New York Bight area can be found in Section 4.4.2.5. Two federally endangered whales—fin whales and NARWs—could occur in the New York WEA.

Impacts associated with the proposed action (e.g., acoustic impacts from pile driving, vessel strikes, water quality effects, entanglement and changes in prey abundance and distribution, loss of habitat, trash and debris and fuel spills) are expected to be moderate overall, although potential impacts would range from negligible to moderate depending on the activity being conducted during site characterization and site assessment. The annual number of vessel trips associated with the proposed lease (an average of 142-213 round trips annually) will account for approximately 0.46 to 0.70 percent of the more than 30,768 total vessel trips expected to occur in the vicinity of the WEA each year, excluding non-commercial vessel traffic. This negligible increase in vessel traffic could last for approximately five years. Adherence to BOEM’s SOCs (Appendix B) regarding vessel strike avoidance measures and exclusion zones to minimize acoustic impacts would reduce the potential for cumulative impacts on marine mammals, including ESA-listed species. The proposed action's incremental contribution to cumulative impacts is expected to be minor. Based on the mitigation measures outlined in BOEM’s SOCs for Protected Species (Appendix B), BOEM has determined that the overall impact on marine mammals from the proposed action would be moderate.

Hydrokinetic projects may affect marine mammals through obstruction of movements/migration, suspension of sediments and contaminants, turbulence and/or rotor strikes, entanglement in submerged cables, and impingement on screens used to protect machinery, but impacts are anticipated to be negligible to minor with appropriate site selection and project design.

The proposed action would result in a minor incremental contribution when combined with the past, present and reasonably foreseeable future activities, and overall cumulative activities considered in this analysis are anticipated to cause **moderate** impacts to marine mammals.

Sea Turtles

Sea turtles experience a variety of past and present anthropogenic impacts, including vessel strikes, hooking and entanglement with fishing gear, noise from human activities, pollution, disturbance of marine and coastal reproductive habitats, climate change, effects on benthic habitat, waste discharge, and accidental fuel leaks or spills. Loggerhead turtle, green turtle, Kemp’s ridley turtle, and leatherback turtle are ESA-listed as threatened or endangered and are all highly migratory species that could occur within, or in the vicinity of the New York WEA and can be affected by threats over a large area. Although many conservation efforts are underway to reduce the level of threat to sea turtles and populations appear to be stable or increasing, these impacts are expected to affect sea turtle populations in the foreseeable future.

The impacts to sea turtles from reasonably foreseeable activities in the geographic region of the proposed lease area (Section 4.7.1) are expected to occur primarily from underwater noise from pile driving; vessel strikes; entrainment in DP thrusters; increases in suspended sediment resulting in elevated turbidity levels, release of contaminants, and temporary displacement of prey and sea turtles; entanglement related to meteorological tower and buoy operation; loss of habitat and changes to prey abundance/distribution; trash and debris; fuel spills; construction and operation of wind turbines; and hydrokinetic projects. For BOEM-regulated projects and activities (wind energy development, Block Island Wind Farm undersea transmission line, and OCS minerals use), adherence to BOEM's SOCs would reduce the potential cumulative impacts on sea turtles. Impacts would range from negligible to moderate.

In general, most impacts to sea turtles from future wind farm projects would be negligible to moderate for all phases of development, assuming proper siting and mitigation measures are followed. Hydrokinetic projects built in the future may affect sea turtles through obstruction of movements/migration, suspension of sediments and contaminants, turbulence and/or rotor strikes, entanglement in submerged lines, and impingement on screens used to protect machinery, but impacts are anticipated to be negligible to minor with appropriate site selection and project design.

The most likely impacts on sea turtles as a result of the proposed action are vessel strikes and low-frequency underwater noise. The annual number of vessel trips associated with the proposed lease (an average of 142–213 round trips annually) will account for approximately 0.46 to 0.70 percent of the more than 30,768 total vessel trips expected to occur in the vicinity of the WEA each year, excluding non-commercial vessel traffic. This negligible increase in vessel traffic could last for approximately five years. Noise resulting from the proposed action is expected to short-term and effect relatively small areas. No long term increase in ambient noise level is expected. Adherence to BOEM's SOCs (Appendix B) regarding vessel strike avoidance measures and exclusion zones to minimize acoustic impacts would greatly reduce the potential for impacts on sea turtles.

The proposed action would result in a minor incremental contribution when combined with the past, present and reasonably foreseeable future activities, and overall cumulative activities considered in this analysis are anticipated to cause **moderate** impacts to sea turtles.

Finfish, Invertebrates, Essential Fish Habitat, and Federally Listed Fish Species

The analysis area for finfish, invertebrates, EFH, and federally listed fish species is the waters offshore New York and New Jersey, the New York WEA, and the waters surrounding the WEA. The analysis area encompasses demersal and pelagic habitats in the open ocean that provide habitat for over 300 fish species (Jones et al., 1978). Primary invertebrate species that occur in the analysis area include longfin inshore squid, Atlantic sea scallop, Atlantic surfclam, ocean quahog, horseshoe crabs, and American lobster. EFH has been designated for nearly 40 species in the analysis area. Two federally endangered anadromous fish, Atlantic sturgeon and shortnose sturgeon, and three federally designated Species of Concern, bluefin tuna, dusky shark, and sand tiger shark, occur in the analysis area.

Impacts from site characterization activities would be negligible, and thus are not anticipated to contribute to a cumulative effect on fish species. Noise from pile driving during installation of meteorological towers and wind turbines could result in minor effects to fish including Atlantic sturgeon. Other noise sources include sonars from fishing vessels, merchant vessels, and military vessels, as well as vessel traffic noise (engine noise and propeller cavitation).

The cumulative impact to fish from underwater noise may include no effect, habituation to noise, diminishment of communication space, and physiological stress. Because there are no significant acute noise impacts evident from the cumulative activities and because there is no evidence of ambient noise levels, including existing vessel traffic noise, approaching a threshold level where fisheries might be significantly affected, it is expected that there would be a minor incremental increase in physiological stress to some fish from active acoustic sound disturbances from cumulative activities. Elevated noise (at or above impact thresholds) from the construction of the Cape Wind offshore wind facility would not overlap with noise generated in the action area. Thus noise from construction of the Cape Wind project would not incrementally increase the level of noise in the action area if noise generating events from both projects were to occur simultaneously. It is possible that migrating fish could be exposed to multiple acute noise producing events over their lifetime, but not multiple events simultaneously.

Marine pollution, including accidental spills and trash, could have a direct effect on fish and EFH. However, a large-scale spill response involving multiple vessels is not expected from the cumulative activities. Therefore, the incremental impacts to finfish, invertebrates, EFH, and federally listed fish species associated with a fuel spill from vessels under the cumulative activities would be negligible.

Federally-regulated commercial and recreational fishing will result in the direct mortality of fishery resources in the proposed lease area. However, this activity is regulated to ensure the sustainability of the fish resources in the area and is thus not anticipated to result in negative long-term adverse impacts to the fish/invertebrate resources in the proposed lease area.

The proposed action would result in a minor incremental contribution when combined with the past, present and reasonably foreseeable future activities, and overall cumulative activities considered in this analysis are anticipated to cause **negligible** to **minor** impacts depending on the fish/invertebrate species and activity.

4.7.2.2 Military Use and Navigation/Vessel Traffic

The analysis area for military use, navigation, and vessel traffic is the waters offshore New York and New Jersey, the New York WEA and the waters surrounding the WEA. BOEM estimates that the number of vessel round trips from the proposed action would range from approximately 350 to 1,000 over 6 to 7 years (Table 3–10, Section 3.2.4 *Vessel Traffic*), and estimates that one to three vessels associated with the proposed action could be present at any given time in the WEA and its vicinity. A significant amount of vessel traffic is expected to occur under the cumulative activities listed in Section 4.7.1, including high levels of vessel activity associated with shipping and marine transportation around ports along the U.S. Eastern Seaboard. Military operations and commercial and recreational fishing activity would also contribute to overall vessel activity.

Site-specific coordination with DOD would be required to minimize multiple use conflicts on the OCS in and around the WEA; therefore, cumulative impacts on military use are expected to be **negligible**. With proper scheduling and notification to the marine community, impacts to marine transportation would be minimized, and adherence to navigation regulations would minimize navigational risk related to the additional vessel traffic associated with the cumulative activities.

The proposed action would result in a negligible incremental contribution to vessel traffic and navigation when combined with the past, present and reasonably foreseeable future activities, and overall cumulative activities considered in this analysis are anticipated to cause **moderate** impacts to vessel traffic and **negligible** impacts to navigation in the analysis area.

4.7.2.3 Socioeconomic Resources

Cultural, Historical, and Archaeological Resources

Cumulative activities most impacting archaeological resources are seafloor disturbing activities in New York, New Jersey, Rhode Island, and Massachusetts federal and state waters associated with site characterization surveys (shallow hazard, geological, geotechnical, and archaeological surveys), site assessment activities (construction and decommissioning of meteorological towers and/or buoys), the construction of wind turbines, hydrokinetic turbine construction and operation, undersea transmission line installation, and marine minerals use and dredged material disposal. The activities most impacting other historic properties are disruptions of a historic setting that is important to the integrity of a historic structure and a contributing element to its significance under various criteria of eligibility for the NRHP, principally from wind energy development.

The activities analyzed under the cumulative activities are projected to minimally affect the analysis area's archaeological resources and other historic properties. Insofar as all areas of potential effect throughout the state waters and Atlantic OCS offshore New York, New Jersey, Rhode Island, and Massachusetts have been surveyed for marine or terrestrial archaeological resources and provided that identified archaeological resources are avoided by a sufficient buffer to ensure their protection during these activities, impacts to archaeological resources from the cumulative activities remain negligible to minor.

The introduction of visual elements associated with reasonably foreseeable wind energy development offshore New York, New Jersey, Rhode Island, and Massachusetts would not adversely affect the setting and integrity of historic standing structures and districts within the area of potential effect. The affected environment for onshore historic properties included a 0.25 mi (0.40 km) onshore buffer along the coastline between Ocean Grove, New Jersey, and the northeast tip of the FIIS, located in Long Island, New York. Moreover, proposed structures would be located further from shore and likely would not be discernable at these distances. As such, these visual introductions would not adversely affect either the integrity of or the characteristics of the identified historic properties that qualify them for the NRHP visual impacts remain negligible.

Given that the proposed action requires surveying for and resolution of adverse effects to cultural resources, the proposed action would result in a negligible incremental contribution when combined with the past, present and reasonably foreseeable future activities. Overall, cumulative activities considered in this analysis are anticipated to cause **negligible to minor** impacts to archaeological resources and **negligible** impacts to visual resources.

Demographics and Employment

Cumulative activities most impacting demographics and employment are activities in New York and New Jersey state waters related to site assessments, wind turbine construction and operation, hydrokinetic turbine construction, marine minerals use, dredged material disposal, and transportation at New York and New Jersey ports, and renewable energy development because they use similar types of marine crews.

The cumulative activities are anticipated to minimally affect the analysis area's demography because they would involve limited duration influx of employees or would be able to utilize existing capacity in the local workforce. Potential employment activities would have a negligible impact compared to other factors such as population growth or the status of the overall economy.

BOEM anticipates that the proposed action would have beneficial, short-term impacts to demographics and employment in the coastal counties of New York and New Jersey, but would result in an imperceptible, and thus, negligible incremental contribution when combined with the past, present and reasonably foreseeable future activities. Overall, the cumulative activities considered in this analysis are anticipated to result in **negligible** impacts to employment, population growth, age, and racial distributions compared to other factors such as the status of unforeseen national economic health or changes in regional spending.

Environmental Justice

The activities that would most affect low income and minority populations are activities in New Jersey and New York state waters related to site assessments, wind turbine construction and operation, hydrokinetic turbine construction, marine minerals use, dredged material disposal, transportation at New York and New Jersey ports, and renewable energy development because these activities are closer to onshore communities and impact local employment. No disproportionately high and adverse human health effects would occur as a result of the proposed action on minority or low-income populations. The majority of past, present, and future activities analyzed under the cumulative activities would occur offshore. Offshore activities have only minor indirect impacts on the population in the study area. The cumulative activities are projected to result in **negligible** impacts due to distance from shore and the temporary nature of the onshore activities.

Recreation and Tourism

The analysis area for recreation and tourism includes areas within 0.25 mi (0.4 km) of the coastline of Suffolk, Nassau, Queens, and King Counties in New York, and Monmouth County in New Jersey. Impacts to recreation and tourism within the study area from cumulative activities include vessel traffic restrictions in safety zones, vessel traffic, generation of trash and debris, and accidental fuel spills.

Several activities expected to occur under the cumulative impacts scenario may utilize vessel safety zones. Military range complexes and civilian space program use areas that include designated danger zones, restricted areas, and closure areas that may limit access by vessel traffic including recreational activities, during specific times or prior to/during specific activities or operations. In some instances, areas may be completely closed temporarily to all vessel traffic for military or safety reasons, and a local notice to mariners would be issued to allow for appropriate planning of an alternative route or schedule. The proposed action may add temporary vessel traffic with reduced maneuverability to avoid during construction and decommissioning and site characterization surveys. There are no significant impacts evident from the cumulative activities scenario for an exclusion zone.

Vessel operators are required to comply with USCG (33 CFR 151.51-77) (BOEM 2014a); only accidental loss of trash and debris is anticipated. Within the cumulative activities scenario, the operation of survey vessels presents the potential additional debris. However, with the protective measures in place for commercial vessel operating offshore to minimize trash and debris discharges offshore, and based on the types of debris typically found along beaches, it is expected that more than 80 percent of trash is not generated from the activities included in the cumulative activities (CCC, 2016). Because there are no significant impacts evident from the cumulative activities scenario, it is expected that the impacts associated with proposed action would result in an extremely small incremental increase.

A significant amount of vessel traffic is expected to occur under the cumulative activities, including high levels of vessel activity associated with shipping and marine transportation around ports along the U.S. Eastern Seaboard. Military operations and commercial and recreational fishing activity would also contribute to overall vessel activity. All vessel movements are associated with a risk of collision and subsequent loss of fuel. Spill effects on recreational resources, as well as spill response vessel operations, would have a direct but limited effect on recreational activities given the small volume and distance from shore. The increased risk of spill due to the proposed action is small.

The majority of the safety zones for the cumulative activities and projects identified in Section 4.7.1 are farther offshore than most recreational activity. Additionally, the majority of safety zones are for a limited amount of time. Best management practices for minimizing marine debris are in place and fuel spills are expected to be limited. The proposed action would result in a negligible incremental contribution on impacts to recreation and tourism when combined with the past, present and reasonably foreseeable future activities, and overall cumulative activities considered in this analysis are anticipated to cause **minor** impacts to recreation and tourism.

Commercial and Recreational Fisheries

The analysis area for recreational fisheries is the waters offshore New York and New Jersey, the New York WEA and the waters surrounding the WEA. This geographic area is home to substantial recreational fishing activities and the WEA is adjacent to and overlaps with some recreational fishing activity (Figure 4–23). The major recreational fishing areas along the south coast of Long Island are roughly 10 to 25 nm (19-46 km) from the WEA (Figure 4–8 and 4–23). In response to comments from NMFS, BOEM has removed Cholera Bank from lease consideration, greatly reducing overlap with this sensitive benthic habitat and recreational fishing area.

The overall analysis area for commercial fisheries is the Mid-Atlantic Bight from Cape Cod to Cape Hatteras. As described in Section 4.4.3.5, there are several fisheries that overlap spatially and temporally with the proposed action. BOEM determined that the commercial fisheries that use the area the most are the Atlantic sea scallop and the squid, mackerel, and butterfish fisheries, with other species of commercial importance having distributions that overlap the WEA including monkfish, Atlantic herring, black sea bass, summer flounder, scup, and ocean quahog. The scallop fleet accesses the waters overlapping with the New York WEA year round, with slightly more trips occurring in winter months. Although the entire New York WEA is used as a squid fishery, the primary area fished by the squid fleet is in waters less than 16 fathoms (30 m) closer to Cholera Banks (Figure 4-9). The squid fishery operates in and around the New York Call Area primarily between June and September, and is highly variable regarding where the squid will occur and where they will be caught.

Impacts to commercial and recreational fisheries within the analysis area from cumulative activities include anthropogenic noise in the ocean, vessel traffic, seafloor disturbance, increased potential for accidental fuel spills, increased vessel discharge of trash and debris, and direct mortality to marine fauna.

The cumulative impact to fishing from underwater noise concerns the availability and catchability of fish as a result of underwater noise exposure. There is no evidence of ambient noise levels approaching a threshold level where fisheries might be significantly affected. However, fisheries could experience reduced catchability and availability of fish from the installation of meteorological towers and/or meteorological buoys from Virginia to Massachusetts in support of offshore wind and the potential construction of the Cape Wind project, the Atlantic City Wind Farm, and the Virginia Offshore Wind Technology Advancement Project (Section 4.7.1.1). In addition, reduced catchability and availability of fish could occur due to surveys in support of offshore wind (Section 4.7.1.1). However, it is highly unlikely that foreseeable activities would overlap temporally and/or spatially in a way that would appreciably diminish fishing revenue. In the highly unlikely case that spatial and temporal overlap of the aforementioned activities occurs, NMFS data indicates that between 2007 and 2012 only 1.5 percent of average commercial fisheries revenue was sourced from the Massachusetts, Rhode Island/Massachusetts, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina WEAs (Kirkpatrick et. al. 2015). Thus, it is expected that there would be a minor incremental decrease in the availability and catchability of fish resulting from active acoustic sound disturbances from cumulative activities. This is primarily expected to occur in hook and line fisheries, such as the recreational fishery and commercial charter/for-hire fisheries.

BOEM has issued 10 offshore wind energy leases between Massachusetts and Virginia. These leases may be reasonably expected to result in the placement of up to 9 meteorological buoys or meteorological towers from Massachusetts to Virginia, and the construction of up to 130 offshore wind turbines in Nantucket Sound as part of the Cape Wind offshore wind energy project. These installations will result in some navigational obstructions in the areas where they are placed. However, the number of buoys and towers that could be installed is not expected to result in a significant increase in hazards to fishing operations, taking into account the number of existing navigational hazards on the OCS, including existing shipwrecks, navigational buoys, and towers (observational towers/lightships). Incremental impacts to commercial fisheries arising from the presence of such structures are expected to be negligible.

Spill effects on commercial fishes, as well as spill response vessel operations, could have a direct effect on commercial fishing operations. However, a large-scale spill response involving multiple vessels is not expected from the cumulative activities. Therefore, the anticipated incremental impacts to commercial fisheries activities associated with a fuel spill from vessels under the cumulative activities would be negligible.

Federal commercial and recreational fishing regulations will continue to result in constrained fishing effort. However, these constraints are intended to ensure that a sustainable biomass is available for the fishery on an annual basis. Neither the longfin squid nor the Atlantic sea scallop fisheries are currently overfished, therefore it is not anticipated that fishing regulations will further restrain fishing harvest and thus socio-economic impacts. In September 2016, NMFS released for public comment Amendment 16 to the Atlantic Mackerel, Squid, and Butterfish FMP. This amendment is principally to adopt measures to protect deep-sea coral from impacts to fishing gear. Using the same fishing revenue data as BOEM used in the WEA exposure analysis, NMFS estimated that between 19 and 24 percent of squid revenue (primarily shortfin squid) could be impacted, depending on the alternative selected. The EA states that in combination across designations and gear alternatives, the overall magnitude of the direct and indirect impacts to fishing operations resulting from the implementation of broad coral zones with bottom fishing restrictions likely ranges from neutral to moderately negative, depending on the range of current operations and ease of redistributing effort for a given fishery. If additional fishing restrictions were to be implemented through FMP amendments the impacts would be evaluated by NMFS at that time. NMFS further states that through federal consultation provisions of the Magnuson-Steven Act, it can work to minimize the extent and magnitude of indirect impacts those actions could have on human communities. Regarding scallops, as scallop access area trips set under the provisions of the fishery management plan become reduced due to the rotational harvest management, or those areas closed entirely to allow biomass to increase, areas such as the proposed lease area could experience additional fishing pressure.

The proposed action would result in a minor incremental contribution when combined with the past, present and reasonably foreseeable future activities, and overall cumulative activities considered in this analysis are anticipated to cause **negligible** to **moderate** impacts depending on the fishery and activity.

Visual Resources

The analysis area for visual resources includes a 27 mi (43 km) buffer around the WEA, cropped at 0.25 mi (0.4 km) inland from the shoreline (Figure 4–27). The 27 mi (43 km) buffer was selected because this height represents the distance at which the tip of a meteorological tower measuring 394 ft (120 m) would drop below the horizon, thereby precluding any potential view of the structure. The onshore analysis area was restricted to within 0.25 mi (0.4 km) of the shoreline based on the likelihood for potential views of the project area to be blocked by vegetation, buildings, or other structures. This area includes portions of Long Island, New York, and New Jersey.

The landscape character of the analysis area is a combination of beaches, communities, and industry. In general, the seascape appears large in scale, panoramic, and dominated by the broad horizontal plane of the Atlantic Ocean. Dominant colors in the landscape include the varied blue tones of the ocean and sky, the pale tan of the sandy beach, and the greens of upland vegetation. The horizon appears pale tan/white as a result of the atmospheric haze and sea spray. No major structures exist on the horizon, though commercial and recreational boat traffic is common.

Impacts to visual resources from cumulative activities identified in Section 4.7.1 are expected to occur primarily from increased vessel traffic, and changes to the viewshed resulting from installation of a meteorological tower (a buoy would not be seen from shore) or wind turbines. In general, the majority of these cumulative activities would not likely be visible from the shoreline due to their distance and the likelihood vessels would be below the horizon. The proposed action would result in a negligible incremental contribution when combined with the past, present and reasonably foreseeable future activities. The introduction of visual elements associated with reasonably foreseeable wind energy development and increased vessel traffic from the cumulative activities discussed in Section 4.7.1 are expected to result in **minor** cumulative effects to viewsheds offshore New York, New Jersey, Rhode Island, and Massachusetts.

4.7.2.4 Conclusion

The hallmark of the affected environment considered in this EA is one of past, present, and foreseeable human-induced impacts over an extended period of time. The incremental contribution of the proposed action and alternative to other past, present, and reasonably foreseeable actions that may affect the environment would be **negligible to moderate**. Based on the foregoing information and the scope of this analysis, the proposed action would not result in a significant incremental contribution to cumulative effects on any resources discussed in this EA. In addition, the proposed action and alternative would facilitate the collection of meteorological, oceanographic, and biological data for the environment offshore New York.

5 CONSULTATION AND COORDINATION

This section discusses public involvement in the preparation of this EA, including BOEM's responses to public comments; formal consultations; and cooperating agency exchanges.

5.1 Public Involvement

5.1.1 Notice of Intent

On May 28, 2014, BOEM published the NOI to prepare an EA for the *Commercial Wind Leasing and Site Assessment Activities on the Atlantic OCS Offshore New York* in the *Federal Register* (79 FR 30643). Input on issues and alternatives to be analyzed in the EA were solicited, with BOEM accepting comments until July 14, 2014. During the 45-day comment period, BOEM received 30 comments from the government (state and federal), non-governmental organizations (NGOs), private citizens, companies, and a university. Several of the commenters, including the Marine Mammal Commission, NJDEP, Oceana, the Natural Resources Defense Council, and Clean Ocean Action (COA) raised concerns about the effects of noise on the seasonal residency and migratory patterns of the NARW. Commenters also identified other issues of concern they would like to see analyzed/addressed in the EA, including:

- The potential harmful effects of wind power generation on birds and other fauna that depend upon the offshore ecosystem;
- The impacts of proposed action on endangered marine mammals and sea turtles, benthic marine life and habitat, protected fish species and EFH, commercial and recreational fishing, the economy, and navigation safety and vessel traffic;
- Coordinating with relevant federal, state, and local agencies throughout the environmental review process; and
- Incorporating mitigation efforts in a lease agreement.

The comments can be viewed at http://www.regulations.gov by searching for docket ID BOEM-2014-0003.

5.1.2 Notice of Availability and Public Meetings

On June 6, 2016, a Notice of Availability (NOA) for review of the EA was published in the *Federal Register* (81 FR 36344). Comments on the EA were initially solicited for 30 days following publication of the NOA. In response to stakeholder requests, BOEM extended the public comment period by an additional 7 calendar days from the original comment deadline of July 6, 2016, to the extended deadline of July 13, 2016. All public comments received by BOEM can be viewed at http://www.regulations.gov by searching for docket ID BOEM-2016-0038.

During the comment period, BOEM held five public meetings to provide an overview of the EA, solicit public comment, and discuss next steps in the environmental and leases processes. Meetings were held in June 2016 at the following locations:

- Monday, June 20, 2016
  Long Branch Middle School (Auditorium)

404 Indiana Avenue, Long Branch, New Jersey 07740
6:00- 8:00 p.m.

- Tuesday, June 21, 2016
  Hofstra University (Plaza Room)
  900 Fulton Avenue, Hempstead, New York 11549
  6:00- 8:00 p.m.

- Wednesday, June 22, 2016
  Westhampton Beach Elementary School
  379 Mill Road, Westhampton Beach, New York 11978
  6:00- 8:00 p.m.

- Thursday, June 23, 2016
  University of Rhode Island, Narragansett Bay Campus
  Coastal Institute Building (Hazard Rooms A & B)
  215 S Ferry Road, Narragansett, Rhode Island 02882
  6:00- 8:00 p.m.

- Monday, June 27, 2016
  Waypoint Event Center at Fairfield Inn & Suites
  Sea Loft Room
  185 MacArthur Drive
  New Bedford, Massachusetts 02740
  6:00 - 8:00 p.m.

More information on these meetings is available on BOEM's website at: http://www.boem.gov/New-York-Environmental-Assessment-Public-Meetings/. In addition to these BOEM-led information sessions, BOEM also notified the Mid-Atlantic Fishery Management Council (MAFMC)[28] and the New England Fishery Management Council (NEFMC)[29] of the NOA of the EA during their scheduled public meetings, and solicited comments. The Atlantic States Marine Fisheries Commission (ASMFC)[30] was notified that the EA was forthcoming, but not yet available. The meetings are listed below:

[28] See http://www.mafmc.org/briefing/june-2016 for meeting details.

[29] See http://www.nefmc.org/calendar/june-2016-council-meeting for meeting details.

[30] See www.asmfc.org/files/Meetings/2016SpringMtg/2016SpringMeetingSummary.pdf for meeting details.

- Wednesday, May 4, 2016
  Atlantic States Marine Fisheries Commission Spring Meeting
  The Westin Alexandria
  400 Courthouse Square
  Alexandria, Virginia 22314
- Monday, June 13, 2016
  Mid-Atlantic Fishery Management Council June Council Meeting
  University of Delaware – Clayton Hall
  100 David Hollowell Drive
  Newark, Delaware 19716
- Tuesday, June 21, 2016
  New England Fishery Management Council June Meeting
  Holiday Inn by the Bay
  88 Spring Street

  Portland, Maine 04101

BOEM considered public comments on the EA in determining whether to issue a Finding of No Significant Impact, or conduct additional analysis under NEPA (i.e., prepare a revised EA).

5.1.3 Summary of Public Comments Received on the Environmental Assessment

BOEM received a total of 62 submittals from a variety of sources including private citizens, federal and state agencies, NGOs, and industry. NGOs include environmental groups, trade associations, businesses, and universities. Submittals included letters, emails, comment cards, comments made to a court reporter at the five public meetings, and comments made during open discussion section of the public meetings. BOEM reviewed each submittal and identified 298 discrete comments within the 62 submittals.

Table 5–1 provides an overview of the stakeholders who submitted comments along with their affiliation, type of organization, residence, and how many comments BOEM identified within each submittal. Some commenters sent multiple submittals. In these cases, BOEM analyzed each submittal separately. The majority of commenters were private citizens (23), followed by environmental groups (8), federal agencies (7), trade associations (5), businesses (4), state agencies (4), universities (2), and federal organizations (1).

Table 5–1
List of Commenters and their Affiliation

From	Affiliation	Type of Organization	Residence[31]
Rebecca Lent	Marine Mammal Commission	Federal Agency	Bethesda, MD
Richard Robbins, Jr.	Mid-Atlantic Fisheries Management Council (MAFMC)	Federal Agency	Dover, DE
John K. Bullard	National Marine Fisheries Service (NMFS)	Federal Agency	Gloucester, MA
Frank Hays	National Park Service (NPS)	Federal Agency	Philadelphia, PA
B.L. Black	U.S. Coast Guard (USCG)	Federal Agency	Boston, MA
Grace Musumeci	U.S. Environmental Protection Agency (EPA)	Federal Agency	New York, NY
David A. Stilwell	U.S. Fish and Wildlife Service (USFWS)	Federal Agency	Cortland, NY
David E. Pierce	Massachusetts Division of Marine Fisheries (MADMF)	State Agency	Boston, MA
John Gray	New Jersey Department of Environmental Protection (NJDEP)	State Agency	Trenton, NJ
Jason McNamee	Rhode Island Department of Environmental Management (RIDEM), Division of Fish & Wildlife / Marine Fisheries	State Agency	Jamestown, RI
Sandra Allen	State of New York Department of State	State Agency	Albany, NY
George Povall	All Our Energy	Environmental Group	Point Lookout, NY
Willett Kempton, Jonathan Buonocore	Center for Carbon-free Power Integration, University of Delaware	University	Newark, DE

[31] Residence is based on information provided by the commenter. Commenters who attended the public meetings and did not provide a residence were assigned the attended meeting location as a residence.

From	Affiliation	Type of Organization	Residence[31]
Adrienne Esposito	Citizens Campaign for the Environment	Environmental Group	Farmingdale, NY
Zachary Lees	Clean Ocean Action (COA)	Environmental Group	Highlands, NJ
David E. Frulla, Andrew E. Minkiewicz, Anne E. Hawkins	Kelley Drye & Warren LLP on behalf of Fisheries Survival Fund	Trade Association	Washington, DC
Edward Kelly	Maritime Association of the Port of New York and New Jersey	Trade Association	New York, NY
Diane Pleschner-Steele, Marjorie Orman and Jim Gutowski, Greg DiDomenico, Sean Martin, Bonnie Brady, Robert Vanasse, Jerry Schill, Glenn Reed, Eric Reid, Bob Jones, Lori Steele	National Coalition for Fishing Communities	Trade Association	Washington, DC
Katherine Kennedy, Priscilla M. Brooks, Catherine Bowes, Lisa Dix	Natural Resources Defense Council (NRDC), the Conservation Law Foundation (CLF), the National Wildlife Federation (NWF), the Sierra Club	Environmental Groups	Washington, DC
Thomas Nies	New England Fishery Management Council (NEFMC)	Federal Organization	Newburyport, MA
Michael J. Livingstone	Nordic Fisheries, Inc.	Business	New Bedford, MA
Gordian Raacke	Renewable Energy Long Island	Environmental Group	East Hampton, NY
Meghan Lapp	Seafreeze Ltd	Business	North Kingstown, RI
Kylie Campanelli	Sierra Club	Environmental Group	Westhampton, NY
Jim Brown, Susan Elbin	South Shore Audubon Society, New York City Audubon	Environmental Group	Freeport, NY
Stephanie McClellan	Special Initiative on Offshore Wind (SIOW), University of Delaware	University	Newark, DE
Shannon Rusing	Texas Oil & Gas Association	Trade Association	Austin, TX

From	Affiliation	Type of Organization	Residence[31]
Katie Almeida	The Town Dock	Business	Narragansett, RI
Mary O' Rourke	Trawlworks, Inc.	Business	Narragansett, RI
Howard Rosenbaum, Melinda Rekdahl, Ricardo Antunes, Merry Camhi, Paul L. Sieswerda, Arthur Kopelman	Wildlife Conservation Society, Gotham Whale, Coastal Research and Education Society of Long Island (CRESLI)	Environmental Group	Bronx, NY
Douglas Schneider	World Shipping Council	Trade Association	Washington, DC
Bonnie Brady	Citizen	Private Citizen	Westhampton, NY
John Burke	Citizen	Private Citizen	Hempstead, NY
Ruth Cohen	Citizen	Private Citizen	Great Neck, NY
Harriet Didriksen	Citizen	Private Citizen	Narragansett, RI
Jim Gutowski	Citizen	Private Citizen	Long Branch, NJ
Christopher Hammer	Citizen	Private Citizen	Long Branch, NJ
John Haran	Citizen	Private Citizen	Narragansett, RI
Ernest Harsch	Citizen	Private Citizen	Huntington Station, NY
Steve Hopkins	Citizen	Private Citizen	Rye, NY
Edith Kantrowitz	Citizen	Private Citizen	Brooklyn, NY
Julie Lofstad	Citizen	Private Citizen	Westhampton, NY
Arthur Ochse	Citizen	Private Citizen	Long Branch, NJ
Kevin O'Keefe	Citizen	Private Citizen	East Meadow, NY
Anne Ostling	Citizen	Private Citizen	Hicksville, NY
Elaine Peters	Citizen	Private Citizen	Hicksville, NY
Benjamin Riggs	Citizen	Private Citizen	Newport, RI
Jerry Rivers	Citizen	Private Citizen	Roosevelt, NY
Elizabeth Sabatini	Citizen	Private Citizen	Hempstead, NY
Luciano Sabatini	Citizen	Private Citizen	Massapequa, NY

From	Affiliation	Type of Organization	Residence[31]
Ronald Shrader	Citizen	Private Citizen	New Bedford, MA
Nancy Solomon	Citizen	Private Citizen	Hempstead, NY
Joseph Tonini	Citizen	Private Citizen	Mineola, NY
Brien Weiner	Citizen	Private Citizen	Valley Stream, NY

The sections below include a summary of the comments BOEM received during the public comment period on the EA, as well as BOEM's responses. Changes to the EA made in response to comments have been noted. Comments were received from individuals, resource agencies, and non-governmental organizations.

BOEM received a number of comments regarding concerns or requests to analyze the potential impacts of the installation, construction, and operation of a commercial scale offshore wind facility offshore New York. These topics include, but are not limited to: (1) electromagnetic fields, (2) noise, (3) displacement of species, (4) vessel strikes, (5) human health, (6) aircraft and sea navigation safety, (7) fuel spills, (8) outreach and consultations, (9) cumulative effects, (10) long term planning, (11) a segmented NEPA process, (12) bottom disturbance, and (13) compensatory mitigation funds for damage to fish habitat, fishing vessels/gear, and/or operator revenues.[32] As discussed in Sections 1.4.2 and 4.7.1.1, these activities are outside the scope of the analysis of this EA. Additional analyses under NEPA would be required before any future decision is made regarding construction of a wind energy facility in the New York WEA. Such comments have been noted and will be considered for future decisions.

Other comments outside the scope of this EA include requests for additional studies and utilization of a regional ocean planning approach. Though these comments are not addressed in this EA, BOEM is taking them into consideration for future planning and permitting.

BOEM received several comments in support of, or opposition to, particular alternatives or general development of offshore wind. Some comments addressed the offshore wind industry as a whole, while others were specific to offshore wind development in the New York WEA. Commenters referenced climate change, the need for clean energy, beneficial economic impacts, and the efficacy of mitigation and monitoring as reasons for supporting offshore wind energy. Some of these commenters asked that BOEM expedite its leasing process. Other commenters referenced economic and environmental impacts and maintenance costs as reasons to oppose a wind energy facility in the New York WEA, or other locations on the OCS.

[32] Please note that comments on these topics that were related to site characterization and/or site assessment activities are discussed below.

Commenters expressing support for Alternative A asserted it would be most appropriate to develop site specific setback distances based on a site’s unique characteristics, and expressed concern about the validity of the information used in developing the larger setback distances in USCG’s MPGs for navigation. Commenters supporting Alternative B expressed a preference for the setback distances outlined in USCG’s MPGs. These commenters also argued that under Alternative B, lighting from a meteorological tower would be less likely to be visible from NPS-managed lands, asserting that Alternative B would reduce overlap with known fishing areas and Cholera Bank, and recommended that the EA incorporate analysis of these benefits. Some commenters also supported Alternative C, the no-action alternative, asserting conflicts with major commercial fisheries. These comments will be considered in BOEM’s decision-making process.

Several comments resulted in minor additions, corrections, and clarifications to Sections 1, 2, 3, and 4, and Appendix B of the EA. Such changes to the EA include, but are not limited to, the following:

- Section 2.5 of the EA was updated to clarify that "exclusion zones" in that section refer to BOEM's responsibilities to protect marine mammals.
- In Section 3.2.4, the basis of the assumption that vessels would use a larger staging port for site assessment was clarified.
- It was clarified in Section 4.5 that because scope of the activities under Alternative B would occur within the same geographic area as those described in Section 4.4 for Alternative A the affected environment described under Alternative A is effectively the same as the affected environment for Alternative B. While the affected environment for Alternative C includes the affected environment described under Alternative A in Section 4.4 and within the cumulative analysis in Section 4.7.2.
- Section 4.4.1.1 of the EA was updated with the latest NAAQS information, emissions calculations were adjusted with improved trip estimates, and additional text was added to further clarify the requirement to follow all state and local emissions regulations during onshore operations.
- Section 4.4.2.8 of the EA was updated to include the Atlantic sturgeon Carolina DPS and mislabeled Atlantic sturgeon DPS references in Section 5.3.1.2 were corrected.
- Section 4.7.1.3 of the EA was updated to describe expected activities of the Poseidon Transmission Project and the proposed Northeast Supply Enhancement Project. BOEM also updated the status of potential activities related to its OCS wind energy leases.
- Section 4.7.1.4 of the EA was updated to clarify that the WEA does not overlap potential sand borrow areas, including those identified by NJDEP.
- Section 5.3.2 of the EA was updated to reflect the status and outcomes of government consultations.

The comments received, BOEM’s responses, and any applicable changes to the EA are summarized below.

5.1.3.1 Commercial Fisheries

Commercial Fisheries: Alternatives and NEPA Process

Summary of Comments Received on Commercial Fisheries: Alternatives and NEPA Process

NMFS, COA, and several fishing industry entities recommended that BOEM consider an alternative to remove areas that they consider to pose the greatest conflict with commercial fisheries.

The Fisheries Survival Fund (FSF) asserted that the EA improperly incorporated by reference BOEM's 2014 G&G Final PEIS. The FSF alleged that the PEIS did not adequately address scallops and did not evaluate the impacts to invertebrate fishery resources because it was focused on a geographic area south of the New York WEA.

The FSF also asserted that BOEM was deferring consideration of the relevant environmental impacts of a meteorological tower on the scallop resource until it receives a SAP, and that doing so violated NEPA. The FSF argues that the EA fails to consider impacts of tower placement and requirements to exclude such towers from certain areas, and that the EA generally does not provide the level of detail required to obtain public input and analyze the relevant issues.

BOEM Response to Comments on Commercial Fisheries: Alternatives and NEPA Process

BOEM is required to identify reasonable alternatives to the proposed action that will avoid or minimize adverse effects associated with the proposed action (40 CFR 1500.2(e)). For this EA, the proposed action is lease issuance (survey work) and approval of site assessment activities (construction and installation of a meteorological tower and/or buoys). Given the short duration and limited scope of the proposed action, the mobile nature of commercial fishing, and the minor anticipated impacts as discussed in Section 4.4.3.5, BOEM has determined that an alternative for removing areas to reduce conflicts with commercial fishing is not reasonable under the proposed action.

In the June 2016 EA, BOEM explained in Section 2.4 why additional alternatives regarding impacts to fishery resources from site characterization and site assessment activities were not considered in the EA. Section 4.4.2.7 of the EA contains the results of scallop resource assessment surveys that show variability of scallop occurrence between survey stations and areas of low scallop density. These surveys show that that numerous locations within the proposed lease area could support the placement of a meteorological tower without significantly impacting the scallop resource in the area. This information will be further verified before BOEM authorizes construction of a meteorological tower, as BOEM will review a lessee's SAP and may impose terms and conditions, as necessary, to minimize or avoid impacts to fishery resources. Therefore, BOEM believes it is unnecessary to analyze an alternative that would exclude large portions of the proposed lease area from leasing due to potential impacts to the scallop resource from meteorological tower installation.

BOEM acknowledges the FSF's concerns about the impacts of meteorological tower placement on scallop resources. However, BOEM disagrees that these impacts were not assessed in the EA, and that the impact assessment to scallop resources from site assessment and site characterization was deferred until the submittal of a SAP. BOEM addresses comments regarding the impacts of meteorological tower construction on habitat, including scallop habitat, in the comments in the benthic habitat section below (5.1.3.2) and in Sections 4.4.2.3 and 4.4.2.7 of the EA. The EA clarifies that there would be negligible to minor impacts to the scallop resource from site assessment activities.

As explained in Section 1.4.1 of the EA, although the geographic area evaluated in the G&G Final PEIS does not cover the area proposed for lease offshore New York, the 2014 G&G Final PEIS evaluated the survey activities proposed in this EA, as well as impacts to similar resources. Consequently, the G&G Final PEIS scenario of impact-producing factors and the types of impacts that may result from G&G surveys is applicable to the New York WEA and surrounding areas. Therefore, BOEM believes that it appropriately incorporated by reference the relevant portions of the G&G Final PEIS into this EA.

Changes to the EA Related To Comments on Commercial Fisheries: Alternatives and NEPA Process

BOEM has reduced the proposed lease area by 2 percent due to sensitive bottom habitat associated with Cholera Bank (Section 2.1). Although this reduction was not made in response to fisheries impacts concerns, it has the effect of reducing the estimated overlap with the squid fishery by 8 percent and all fisheries by 7 percent based on data from 2007-2012 (Section 4.4.3.5).

Section 1.4.1 of the EA to explains BOEM's rationale for incorporating the G&G Final PEIS into this analysis. BOEM also updated Section 4.4.2.7 (Figures 4–17a & 4–17b) to provide additional information regarding the occurrence of scallop resources. More broadly, Sections 2.4, 4.4.2.3, 4.4.2.7, 4.4.3.5, 4.7.2.1, and 4.7.2.3 of the EA have been revised to include additional and updated information regarding potential impacts to scallop resources from the proposed action. Although not in response to a specific comment, the impact to commercial fisheries from bottom disturbing activities was changed from negligible to minor and the impact of bottom disturbing activities to recreational fisheries was changed from minor to negligible (Section 4.4.3.5). These impact levels were incorrectly transposed within the same sentence in the previous version of this document. As the supporting paragraph indicates, the higher level of impacts from bottom-disturbing activity is associated with shellfish, such as scallops, which is a commercial fishery.

Commercial Fisheries: Planning and Outreach

Summary of Comments Received on Commercial Fisheries: Planning and Outreach

Several commenters (e.g., NEFMC; MAFMC; National Coalition for Fishing Communities; and the Commonwealth of Massachusetts Division of Marine Fisheries [MA DMF]) stated that they are not opposed to offshore wind, but believe that BOEM's process limits the ability of stakeholders to provide meaningful input. MAFMC asserted BOEM should utilize a regional ocean planning approach for a more integrated stakeholder process conducted at a regional scale.

Several commenters from agencies (i.e., NMFS, MAFMC), businesses (e.g., The Town Dock and Seafreeze Ltd.), and local citizens stated that the New York WEA is heavily relied upon by fishermen from surrounding states (New York, New Jersey, Rhode Island, and Massachusetts) and asserted that they were not adequately consulted during the Area ID process and that their views were not adequately considered. These stakeholders asserted that the New York WEA has a regional significance to the industry, and that BOEM's outreach should include states beyond New York and New Jersey, and their respective fisheries management councils.

Commenters encouraged BOEM to work closely with the fishing industry throughout future steps of the wind energy development process and ensure potential lessees are aware of conflict with commercial fishing industry prior to moving forward with planning for large scale development. Seafreeze expressed concern that BOEM does not require its lessees to engage with the fishing community.

BOEM Response to Comments on Commercial Fisheries: Planning and Outreach

BOEM acknowledges fishing concerns and believes that fishing and offshore wind energy development can be coordinated to reduce potential impacts to commercial fishing. BOEM takes public outreach, especially outreach with fisheries stakeholders, very seriously. In the eight months between November 2015 and June 2016, BOEM held eight public meetings, and attended three fisheries management council/commission meetings regarding the New York area ID and EA. Fisheries groups also had the opportunity to attend and publicly comment at each of the four New York Intergovernmental Renewable Energy Task Force Meetings held between November 2010 and April 2016. For the eight public meetings, the locations were often chosen for their proximity to known fishing ports with landings from the New York WEA and fishing stakeholder input (see Sections 1.6.4 and 5.1.2 for meeting details). BOEM has also established a Fishing Industry Stakeholder webpage (http://www.boem.gov/Atlantic-Fishing-Industry Communication-and-Engagement/) to better communicate the status of Atlantic renewable energy projects.

On a programmatic level, BOEM continues to promote dialogue between fishermen and the offshore wind energy industry in order to develop best management practices to avoid or minimize impacts. In conjunction with Virginia, BOEM co-funded and participated in the Collaborative Fisheries Planning for Virginia's Offshore WEA (www.boem.gov/VWEA-Final-Report) which established a process for the two-way exchange of information with potentially impacted fishing communities. In the Mid-Atlantic Regional Ocean Action Plan, BOEM supported the inclusion of enhancing "BOEM engagement of fishing industries through improved data and specific interactions" as an action item for the Agency (Mid-A RPB, 2016).

As the New York leasing process moves forward, BOEM will continue outreach with stakeholders through BOEM's stakeholder email list, website updates, and public notices and meetings. BOEM aims to reach fishermen and stakeholders throughout the region by continuing to engage with fisheries management councils and commissions via regular project updates to the full Council/Commission, or appropriate committees thereof. BOEM will also remain engaged with state agencies through advisory and working groups established by the states. This engagement will continue throughout the subsequent phases of the decision-making process. BOEM will also continue to collect, verify, and validate data regarding fisheries usage of the area as it become available.

BOEM will also include in its Final Sale Notice language advising bidders of potential space use conflict with the fishing industry. If a lease is issued, the lessee may propose a commercial wind facility through the submission of a COP. The COP would include information that the lessee has gathered about the area, including fisheries usage and corresponding economic information. BOEM will conduct a project-specific NEPA analysis, likely an EIS, on the COP (Section 1.1.1). During the formal scoping period for a NEPA document, BOEM hosts public scoping meetings to verify environmental and socio-economic information, and to gather additional input on issues, alternatives, and mitigation measures to be considered. BOEM then holds a second public comment period during which BOEM seeks comments on its draft NEPA document, concurrently hosting additional public meetings.

BOEM believes in the importance of regular communication between lessees and the fishing industry. Accordingly, BOEM issued guidance to lessees in October 2015 regarding best practices for engaging in outreach with fisheries to acquire data to meet the information requirements for SAPs, COPs, and GAPs. For the New York lease sale, BOEM will add a lease stipulation in Addendum C of the New York lease, requiring the lessee to develop a publicly available FCP that describes the strategies that the lessee intends to use for communicating with fisheries stakeholders prior to and during activities in support of the submission of a plan. The FCP must include the contact information for an individual retained by the lessee as its primary point of contact with fisheries stakeholders (i.e., Fisheries Liaison). If the lessee develops a project website, the FCP must be posted on the lessee's project website. If the lessee does not develop a project website, the FCP must be made available to BOEM and the public upon request. BOEM hopes that this requirement will encourage the lessee to consider their fisheries outreach strategy at an early stage of project development, and result in fisheries concerns being addressed in the lessee's survey plans, construction plans, and project design.

Changes to the EA Related to Comments on Commercial Fisheries: Planning and Outreach

Sections 1.6.4 and 5.1.2 of the EA were updated to fully describe public outreach that BOEM has already conducted. A description of additional opportunities for public involvement after a COP is received was added to Section 1.1.1. Any future meetings will be announced on BOEM's website and through a note to stakeholders.

BOEM added language on the role of the fishery liaison in coordinating survey activities throughout the EA, and specifically in Section 4.4.3.5. Additionally, BOEM added more information to Section 4.4.3.5 regarding BOEM's October 2015 guidance to developers regarding consultation with the fishing industry in order to fulfill regulatory obligations.

Commercial Fisheries: Fisheries Data

Summary of Comments Received on Commercial Fisheries: Fisheries Data

BOEM received comments from state and Federal agencies (i.e., MADMF, NMFS, MAFMC, NJDEP, and NEFMC) and the fishing industry asserting that the EA relied on insufficient or inconsistent fisheries data. Three of the comments received in this subcategory related to scallops and squid. The FSF argued that the EA considers little of the available information on both the scallop biological resource and fishery operations in the area, and that the EA fails to evaluate the impacts of several aspects of the proposed action to the scallop fishery. The FSF asserts that BOEM made no efforts to obtain further information on the impacts of the proposed action to the scallop resource, and has failed to acknowledge data uncertainties.

Several commenters claimed that the information in the EA on resource conditions and fisheries operations was out of date, and recommended the inclusion of updated information.

MAFMC stated other commercially important fisheries for this area may include mackerel, butterfish, Atlantic surfclam, and ocean quahog. NEFMC advised adding the skate and small mesh multispecies fisheries to harvesting in the New York WEA. NEFMC also recommended that BOEM take into account data on the number of trips or days fished in the area to better represent fishing effort in the area.

NEFMC suggested that BOEM analyze whether the WEA is likely to increase or decrease in importance to various fisheries over time. In addition, they urged BOEM to consider variation in fishing activity over time, noting that some fishery resources are naturally variable in their distribution; for instance, NEFMC and the FSF asserted that patterns of effort in the scallop fishery are strongly influenced by the rotational management system.

BOEM Response to Comments on Commercial Fisheries: Fisheries Data

In response to comments on the EA, BOEM obtained additional scallop resource assessment information for the New York proposed lease area from the Virginia Institute of Marine Science (VIMS). The VIMS scallop assessment work collected data in the WEA in 2011 and 2014. However, as described in Section 4.4.2.7, the additional data does not change BOEM's impacts analysis for the scallop resource due to the proposed action.

Changes to the EA Related to Comments on Commercial Fisheries: Fisheries Data

In response to recommendations from NEFMC, MAFMC, and NMFS, BOEM has expanded the discussion of potentially affected fisheries and added Appendix G, which includes the revenue exposure for several more fisheries and expanded the dataset to include revenue data for 2013, 2014, and 2015 for the squid and scallop fisheries. Appendix G also describes the number of permits by gear category, which is useful in understanding the effort associated with the proposed lease area. Although this information is useful in characterizing the use of the area as a fishery, it does not change BOEM's initial analysis of the impacts from the proposed action.

BOEM updated Section 4.4.2.7 to include an analysis of relevant scallop resource information from VIMS. BOEM has added more discussion in Section 4.4.3.5 regarding other fisheries harvesting in the New York WEA, and updated Section 4.7.1, to discuss spatial and temporal scale. BOEM also updated the description of the affected environment in the EA to reflect these additions. Additionally, the cumulative impacts section of the EA has been updated to more clearly address cumulative impacts to fisheries on a spatial and temporal scale.

Commercial Fisheries: Economic Impacts

Commenters raised concerns regarding the economic impacts on commercial fishing of the proposed action and construction of an offshore wind energy facility—particularly from representatives from the scallop and squid fisheries (e.g., FSF, Trawlworks, Inc., Nordic Fisheries, Inc., Seafreeze Ltd., Town Dock, and commercial fishermen at public meetings), fisheries management councils, and fisheries-related regulatory agencies from New Jersey, Rhode Island, and Massachusetts. Most commenters did not clearly distinguish whether they asserted the economic impacts would be from the proposed action or the construction and operation of a commercial wind energy facility. Because the impacts of a commercial wind energy facility are outside the scope of this EA, BOEM will address such comments only as they pertain to site characterization and site assessment activities.

Summary of Comments Received on Commercial Fisheries: Economic Impacts

Valuation of Fisheries

Multiple commenters argued that the EA's socioeconomic impact analysis undervalues the economic importance of area for the squid industry. MAFMC stated the squid fishermen have voiced these concerns about the underrepresentation of the value of the NY area for fishing. The Town Dock questioned the validity of the NMFS socioeconomic fisheries revenue data, asserting that it did not show Rhode Island ports' dependence on the New York WEA.

Commenters argued that development of the New York WEA will heavily affect summer loligo squid catch, which would have a negative impact on that fishery and shoreside support services to the industry. They asserted that the EA's squid revenue estimate (i.e., squid caught in the lease area) was off by an order of magnitude and that the EA ignored the economic multiplier effect (i.e., the ripple effect of lower use of shoreside services if landings are reduced). Nordic Fisheries, Inc., also asserted that potential losses from its scallop fishery will also impact related on-shore businesses.

In late 2015, the Town Dock submitted data showing the lbs of squid caught, and resulting revenue from trips that fished in the New York WEA. In a comment on the EA they questioned if that data was used in the EA. Seafreeze also asserted that the 2014 squid fishing VMS charts in the Mid-Atlantic data portal show that the New York WEA contains the most concentrated squid fishing activity, which translates into economic importance.

Seafreeze Ltd. argued that it was inappropriate to compare the mortality due to the harvesting of fish to potential injury from site characterization, because fishing generates economic activity from the squid resource.

Socioeconomic Data

Seafreeze expressed concern that the NMFS socioeconomic revenue study, on which BOEM's EA analysis is based, will not be made publically available until after the comment period. Commenters asserted that the squid fishery should have been contacted earlier for their opinions regarding the economic value of the New York WEA. RIDEM commented that BOEM's November 2015 meetings about the economic value of the New York WEA should have also been held in RI and MA, instead of just in New York or New Jersey, given the use by fishermen from these homeports in these states.

The MADMF, NEFMC, and NJDEP suggested that a more fine-scale analysis of socioeconomic impacts, including more recent data, should be used in the revised EA.

Interpretation of Economic Data

The FSF argued that proceeding with a lease sale would cause severe adverse economic and social impacts to the scallop fishery, and that this concern was inadequately addressed in the EA. Seafreeze contends that if BOEM's conclusion for the EA is that impacts to commercial fishing are "minimal," this determination will be carried into future NEPA assessments.

BOEM Response to Comments Received on Commercial Fisheries: Economic Impacts

BOEM appreciates the input from stakeholders and has incorporated some additional data and provided additional clarification and analysis as appropriate for the proposed action. BOEM notes the suggestions of additional analyses to conduct if a COP for a commercial scale wind energy facility is submitted.

Valuation of Fisheries

The EA sufficiently analyzes potential impacts to the fishing industry due to the proposed action, which consists of lease issuance, site characterization, and site assessment activities (Sections 4.4.3.5 and 4.4.2.7). Future NEPA analysis would consider the impacts associated with future commercial wind facility development, such as impacts from wind turbine foundations and cable installation. As discussed in Section 1.4.2, all comments related to the impact of wind turbine construction and operation will be analyzed once project specific designs and mitigation measures are proposed.

In response to the Town Dock's comment about the data they provided BOEM, the submitted report was considered in BOEM's analysis; however, the report contained confidential business information that BOEM chose not to cite directly in the EA. Nonetheless, Section 4.4.3.5 has been updated to better describe squid fishing activity in the greater New York Bight area. Specifically, BOEM added a graphic of satellite-derived Vessel Monitoring System data in 2014 depicting both the proposed lease area and NMFS statistical area 612 (Figure 4–25).

With respect to the impacts of sound-producing activities on the economics of commercial fisheries, there is no evidence to support a seasonal restriction of sub-bottom profilers due to loss of the fishery because of the impacts of survey sounds, as stated in Section 2.4. However, this section of the EA, as well as Sections 4.4.2.7 and 4.4.3.5, has been updated to include new studies regarding the impacts of sound to squid and scallop that further support this conclusion. Lastly, BOEM revised section 2.4 to clarify that its assessment of squid mortality was tied to the impacts to the squid resource itself, and not the economic impact associated with sources of injury or mortality.

Socioeconomic Study

BOEM believes NMFS's revenue raster data is the best available data to indicate the level of fishery economic activity for a particular ocean location. NMFS and MAFMC have used the same data in Amendment 16 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (MAFMC, 2016) in assessing impacts to the squid fishery, among others, from prohibiting fishing activity around deep-water coral sites. BOEM made available the NMFS socioeconomic data used in the EA on its website in September 2015, and identified the NMFS technical paper describing how the data was generated (DePiper, 2014).

Since publishing the EA in April 2016, BOEM acquired three additional years (2013-2015) of revenue data, which has been incorporated into this EA. We believe the available data is sufficient to analyze the proposed activities covered by this EA.

Interpretation of Economic Data

BOEM believes that comments regarding interpretation of fisheries economic data are related to full build-out of the lease, and therefore out of scope for this EA. BOEM also emphasizes that a new economic analysis will be completed for any future NEPA document, should a lessee submit a COP for development of the proposed New York lease.

Changes to the EA Related to Comments on Commercial Fisheries: Economic Impact Comments

Section 4.4.3.5 of the EA was updated with three additional years of revenue data for the squid fishery; addition information is in the new Appendix G. Additionally, information was added to Section 4.4.3.5 to describe the squid industry's use of NMFS statistical area 612, which includes the New York WEA and adjacent areas.

Sections 2.4, 4.4.2.7, and 4.4.3.5 of the EA were revised to clarify that the assessment of squid mortality is tied to the impacts to the squid resource itself and not the economic impact.

Based on the facts provided in the BOEM response above, the impact determinations for commercial fisheries in this EA remain unchanged.

Commercial Fisheries: Cumulative Impacts

Summary of Comments Received on Commercial Fisheries: Cumulative Impacts

The FSF stated that the EA fails to consider cumulative impacts of the proposed action to Atlantic fisheries. In particular, the FSF asserts that the Federal management of their industry means the analysis needs to include a regional assessment of socioeconomic impacts from Massachusetts to Virginia. Additionally, the FSF argues that BOEM needs to account for the rotational management of scallops.

Seafreeze maintains that the squid fishery has become more important to Rhode Island fishermen over time, as opportunities in other fisheries, such as the groundfish, have become more limited. Seafreeze asserts that BOEM needs to conduct a more in-depth cumulative economic analysis, in addition to studying the effect on individual vessels and on-shore businesses.

MAFMC communicated squid industry arguments that "there are changes occurring in the squid fishery, which would result in revenues increasing in this area over time, and that the potential impact on future activities is not reflected in the EA." MAFMC recommends that the EA use the most recent information, considering the full breadth of available data and the changing environment, when determining the consequences of leasing the New York WEA.

BOEM Response to Comments Received on Commercial Fisheries: Cumulative Impact

As noted above, BOEM has utilized the best available science regarding commercial fishing and commercial fishing resources to describe the affected environment and assess potential impacts from the proposed action. The EA has been updated in Section 4.4.3.5 and 4.7.2.3 to reflect fishery management actions, including scallop rotational management and the proposed Amendment 16 to the Mackerel, Squid, and Butterfish FMP. These analyses cover the entire geographic scope of the fisheries and their overlap with past, present, and reasonably foreseeable future actions. These reasonably foreseeable future actions include the installation of meteorological towers and/or meteorological buoys from Virginia to Massachusetts in support of offshore wind and the potential construction of the Cape Wind project, the Atlantic City Wind Farm, and the Virginia Offshore Wind Technology Advancement Project (Section 4.7.1.1) and fishery management actions. This analysis determined that cumulative impacts to commercial fisheries are negligible to moderate. Cumulative effects from the potential future construction of a commercial scale offshore wind facility in the proposed New York lease area are out of the scope of this EA, and will be considered if and when such activities are proposed.

Changes to the EA Related to Comments on Commercial Fisheries: Cumulative Impact

Sections 4.4.3.5 and 4.7.2.3 have been updated to better reflect existing and future fishery management actions related to the proposed action.

5.1.3.2 Benthic Communities and Marine Life

Benthic Communities: Cholera Bank Habitat and Adverse Effects on Marine Life

Summary of Comments Received on Benthic Communities: Cholera Bank Habitat and Adverse Effects on Marine Life

BOEM received several comments regarding concerns about potential adverse impacts to benthic communities from site assessment activities, including physical disturbance and construction noise from meteorological tower installation. NMFS contends that Cholera Bank is a structurally complex habitat that provides important functional value to fish as shelter and refuge from predators. NMFS further asserts that "complex benthic substrates are vulnerable to disturbance, particularly due to extended recovery times (Collie et al. 2005; Bradshaw et al. 2000). During the development of any SAP, impacts to these sensitive areas should be avoided."

Seafreeze argues that BOEM failed to analyze the potential cumulative impacts of industrial construction and the resulting modification of productive benthic habitat.

Further, the COA asserts that the installation, operation, maintenance, and decommissioning of meteorological towers, and buoys anchored to the seafloor will lead to localized destruction (or at the very least, modification) of seafloor habitat and increased short-term aquatic turbidity, which may lead to either temporary or permanent displacement of benthic marine life. Both NMFS and COA request that BOEM avoid, reduce, or mitigate such impacts as much as possible.

BOEM Response to Comments on Benthic Resources: Cholera Bank Habitat and Adverse Effects on Marine Life

BOEM acknowledges concerns regarding adverse effect to fish and invertebrates from the proposed activity, particularly from noise and physical habitat disturbance. In response to comments, BOEM removed five aliquots, comprising the Cholera Bank area, from leasing consideration in the EA due to concerns of site assessment activities impacting the structurally complex sensitive bottom habitat of Cholera Bank as identified by NMFS. BOEM has incorporated additional information from the northeast and mid-Atlantic regional data portals describing the habitat in the proposed lease area, and added the results of recent studies on the effects of sound to squid and scallops. However, there is no new information that would lead BOEM to believe that any of the proposed activities would have any effect to these resources exceeding the negligible to minor impacts. Regarding the cumulative effect of the proposed action to fish habitat, BOEM has revised section 4.7.2.1 clarify that the overall availability of benthic habitats to marine fauna, particularly the soft-bottom, sandy substrate present in the proposed lease area, is largely unchanged across southern New England and the Mid-Atlantic

Bight, when considering past, present, and reasonably foreseeable future actions.

Changes to the EA Related to Comments on Benthic Resource: Adverse Effects on Marine Life Comments

The descriptions and analyses of Alternatives A and B in Sections 2.1, 2.2, 4.4, and 4.5 of the EA have been updated to reflect that the Cholera Bank sensitive habitat will not be available for leasing. A thorough description of the Cholera Bank area has been added to Section 4.4.2.3. The EA has been updated to reflect recent studies, including the effects of sound to marine invertebrates (e.g., squid and scallop) in Sections 2.4 and 4.4.2.7. The importance of soft-bottom habitat, as reported in Kritzer et al (2016) was also added to 4.4.2.3. The results of these studies do not change the conclusions of the EA regarding the impacts on benthic communities from site characterization and site assessment activities.

Benthic Resources: Data

Summary of Comments Received on Benthic Resources: Data

The FSF asserts that in describing benthic habitats and associated species within the New York WEA, the EA relies solely on a study by TNC that referenced benthic grab samples conducted by the NEFSC between the 1950s and the early 1990s. The FSF notes that this study did not list Atlantic scallops as among the characteristic species for the habitat type, even though scallops inhabit a large portion of the New York WEA at commercially viable densities. Therefore, the FSF questions the use of this study as the basis of the EA analysis. The FSF also comments that the EA omits consideration of certain specific scientific evidence on likely impacts, including, but not limited to, electromagnetic impacts to invertebrates and ecosystem-level impacts to benthic communities from meteorological tower construction.

BOEM Response to Comments on Benthic Resources: Data

BOEM disagrees that the EA relies on one study to describe benthic habitats and associated species within the New York WEA. Other data sources were used in the EA, including those specifically designed to assess the densities of scallops in the New York WEA. For example, the SMAST scallop survey data was presented and analyzed in Section 4.4.2.7 and Figure 4–16. Since the publication of the EA, additional data has been made available on the Northeast Ocean Data Portal that has been incorporated into Section 4.4.2.3 of the EA. Although this information provides some additional detail regarding benthic marine life in the proposed lease area, it did not change BOEM’s impacts analysis from the proposed action. Impacts to scallops associated with anthropogenic sound have also been updated with the results of a study completed in Australia. With respect to electromagnetic impacts (e.g., EMF) to invertebrates, including ecosystem-level impacts to benthic communities, no EMF would result from a meteorological ocean facility, and the level of proposed seafloor disturbing activity (less than 1 ac) is not anticipated to have detectable effects across the Northeast continental shelf ecosystem (over 20 million ac). Therefore, a meteorological tower and/or buoys would not have ecosystem effects.

Changes to the EA Related to Comments on Benthic Resource: Data Comments

Section 4.4.2.3 and Figures 4–7 to 4–11 of the EA have been updated to reflect the best available science on the regional data portals. These include information regarding the average abundance of scallops in the proposed lease area. Section 4.4.2.7 has been updated with the latest information regarding the impact to scallops from anthropogenic noise. This information provides some additional detail regarding benthic marine life occurrence and impacts; however, it did not change the impacts analysis from the proposed action as described in the June 2016 EA.

5.1.3.3 Avian and Bat Resources

Summary of Comments Received on Avian and Bat Resources

USFWS provided comments on the EA. The South Shore Audubon Society and the New York City Audubon Society (Audubon), as well as the Natural Resources Defense Council (NRDC), Conservation Law Foundation (CLF), the National Wildlife Federation (NWF), and the Sierra Club (collectively, Joint Environmental Commentators) also provided comments in their joint letters.

USFWS and Audubon recommended that all bird surveys be undertaken for three years for a future COP. USFWS also suggested that the energetic costs of flushing birds during winter bird surveys be considered, and that there should be an evaluation on how to reduce flushing birds during surveys. USFWS recommended acoustic monitoring devices for birds and bats be placed on the meteorological tower and recommended monitoring for bats from April 15 to October 1, and monitoring year-round for birds. Audubon expressed preference for the installation of a meteorological tower over buoys.

Audubon stated that information on Roseate Terns in the area was "sorely lacking in the planning area," and expressed concern about relying on "composite maps" and the quality of data used to develop those maps.

USFWS and Audubon expressed concerns stated that migration and movement pathways are not well established for five main species/taxa: 1) northern long-eared bat; 2) Red Knot; 3) Piping Plover; 4) Roseate Tern; and 5) nocturnal passerines. Audubon recommended an expanded discussion on nocturnal migrants be included in the EA, with reference to several recent articles on tracking birds using weather surveillance radar in the region.

USFWS recommended that BOEM follow the FAA guidance for lighting of structures. Audubon made a similar recommendation, and also referenced voluntary guidelines for communication towers from USFWS. The joint letter expressed concern regarding the impacts that lighting from metrological tower could have on migrating birds. Other comments suggested that monitoring should be designed to examine migration routes and determine at what flight altitudes birds are migrating, including the time of day migration is occurring.

Audubon "urged that USFWS be consulted and given a prominent role in researching and providing data regarding the impacts of site assessment activities…on migrating birds."

USFWS recommended that its contact information be included in the SOCs as the place to register reports of dead listed species. The joint letter recommended that the lease include monitoring provisions that will ensure multiple methods of study (e.g., radar, thermal, acoustic, and direct observation) are used within the region, during all phases of pre-construction investigation, to build an understanding of the risks involved and the mitigation efforts needed.

BOEM Response to Comments on Avian and Bat Resources

In response to comments on survey methodology, text was added to Section 3.2.1.3 of the EA clarifying that digital aerial surveys are flown at an altitude that does not disturb birds. The clarifying text does not change BOEM's impacts analysis for the avian resource due to the proposed action. No other updates to the EA are needed, because these concerns are currently addressed in the current Avian Guidelines (http://www.boem.gov/Survey-Guidelines/), and text will be added to the updated guidelines to further emphasize this point, which will be released later this year. The suggested timeframes for avian and bat surveys are within the survey timeframe specified in Table 3–5 of the EA. BOEM acknowledges the preference for a meteorological tower over buoys; however, BOEM does not specify the type of technology to be used by the developer.

BOEM relied on multiple sources of information in the June 2016 EA to describe Roseate Tern use of the area. Additional information on Roseate Tern movement and use of the area was added to the EA. The additional information confirms the initial findings in the June 2016 EA.

Regarding migration and movement of birds and bats, text has been added to Sections 4.4.2.1 and 4.4.2.2 of the EA on the biology of northern long-eared bats and other ESA species. New information provided by the commenter was added to describe movements of nocturnal migrants and the potential impacts to nocturnal migrants.

The use of FAA lighting is noted throughout the EA, particularly in the SOCs (Appendix B, Section B.6). Text has been added to clarify the baseline lighting conditions and potential impacts of lighting from the meteorological tower. Specifically, compared with the well-lit surrounding city (http://earthobservatory.nasa.gov/IOTD/view.php?id=82155), the impacts to migratory birds by a few medium intensity aviation obstruction lights placed on a 300 to 400 ft tower will be extremely small, particularly when placed in the context of the lighting of New York City's 113 skyscrapers (>600 ft).

BOEM is committed in continuing to work with USFWS throughout the development of wind energy process in the NY region. BOEM solicited and received comments on the June 2016 EA initiated informal ESA consultation with USFWS on the impact the proposed actions would have to Roseate Terns, piping plovers, red knot, and northern long-eared bats; and has partnered with USFWS on several regional studies related to wind energy development (http://www.boem.gov/Renewable-Energy-Ongoing-Studies/). The SOCs in the EA were updated to include USFWS contact information.

Changes to the EA Related to Comments on Avian and Bat Resources

Section 3.2.1.3 of the EA was revised to address comments on mitigation and monitoring. USFWS contact information has been included in Appendix B.6, Number 5 as the recipient of an annual report that documents dead birds. Sections 4.4.2.1 and 4.4.2.2 of the EA were also updated.

5.1.3.4 Marine Mammals

Marine Mammals: Additional Data

Summary of Comments Received on Marine Mammals: Additional Data

Comments from Wildlife Conservation Society (WCS), Gotham Whale, and the Coastal Research and Education Society of Long Island (CRESLI) requested that BOEM ensure it is relying on the latest information on the distribution and abundance of marine mammals in the New York Bight area, including the updated density models by Roberts et al. (2016). Commenters encouraged BOEM to consider not only the latest North Atlantic Whale Consortium 2015 Annual Report Card and other sources already referenced in the EA, but also directed BOEM to Rolland et al. (2016) for new information on the NARW. Additionally, these commenters asserted that the analysis in the EA is inadequate because it relies solely on information found in the 2014 G&G Final PEIS. The commenters referenced three scientific papers (Blackwell et al., 2015; Nowacek et al., 2015; Southall et al., 2013) that BOEM should consider as additional information in the EA. The commenters also referred BOEM to the CetMap and CetSound products and databases as sources of data that could be incorporated into the EA.

BOEM Response Related to Marine Mammals: Additional Data Comments

BOEM has updated the EA to include several references suggested by commenters, however, the inclusion of these information sources does not change the determinations of the analyses in the EA, and the suite of SOCs described in the EA remains unchanged.

The EA has been updated to reflect the Robert et al. (2016) density models currently available through the Northeast Ocean Data Portal (Section 4.4.2.5), since the density models are not available through CetMap. BOEM considered the available data in SoundMap and determined that there is no data available for underwater sound profiles in the vicinity of the New York WEA. BOEM has included Rolland et al. (2016) in the EA (Section 4.4.2.5) in order to reference the observed decline in general NARW population health from 1980 to 2008.

Additional information on humpback whales and other large whales in the New York Bight is being prepared for publication (comment from Antunes et al. and Gotham Whale Observation Data), but is currently unavailable for use in this analysis. BOEM will consider any future information available for large whales in the New York Bight area during our review of any future actions that may be proposed to occur in the proposed lease area.

Blackwell et al (2015) refers to the effects of marine seismic (i.e., airgun) surveys on bowhead whale calling rates and Nowacek et al (2015) discuss the potential impacts of marine seismic (i.e., airgun) surveys on various marine species, and call for international collaboration to manage marine seismic surveys and ocean noise. Seismic surveys are not part of this proposed action. Seismic surveys are used to penetrate deep (thousands of meters) into the seafloor to map deep geological features, such as oil and gas deposits. HRG surveys use sonars and other electro-mechanical sounds to map shallow (<150 m) subsea geophysical features necessary to obtain information for siting and installation of renewable energy structures.

The WCS commented that the use of an HRG system similar to the system implicated in a marine mammal stranding event can pose a similar threat to cetaceans with a mid-frequency hearing range. BOEM does not agree with this statement. In summary, the use of a 12 kHz multi-beam echosounder system (MBES) was implicated as a possible cause of a 2008 mass stranding of approximately 100 melon-headed whales in the Loza Lagoon system in Madagascar. However, the investigation by a team of experts determined that the use of a 12 kHz MBES was “the most plausible and likely initial behavioral trigger of the stranding event, concluding that the operation of the survey in a directed manner (north to south) parallel to shore may have trapped the animals between and the sound source and shore, and that the animals continued to turn inland until they entered the lagoon and became entrapped, which resulted in the stranding”. The report determined that a variety of secondary factors contributed to or ultimately caused mortalities that were specific to the geographic area, and that these types of systems are used worldwide for ocean bottom mapping, fish finding, and other common surveys without linkages to stranding events. The unique conditions that resulted in the stranding are not present in the New York WEA and the secondary threat of marine mammal strandings is not expected. This information has been added in Section 4.4.2.5 of the EA.

BOEM has also considered recent scientific information on the effects of HRG surveys on marine mammals and concludes the proposed 200 m exclusion zones for HRG surveys adequately protects marine mammals in the low and mid/high frequency range of hearing. In addition to the information in our G&G PEIS, BOEM has also considered new information resulting from a collaborative study measuring the sound propagation from all types of HRG survey equipment being used on the OCS. The first year of results (Crocker & Fratantonio, 2016) from this ongoing study suggest that our 200 m exclusion zone may be adequate to mitigate for both potential injury (Level A Harassment under the MMPA) or behavioral impacts (Level B Harassment under the MMPA) with the exception of low-frequency impulsive sounds that could be potentially be associated with HRG surveys. BOEM's proposed lease requirements for HRG surveys are directed toward avoiding ear injury in marine mammals, but new information shows that the proposed exclusion zone covers a distance in which injury and behavioral impacts may occur.

Changes to the EA Related to Comments on Marine Mammals: Additional Data Comments

Section 4.4.2.5, subsection *North Atlantic Right Whale*, has been updated to reflect the Northeast Ocean Data Portal, which contains the Roberts et al. (2016) density map data, and Section 4.4.2.5 of the EA was revised to include Rolland et al., (2016). BOEM has included a discussion of Blackwell et al. (2015) and Nowacek et al. (2015) papers in the context of the HRG equipment proposed for surveys in Section 4.4.2.5 of the EA. Southall et al. (2013) has already been considered in our Atlantic G&G PEIS, and was reassessed and summarized in Section 4.4.2.5 in the EA.

Marine Mammals: Mitigation and Monitoring

Summary of Comments Received on Marine Mammals: Mitigation and Monitoring

Comments from the NJDEP suggested that BOEM consider increasing the exclusion zone for marine mammals and sea turtles to 1 km during geophysical surveys.

The Marine Mammal Commission, WCS, Gotham Whale, CRESLI, COA, NRDC, CLF, NWF, and the Sierra Club expressed a concern that site assessment and characterization activities could harm marine life and protected species, including the highly endangered NARW. Additionally, these groups expressed concern that such activities could result in increased potential for ship strikes as a result of displacement of whales from the WEA. The following is a summary of the requirements that these groups have recommended to minimize impacts to marine species in the WEA during site assessment and characterization activities:

1. Seasonal restrictions prohibiting sub-bottom profiling and pile-driving activities from November 23 through March 21 and requiring protective measures from March 22 through April 30 and November 1 through November 22.
2. A 10-knot speed limit restriction during the period of November 1 through April 30 on all vessels of any length associated with site assessment surveys and site characterization activities, including survey vessels and support vessels operating in, and transiting to and from the WEA.
3. The use of the best commercially available noise attenuation and source level reduction technology to reduce sound during pile driving from March 22 through April 30 and November 1 through November 22 (unless such technology is prohibitively expensive).
4. A minimum 500 m exclusion zone around sub-bottom profilers for all marine mammals and sea turtles, and the shutdown of pile driving if a NARW is observed within the 160 dB isopleth around the pile driving source.
5. A minimum of 2 NMFS-approved PSOs (1 on/ 1 off) at each sub-bottom profiling site, and 4 NMFS-approved PSOs (2 on/ 2 off) at each pile driving site, with additional requirements during March 22 through April 30 and November 1 through November 22.
6. To only allow sub-bottom profiling at night if the site-specific risk assessment shows acceptable results regarding the potential for right whale activity during the survey period. Pile driving should be prohibited at night.
7. Require the use of aerial surveys during pile driving from March 22 through April 30.

BOEM Response to Comments on Marine Mammals: Mitigation and Monitoring

BOEM has carefully considered the comments by environmental NGOs seeking additional mitigation and monitoring measures related to marine mammals. For the reasons provided below, BOEM has determined that the SOCs presented in the EA do not need to be amended.

Concern that site assessment and characterization activities could harm marine life and protected species, including the highly endangered NARW: The NJDEP comments cited literature referencing seismic airgun emissions. The types of acoustic sources used for HRG surveys under the proposed action do not include the use of airguns. The HRG surveys associated with the proposed action operate at a much lower sound production level, at higher frequencies or tones, and generally survey much smaller oceanic areas than seismic surveys conducted with airguns. Based on the hearing abilities of the marine mammal and sea turtles species that may occur in the area and the sound characteristics of the HRG sound sources, BOEM believes an exclusion zone of 200 m for marine mammals and sea turtles, and a 500 m separation distance for NARWs adequately minimize the potential impacts that may occur to these species.

Concern for the increased potential for ship strikes as a result of displacement of whales from the WEA and a request for additional vessel speed restrictions: Appendix B of the EA (Standard Operating Conditions) states that the vessel strike avoidance measures apply to all vessels conducting activity in support of a plan (i.e., SAP and/or COP) submittal, including those vessels transiting to and from local ports and the lease area. These measures include requirements to maintain a vigilant watch for protected species, slow down or stop vessels to avoid striking protected species, mandatory speed restrictions within DMAs for all vessels, and vessel speed restrictions for vessels 65 ft or larger operating within the project area from November 1 through July 31, since they are known to pose significant risk of collision to NARWs. In addition, all vessels conducting on-lease activity are required to remain 500 m away from NARWs.

At this time, BOEM does not support extending speed restrictions to smaller vessels less than 65 ft due to high levels of existing vessel traffic, the anticipated occurrence of few NARWs in the lease area, and project-related vessel crew safety associated with this short-term, localized action.

The construction (pile-driving activities) of one meteorological tower is anticipated to be localized, last for one to three days, and project-related vessel traffic will present no change in the overall current traffic pattern and associated current risk of collision due to current ongoing non-project related activities. Considering the scope of the proposed activity, as well as the above-referenced mitigations, disturbance and displacement within the WEA as a result of site characterization and assessment activities will be appropriately minimized to reduce the risk of ship strike.

Request for increased exclusion zones for sub-bottom profiling operations: The exclusion zones that BOEM requires during operations are conservative estimates based on the best available data on the hearing abilities of the different marine mammal species (Southall, 2007), as well as the updated guidance from NMFS (81 FR 51693). BOEM requires sound source verification of all acoustic sound sources operating within the hearing range of protected species to ensure that SOCs reduce or minimize any potential impacts to protected species, including the NARW. In addition, the 200 m default exclusion zone for HRG equipment operating below 200 kHz is anticipated to prevent Level B behavioral harassment thresholds as defined by NMFS (Crocker & Fratantonio, 2016).

Recommendation that a minimum number of PSOs be used during HRG surveys and pile driving activities: BOEM and NMFS reviewed BOEM's PSO requirements in light of industry, regulatory, protected species, and other considerations (Baker et al., 2013). Based on that review, BOEM and NMFS believes that the number of PSOs should be evaluated on a case-by-case basis, due to project differences in the types of equipment used, impact zones, region in which a survey may occur, and berthing capacities of vessels used for a project. Thus, rather than specify a minimum number of PSOs that should be used prior to receiving project plans, BOEM requires that the number of PSOs must be sufficient to effectively monitor the exclusion zone at all times. In order to ensure effective monitoring, PSOs must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch, unless a different schedule is approved by the Lessor. Additionally, PSOs must not work for more than 12 hours in a 24-hour period. Based on these requirements, BOEM intends to evaluate the number of PSOs required for specific projects once plans are submitted by a lessee to ensure that effective mitigation and monitoring will occur.

Request for site specific risk assessments: BOEM leases require lessees to submit a survey plan that must set forth details of the survey, including how the lessee will comply with BOEM's lease stipulations (including SOCs) and how the proposed plan will result in the necessary data to support their SAP. The SAP survey plan will effectively contain the lessee's marine mammal harassment avoidance plan. Following submittal of the survey plan to BOEM, the lessee is required to address any comments BOEM has, to BOEM's satisfaction, before the lessee commences surveys. For these reasons, BOEM does not believe that a separate marine mammal harassment avoidance plan is needed.

Pile driving concerns: BOEM has determined that its current pile driving mitigation measures are sufficient based on the best available information, and that additional mitigations are not warranted at this time. BOEM has taken a precautionary approach to protect NARWs from noise impacts during pile driving operations. First, BOEM imposes a seasonal restriction on pile driving between November 1 and April 30. BOEM also prohibits any pile driving activities to occur during the March 22 to April 30 period of concern. The seasonal restriction on pile driving particularly focuses on NARW Seasonal Management Periods, when the highest densities are anticipated (Cornell, 2010; Kraus et al., 2016; Bailey et al., 2010). Due to the highly endangered status and cryptic nature of this species, however, other species in the area during those times are expected to benefit from this restriction.

BOEM carefully considered the information available for marine mammals when we developed the seasonal restriction conditions on pile driving for the proposed lease sale. BOEM is not aware of any information suggesting the proposed lease area is important habitat for fin and humpback whales. Considering currently available distribution data (Roberts et al., 2016), BOEM is of the opinion that a seasonal restriction on pile driving for one meteorological tower for fin or humpback whales is warranted at this time. BOEM also prohibits nighttime operations unless an alternative monitoring plan is submitted for BOEM and NMFS' approval.

During the months which pile driving is allowed, BOEM imposes other SOCs to minimize the potential for exposure to sounds produced by pile driving that apply to all marine mammals, including the power down of a pile driver when any marine mammal is sighted. The SOCs for pile driving in the EA are based on the best information currently available, although BOEM acknowledges that more thorough marine mammal surveys are being planned to provide more detailed data within the proposed lease area.

Changes to the EA Related to Marine Mammals: Mitigation and Monitoring

BOEM made no specific changes to the EA to address comments on lease requirements and conditions of plan approval, because either the SOCs already address commenter concerns or BOEM has determined, based on the best available science, that the SOCs are sufficient to reduce or minimize potential impacts to protected species to minor to moderate levels. BOEM will continue to re-evaluate its SOCs as new information becomes available.

Marine Mammals: Noise

Summary of Comments Received on Marine Mammals:

Commenters indicated that the current behavioral threshold criteria being used by NMFS do not adequately represent the true impacts of noise-producing activities on marine mammals, and it is unclear what criteria were used to evaluate behavioral impacts. Commenters also expressed concern that the biological surveys for marine mammals and sea turtles are proposed to be conducted at the same time as HRG surveys since the noise produced by the HRG surveys may affect cetacean sighting rates. Additionally, commenters urged BOEM to fully consider the cumulative effects of the proposed action with other noise-producing activities in the region, and suggested that sources such as Moore et al. (2012) could provide guidance in this assessment.

BOEM Response to Comments on Marine Mammals: Noise

BOEM has clarified in the EA the criteria it used to assess Level B Harassment. BOEM is applying the traditional threshold level used by NMFS to predict the potential onset of behavioral reactions to intermittent noise (160 dB RMS) and to continuous noise (120 dB RMS). The commenter stated that the current threshold criteria do not adequately represent the impacts of noise-producing activities on marine mammals, but did not provide any additional supporting information stating why NMFS criteria are inadequate. BOEM finds that these criteria represent the best information to assess impacts to marine mammals in the EA. In general, assuming all marine mammals may be potentially disturbed at these levels over estimates the number of animals that may be harassed, compared to alternative methods of assessing behavioral disturbance. BOEM believes this conservative approach is appropriate to assess potential impacts to marine mammals. Regarding the SEL criteria to assess Level A Harassment, NOAA published their final *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* during the public comment period for this EA. BOEM has applied this new information in the assessment of underwater sound impacts on marine mammals in Section 4.4.2.5 of the EA.

The commenter stated a concern that a lessee may conduct surveys for marine mammals and sea turtles at the same time as HRG surveys, as the noise produced by the HRG surveys may affect cetacean sighting rates. BOEM agrees with this comment. On July 1, 2013, BOEM published *Guidelines for Providing Information on Marine Mammals and Sea Turtles for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 Subpart F*. BOEM's guidelines are intended to provide lessees guidance on the type of information that will be needed if inadequate information exists. BOEM encourages lessees to coordinate closely with BOEM on information needs and survey design. BOEM has updated the EA in Sections 3.2.1, 3.2.1.3, and 3.2.4.1, and will ensure the proper guidance is provided that marine mammal surveys do not concurrently occur with HRG surveys.

The WCF recommended that BOEM fully consider the cumulative effects of the proposed action with other noise-producing activities in the region, and suggests that sources such as Moore et al. (2012) can provide guidance in such an assessment. BOEM reduces its impacts early in the planning process by conducting site identification through public stakeholder meetings to avoid areas that may have significant impacts on the environment, including marine mammals. Acoustic impacts associated with the proposed activities in the EA are expected to be spatially localized, occur intermittently, and be short-term in duration. Implementation of mitigation measures, such as time area closures, monitoring, and clearance of acoustic exclusion zones are expected to minimize potential impacts from acoustic sources and result in a minor incremental increase in underwater noise. Based on the above, the acoustic effects on the marine environment will have short-term, minor impacts to marine mammals and sea turtles while the sounds are present.

Changes to the EA Related to Marine Mammals: Noise

The criteria used to assess Level B Harassment for intermittent noise (160 dB RMS) and for continuous noise (120 dB RMS) have been clarified in Section 4.4.2.5 of the EA. BOEM has also applied the new NOAA guidance to assess the effects of sound exposure on marine mammal hearing and have defined Level A Harassment in Section 4.4.2.5 of the EA based on these criteria. BOEM has updated the EA in Sections 3.2.1, 3.2.1.3, and 3.2.4.1, and will ensure the proper guidance is provided that marine mammal surveys do not occur concurrently with HRG surveys. BOEM has also included a section on the cumulative impacts of anthropogenic noise on marine mammals and sea turtles in Section 4.7.2.1 of the EA.

5.1.3.5 Sea Turtles

Summary of Comments Received on Sea Turtles

Several NGOs provided comments on vessel strikes, the effectiveness of the monitoring measures, the lack of information available regarding impacts to sea turtles, and the reliability of the available sea turtle density data from aerial and shipboard surveys.

The commenters asserted that the EA should address the relative lack of data on sea turtle auditory abilities and the fact that ship strikes result in turtle strandings in the region. The commenters also contended that sea turtles are difficult to monitor for mitigation purposes, and that there is a lack of information on the resulting impacts. They also recommended utilizing mitigation techniques that do not depend on visual observation, which they assert can often be imprecise.

The same commenters additionally noted that limiting the speed of project vessels within the WEA, as they have recommended for marine mammals (see Recommendation 1, Attachments 1 and 2 of the Marine Mammal Commission letter July 14, 2014) will also benefit sea turtles.

BOEM Response to Comments on Sea Turtles

Because the best available information has been used, BOEM made no changes to the EA to address comments on mitigation and monitoring, or to address comments on sea turtle data.

BOEM agrees that vessel strikes are a large source of injury and mortality of sea turtles. The role of the auditory ability of sea turtles in avoiding vessels is unclear, and responses may be a reaction to the physical presence and speed of a moving vessel, a response to vessel noise, or a combination of factors. Regardless of the mechanism, vessel strikes have been documented to be a large source of injury and mortality in many regions.

BOEM is aware of mitigation strategies using habitat indicators, such as Sargassum and convergence zones that may indicate sea turtle presence. Sargassum is a floating macroalgae that can form large clumps or mats that provides shelter and contains habitat that supports food sources for juvenile turtles in the open ocean. Small, juvenile pelagic stage sea turtles are associated with Sargassum; however, we do not expect either Sargassum or pelagic-stage juvenile sea turtles to occur in the proposed lease area. Additionally, convergence areas are not expected on the New York WEA. Adult loggerhead, Kemp's ridley, and green sea turtles in waters off New York spend the majority of their time submerged and feeding in benthic habitats. BOEM believes the most effective method to detect sea turtles in the New York WEA is through visual observations that are proposed as lease conditions. We also considered jellyfish swarms as a possible indicator of sea turtle presence. Leatherback, Kemp's ridley, and loggerhead sea turtles have all been documented to feed on jellyfish. Jellyfish swarms can be used by observers as possible indicators of sea turtles in an area, and increase attention to the area the swarm occurs. Sea turtles can be difficult to sight and observations are required from the highest vantage point of a vessel, which increases the ability to spot sea turtles at the surface of the water. Because sea turtles must surface to breathe and habitat indicators may be unreliable in the New York WEA, visual observation is the primary means to detect sea turtles that may be in the area.

BOEM received a comment that aerial and shipboard survey data may not accurately establish sea turtle densities and must be interpreted along with specific information on diving behavior, which can vary by a factor of five or more depending on season, water depth, thermocline, and behavioral mode. BOEM has used the best available information on sea turtle densities in the EA for the four species of sea turtles that may be found in the proposed lease area. Sea turtles occur in the area with greatest seasonal occurrences in the summer and fall. BOEM, in cooperation with NOAA, USFWS, and the US Navy, are cooperatively conducting a 10-year research study called the Atlantic Marine Assessment Program for Protected Species (AMAPPS). AMAPPS is specifically using data collecting methods to improve baseline information on species distribution and abundance. The study began in 2010 to develop models and associated tools to provide seasonal, spatially-explicit density estimates, incorporating habitat characteristics of turtles (and marine mammals and seabirds) in the western North Atlantic Ocean. Part of this effort is conducting tag telemetry studies within surveyed regions of sea turtles to develop corrections for availability bias in the abundance survey data, and collect additional data on habitat use and life-history, residence time, and frequency of use. BOEM believes the AMAPPS data will account for biases in sighting availability, and BOEM will continue to incorporate the AMAPPS results into assessments as additional results are available.

Changes to the EA Related to Comments on Sea Turtles

Although its analysis has not changed, BOEM has added additional information on vessel strikes, strandings, and sea turtles has been included in Section 4.4.2.6 of the EA.

5.1.3.6 Water Quality

Summary of Comments Received on Water Quality

COA asserts that the EA should include an analysis on how water quality impacts will be monitored and which agency will be in charge of monitoring and enforcement. COA contends that monitoring of vessel discharges, spills, and sediment suspension is critical in ensuring that these impacts remain minor and suggests the EA incorporate a detailed monitoring plan for water quality.

BOEM Response to Comments on Water Quality

Agencies responsible for vessel discharges and spills, and monitoring and enforcement of water quality, are mentioned within Section 3.3.3 of the EA. Under the Ocean Dumping Act of 1972, which was enacted originally to regulate the disposal of wastes in U.S. marine waters, the EPA is the primary agency responsible for regulating the disposal of wastes at sea. The National Oil and Hazardous Substance Pollution Contingency Plan (1968, with updates in 1973, 1981, and

1994), provides the Federal Government with a plan for responding to discharges of oil and releases of hazardous substances and establishes on-scene coordinators within the U.S. Coast Guard and the EPA. The NCP is described in Section 3.2.2 and results from the CWA, the primary federal statute that regulates the protection of the Nation's waters by the establishment of national water quality standards for pollutants and the use of baseline technology for the treatment of pollutants. Federal activities, such as those described by the EA under USACE Nationwide Permits, have regulatory responsibilities under the CWA to prevent water pollution, obtain water discharge permits, meet applicable water quality standards, develop risk management plans, and maintain records. Details pertaining to the process of obtaining a NWP by a prospective permittee are described in Section 3.2.2.1, *Meteorological Towers and Foundations*. As described in Section 3.3.3, *Spills,* the OSCLA outlines the federal responsibility for vessel discharges, spills, and water quality over the OCS; BOEM coordinates with EPA, USCG, and BSEE to provide feedback on research and water quality analysis needs based on compliance verification, mitigation assessment, and findings during site characterization and assessment activities. EPA regulations cover all pollution that occurs as a result of the operations conducted by, or on behalf of, a lessee that damages or threatens to damage life, property, mineral deposits, or the marine, coastal, and/or human environments.

According to 30 CFR 585.611, turbidity, suspended solids, and sediment transport must be monitored for site assessment. Water quality monitoring, specifically of vessel discharges and spills, are monitored during site characterization activities through the National Pollutant Discharge Enforcement Regulation System (NPDES) (Section 402 of the CWA) promulgated and enforced by EPA and USCG. CWA requires a NPDES permit and a review of such permit by the EPA before any site characterization activities may commence, and the USCG has authority to monitor and prevent any potential vessel discharge, spill, or environmental damage that may occur during site characterization activities planned by any lessee. BOEM requires the inclusion of water quality (e.g., vessel discharges and/or spills, suspended solids, and turbidity) and sediment transport information with SAPs submitted by lessees. If water quality information within a SAP is insufficient for environmental review or analyses required by federal law, BOEM may require additional water quality data, or may specify terms and conditions applicable to water quality monitoring for incorporation within a SAP.

Changes to the EA Related to Comments on Water Quality

Based on the discussion above, Therefore, no changes to the EA were made in response to the recommendation for a required monitoring plan, revisions to the EA were made to clarify language on the use of NWPs (Section 3.2.2.1) and additional water quality information described by the Port Ambrose FEIS (Section 4.4.1.2) was added.

5.1.3.7 Vessel Navigation Safety

Vessel Navigation Safety: Requirements

Summary of Comments Received on Vessel Navigation Safety: Requirements

USCG's general comments included discussion of applicable regulations (e.g., PATON, safety zones, and navigational rules of the road), and editorial clarifications of terminology (e.g., navigational risk assessment vs. USCG recommendations). USCG also recommended that a lessee's site characterization and assessment activities be published in the First Coast Guard District Notice to Mariners, to increase awareness in the maritime community. RIDEM suggested that the placement of the meteorological tower and/or buoy(s) locations on NOAA nautical charts would reduce the potential of an allision. USCG's comments stated that they would require these locations on NOAA nautical charts as part of the PATON permitting process.

The Maritime Association of the Port of New York and New Jersey recommended: (1) that all lighting be constructed so as not to interfere with mariners' night vision capabilities; (2) the establishment of clearly delineated contingency plans for any incident which may impede vessel traffic; (3) incorporation of pass through lanes for smaller vessels through the WEA; and (4) placement of AIS and cellular transponders on any approved structures.

BOEM Response to Comments on Vessel Navigation Safety: Requirements

BOEM appreciates USCG providing additional information regarding its jurisdiction and regulations. BOEM agrees that it is appropriate to require identification of a meteorological tower and buoys on NOAA nautical charts, along with local notices to mariners of the lessee's site characterization and assessment activities. Through lease stipulations, the lessee will be required to submit a SAP survey plan that includes contacting USCG regarding issuance of a local notice to mariners and obtaining a PATON permit for any metrological tower and/or buoy(s) installed, which will trigger notification of NOAA to update nautical charts with these new offshore objects.

During its SAP process, BOEM will consult with USCG and other stakeholders to consider and develop additional site-specific measures to mitigate navigational concerns, which could become terms and conditions of SAP approval. Such measures could include lighting specifications and incident contingency plans.

Changes to the EA Related to Comments on Vessel Navigation Safety: Requirements

BOEM accepted USCG editorial suggestions in Sections 2.2, 3.2, and 4.4.2.10. BOEM revised the text in Section 1.6.4 to clarify USCG did not conduct a risk assessment, but provided buffer recommendations based on its preliminary MPG. New requirements for the lessee to obtain a PATON permit and local notice to mariners are described in Section 3.2.2, along with the resulting identification of the site assessment structures on NOAA nautical charts. Throughout the document, BOEM removed any mention of USCG safety zones because the WEA is located beyond USCG's Captain of the Port authority for safety zones, which extends to 12 nm. If needed to maintain navigational safety, USCG has the ability to request International Maritime Organization approval for proposed routing measures.

Vessel Navigation Safety: USCG Marine Planning Guidelines

Section 2.2 (Alternative B) describes USCG's suggested navigational safety buffers for the New York WEA, which matches the final recommendations in their March 2016 MPG (USCG, 2016). Comments were received both for and against the implementation of USCG's MPG of:

- A minimum setback for structures of 2 nm from all TSS lanes, which was included in Alternative B; and
- A minimum setback of 5 nm from all entry/exit points of the TSS lanes, which was not

included in any of the alternatives.

Summary of Comments Received on Vessel Navigation Safety: USCG Marine Planning Guidelines

The Maritime Association of the Port of New York and New Jersey and World Shipping Council (WSC) asked that the USCG MPG recommended buffers be implemented for the New York lease. WSC opined that the basis for BOEM's preference of Alternative A (1 nm buffer) was unclear and unsupported because the EA presents Alternative B as having a lower risk for allision. WSC asserted that the MPG considered the sea space needed for ships to safety maneuver, and was specifically designed to prevent navigational safety conflicts on the OCS between vessels and fixed structures. Seafreeze Ltd. argued that by not implementing the USCG recommendations, there may be insufficient room for maneuvering in case of emergency, equipment failure, or foul weather conditions that require deviation from the TSS. Seafreeze questioned whether BOEM has the requisite national safety expertise to deviate from MPG.

Additionally, Seafreeze commented that the fishing community did not participate in the development of the USCG's MPG. Seafreeze asserted that vessels engaged in trawl fishing have restricted maneuverability, and that a 1 nm buffer zone is therefore insufficient. Fishermen also asserted that the New York lease area is currently their safety zone for fishing vessels between the TSS lanes.

The NRDC, CLF, NWF, and Sierra Club, and the University of Delaware Special Initiative on Offshore Wind (SIOW) agreed with BOEM's identification of Alternative A as the preferred alternative. They asserted that USCG relied on the outdated United Kingdom Maritime Guidance Note 371, which was replaced with Maritime Guidance Note 543 (released in February 2016) prior to the MPG. SIOW supports BOEM's approach to navigational safety described in the EA, which would evaluate navigation setbacks on a case-by-case basis via a site-specific navigational safety risk assessment conducted once BOEM receives a COP.

Several commenters noted that neither Alternative A nor B include the 5 nm buffer from entry/exit of the TSS.

BOEM Response to Comments on Vessel Navigation Safety: USCG Marine Planning Guidelines

The comments regarding selection of alternatives and identification of BOEM's preferred alternative have been noted. BOEM has been in continuous consultation with USCG regarding navigational safety since 2011 regarding the New York WEA, when USCG initially recommended a 1 nm buffer with the TSS (USCG, 2011b). As USCG has stated, the MPG are not mandatory, but should be factored into navigation safety risk assessments to be conducted by developers in support of a COP submission. USCG has acknowledged that "…each project is unique and requires individual review and consultation" (USCG, 2015b).

While BOEM supports the development of guidelines that will reduce risks, BOEM believes that site-specific development of setback distances should be developed in consideration of the unique characteristics of each area and each proposed project. After the release of the final MPG, USCG received comments (docket number USCG-2011-0351) asking for more transparency and suggested that USCG failed to obtain sufficient input from European offshore wind energy developers. Applying setbacks too early in the leasing and development phase may unnecessarily eliminate areas that eventually are determined to be productive and a low navigational risk (Hopper, 2016). BOEM will continue to analyze navigational safety issues and consult with USCG after lease issuance. Due to the concerns raised about USCG's MPG, BOEM will not be implementing the MPG recommendations at this time. However, BOEM will continue to consult with USCG as the leasing process progresses, and intends to hold future navigational safety discussions with maritime community, fishing industry, and offshore wind energy industry.

Implementation of a 5 nm buffer from TSS entry/exit at the western tip of the proposed lease area (i.e., closest to NY harbor) is no longer an issue due to the removal of five aliquots due to the existence of sensitive habitat in Cholera Bank under both Alternatives A and B. Less than one aliquot in the western tip of the proposed lease area is within 5 nm of the TSS entry/exit.

Changes to the EA Related to Comments on Vessel Navigation Safety: USCG Marine Planning Guidelines

BOEM has noted comments about the applicability or non-applicability of the USCG's MPG, but did not make changes to the EA Alternatives. BOEM did expand the discussion of BOEM's AIS analysis (Section 2.2), including Figure 2–3 which shows AIS traffic and the USCG's suggested MPG buffers. Additionally, Sections 2.5 and 3.2.2 were revised to clarify the roles of USCG and USACE in terms of navigational safety and the steps that will be taken if a COP is submitted.

Vessel Navigation Safety: Data Analysis

Summary of Comments Received on Vessel Navigation Safety: Data Analysis

USCG requested that BOEM's analysis include incident data in and near the WEA, along with providing details about the AIS analysis conducted. The RIDEM Division of Fish & Wildlife/Marine Fisheries also requested BOEM be more transparent in its AIS analysis and decision making related to safety zone buffer selection.

BOEM Response to Comments on Vessel Navigation Safety: Data Analysis

BOEM coordinated with the USCG to assess more detailed incident data. The detailed incident data covered the period from 1991 to June 2015 and showed no incidents that occurred in the WEA (DesAutels, 2016).

As noted in Section 2.2 of the EA, BOEM analyzed 2014 AIS data of vessels that travel the length of the Traffic Lanes. The data suggests that the majority of this traffic (over 90 %) stays within the middle to inner portion of the Traffic Lanes, nearer to the Separation Zone, and away from the WEA. BOEM revised its analysis to include additional AIS data (2011 and 2013) and found that 93 to 96 percent of cargo and tanker vessel tracks from 2011 and 2013 that utilize the Traffic Lanes are within the 90 percent polygon derived from 2014 data.

Changes to the EA Related to Comments on Vessel Navigation Safety: Data Analysis

In Section 1.6.4, BOEM added a new figure and description of its analysis of vessel traffic conducted to determine the appropriate TSS buffer during the Area ID process. Sections 2.1 and 2.2 contain BOEM's analysis of additional AIS data (2011 and 2013).

5.2 Cooperating Agencies

Section 1500.5(b) of the CEQ implementing regulations (40 CFR 1500.5(b) encourages agency cooperation early in the NEPA process. A federal agency can be a lead, joint lead, or cooperating agency. A lead agency manages the NEPA process and is responsible for the preparation of an EA or EIS; a joint lead agency shares these responsibilities; and a cooperating agency that has jurisdiction by law or special expertise with respect to any environmental issue participates in the NEPA process upon the request of the lead agency. BOEM invited the following federal and state agencies, and tribal governments, to consider becoming cooperating agencies in the preparation of this EA: BSEE, EPA, NOAA, NPS, USACE, USCG, NYSDEC, the Narragansett Tribe, and the Shinnecock Indian Nation. BSEE, EPA, NOAA, USACE, USCG, and NYSDEC are cooperating agencies, and agreed to participate in the development and review of this EA.

5.3 Consultations

5.3.1 Endangered Species Act

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. BOEM has or will consult with both USFWS and NMFS for activities considered in this EA and species under their respective jurisdictions. The status of consultations for each of the Services is described below.

5.3.1.1 U.S. Fish and Wildlife Service

On April 21, 2016, in preparation of this EA and a biological assessment, BOEM used USFWS's IPaC system to determine if any ESA-listed, proposed, or candidate species may be present in the proposed lease area (https://ecos.fws.gov/ipac/project/YKD7HMJG65GC FECAAWHHWU5YEA). While the report states that "there are no endangered species in this location," and that, "There are no critical habitats in this location," the EA considered the possibility that ESA species may pass over the proposed lease area during migration. On July 8, 2016, the IPaC report identified the Roseate Tern as potentially being present within the proposed lease area.

On July 25, 2016, BOEM submitted a biological assessment to USFWS, and requested concurrence (within 30 days) on BOEM's conclusions that the impacts of the proposed activities are expected to be discountable and insignificant and, thus, not likely to adversely affect ESA-listed bird species, the determination of no effect to ESA-listed bats, and that no critical habitat designated for listed bird species would be adversely affected by the proposed activities. On September 14, 2016, USFWS concurred with BOEM's determination that the proposed action was not likely to adversely affect the piping plover, roseate tern, and red knot, and BOEM's determination that the proposed action would have no effect on the northern-long eared bat.

5.3.1.2 National Marine Fisheries Service

BOEM prepared a biological assessment, entitled *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island, Massachusetts, New York, and New Jersey* (BOEM, 2012f), that analyzed proposed activities associated with the WEA and their possible effects on ESA-listed species under NMFS' jurisdiction that may occur in the project area or vicinity. NMFS issued a Biological Opinion on March 10, 2013 (revised on April 10, 2013) (NMFS, 2013a), concluding the formal ESA consultation process. BOEM has consulted with NMFS on the following actions in this EA:

- Issuing a renewable energy lease;
- Site characterization and archeological surveys including a) HRG surveys (primarily side-scan sonars, echo sounders, and sub-bottom profilers), and b) geotechnical sub-bottom sampling (includes CPTs, geologic borings, vibracores, etc.); and
- Biological resource assessments to determine a) the presence/absence of threatened and endangered species, and b) the presence/absence of other sensitive biological resources or habitats.

NMFS concluded in its biological opinion that the above actions may adversely affect, but are not likely to jeopardize the continued existence of: Kemp's ridley, green, or leatherback sea turtles; the Northwest Atlantic DPS of loggerhead sea turtles; North Atlantic right, humpback (no longer listed under ESA), fin, sei, or sperm whales, or the Gulf of Maine, New York Bight, Chesapeake Bay, or South Atlantic DPS of Atlantic sturgeon. The SOCs in Appendix B are consistent with the Incidental Take Statement of the NMFS Biological Opinion (2013a). Prior to the approval of any activities in a SAP that may affect any ESA-listed species occurring in the New York proposed lease area, BOEM will consult with NMFS pursuant to its obligations under Section 7 of the ESA. Because no critical habitat is designated in the action area, the action is not likely to adversely affect designated critical habitat.

5.3.2 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 600. Certain OCS activities authorized by BOEM may result in adverse effects on EFH and, therefore, require consultation with NMFS. BOEM consulted with NMFS regarding the impacts of the proposed action on EFH. BOEM determined that the proposed action would not significantly affect the quality and quantity of EFH. On July 11, 2016, NMFS provided comments on the EA and recommended that BOEM coordinate with NMFS in the review of site specific SAP and/or COP survey plans, and actual SAPs. Because of the programmatic nature of the EFH assessment, NMFS elected not to provide any specific EFH conservation measures until site-specific plans are received.

5.3.3 Coastal Zone Management Act

The Coastal Zone Management Act requires that federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of a state's federally approved coastal management program (15 CFR 930, Subpart C). If an activity will have direct, indirect, or cumulative effects, the activity is subject to a federal Consistency Determination (CD).

BOEM has determined that New Jersey and New York share common coastal management issues and have similar enforceable policies as identified by their respective coastal zone management plans. Given the proximity of the WEA to each state, the similarity of the reasonably foreseeable activities for the WEA, and the similarity of impacts on environmental and socioeconomic resources and uses within each state, BOEM prepared a single CD under 15 CFR 930.36(a). BOEM determined that issuing a lease and approving site assessment activities (including the installation, operation, and decommissioning of a meteorological tower and/or buoys) in the WEA is consistent to the maximum extent practicable with the enforceable policies of the coastal zone management plans of New Jersey and New York. BOEM submitted the CD to the states of New Jersey and New York on June 6, 2016. The EA provided the comprehensive data and information required under 30 CFR 939.39 to support BOEM's CD.

On August 4, 2016, BOEM received the State of New Jersey's conditional concurrence with BOEM's finding that the issuing a lease and approving site assessment activities in the New York WEA is consistent to the maximum extent practicable with the enforceable policies of the coastal zone management plans of New Jersey. The State of New Jersey placed the following conditions on their concurrence:

- BOEM and any lessee to the WEA shall adhere to the Programmatic Agreement (see Section 5.3.4 for more information about the Programmatic Agreement); and
- The CD shall not affect any future review by the NJDEP of any commercial wind power facility nor should this CD be constructed as an endorsement of any future facility.

On August 15, 2016, BOEM received the State of New York's concurrence with BOEM's finding that the issuing a lease and approving site assessment activities in the New York WEA is consistent to the maximum extent practicable with the enforceable policies of the coastal zone management plan of New York. The State of New York requested the ability to review a lessee's SAP prior to BOEM approval to determine if it proposes activities that will cause an effect on any New York State coastal use or resource that is substantially different from those addressed within the CD. If an eventual lessee submits a SAP, and it shows changes in impacts from those previously considered in the CD, BOEM may require the lessee to submit a consistency certification in accordance with 15 CFR part 930 subpart D.

5.3.4 National Historic Preservation Act

Section 106 of the NHPA (54 U.S.C. § 306108) and its implementing regulations (36 CFR 800) require federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. BOEM has determined that its issuance of a commercial lease and approval of a SAP constitute undertakings subject to Section 106 review. These undertakings have the potential to cause effects on historic properties insofar as these actions may lead to a lessee conducting geotechnical testing and installing and operating site assessment facilities (e.g., a meteorological tower and/or buoys).

BOEM has executed a Programmatic Agreement pursuant to 36 CFR § 800.14(b) to fulfill its obligations under Section 106 of the NHPA for renewable energy activities on the OCS offshore New York and New Jersey. The agreement has been developed for two primary reasons: 1) the bureau's decisions to issue leases and approve SAPs, COPs, or other plans are complex and multiple; and 2) BOEM will not have the results of archaeological surveys prior to the issuance of leases and, as such, will be conducting historic property identification and evaluation efforts in phases (36 CFR § 800.4(b)(2)). The Programmatic Agreement establishes the process to determine and document the area of potential effects for each undertaking; to identify historic properties within the area of potential effects; to assess potential adverse effects; and to avoid, reduce, or resolve any such effects through the process set forth in the Programmatic Agreement. The Programmatic Agreement was executed June 3, 2016 among BOEM, the SHPOs of New York and New Jersey, and the ACHP.

BOEM initiated Section 106 consultation for the undertaking of issuing a commercial lease within the New York WEA June 27, 2016. BOEM initiated consultation through letters of invitation to the New York and New Jersey SHPOs, and ACHP as signatories to the agreement, as well as to the Shinnecock Indian Nation and NPS. BOEM additionally contacted representatives of local governments, state recognized tribes, and federally recognized tribes to solicit information on historic properties and to determine their interest in participating as consulting parties (Table 5–2).

On August 9, 2016, BOEM made a *Finding of No Historic Properties Affected for the undertaking of issuing a commercial lease within the New York WEA* (Finding). The Finding is based on the review conducted by BOEM of existing and available information, consultation with interested and affected parties, and the conclusions drawn from this information. The required historic property identification and avoidance measures that will be included in a commercial lease issued within the New York WEA will ensure that the proposed undertaking will not affect historic properties (Section 4.4.3.1). BOEM shared the Finding and supporting documentation with the consulting parties, and made the Finding available for public inspection on its website at: http://www.boem.gov/Renewable-Energy/Historic-Preservation-Activities/.

Table 5–2
Entities Solicited for Information and Concerns Regarding Historic Properties and the Proposed Undertaking

SHPOs

New Jersey	New York		

Federally Recognized Tribes

Delaware Nation	Mohegan Indian Tribe of Connecticut	Shinnecock Indian Nation	Stockbridge Munsee Community

Other Federal Agencies

National Park Service, Northeast Region			

State Recognized Tribes

Unkechaug Nation			

Local Governments

Borough of Queens, City of New York	Borough of Rumson, NJ	City of Asbury Park, NJ	City of Long Beach, NY
City of Long Branch, NJ	Monmouth County New Jersey	Nassau County New York	Suffolk County New York
Town of Brookhaven New York	Town of Hempstead New York	Town of Islip New York	

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7 PREPARERS

BOEM

NEPA Coordinator

Isis Johnson, NEPA Coordinator, Environmental Protection Specialist

Resource Scientists and Contributors

Michelle V. Morin, Chief, Environment Branch for Renewable Energy
Kyle Baker, Marine Biologist
David Bigger, Avian Biologist
Algene Byrum, Environmental Protection Specialist
Brandi Carrier, Archaeologist
Callie Hall, Oceanographer
William Hoffman, Archaeologist
Brian Hooker, Marine Biologist
Brian Krevor, Environmental Protection Specialist
Daniel O'Connell, Geotechnical Engineer
Desray Reeb, Marine Biologist
Ian Slayton, Physical Scientist
Amy Stillings, Industry Economist
Josh Wadlington, Geographer

Reviewers

BOEM, Office of Renewable Energy Programs

Andrew Krueger, Renewable Energy Program Specialist
Jennifer Golladay, Policy Analyst
Jennifer Miller, Geophysicist
Meghan Winands Araiza, Administrative Program Specialist

BOEM, Headquarters, Office of Environmental Programs

Brian Jordan, Chief, Branch of Environmental Consultation
Tamara Arzt, Environmental Protection Specialist
Stephanie Fiori, Environmental Protection Specialist
Kimberly Bittler, Oceanographer
Jennifer Bosyk, Biologist
Mary Cody, Marine Biologist
Jennifer Culbertson, Ph.D., Oceanographer
Deena Hansen, Oceanographer
Jacob Levenson, Marine Biologist
Douglas Piatkowski, Physical Scientist

Eric Wolvovsky, Meteorologist

DOI, Office of the Solicitor
Joshua Kaplowitz, Solicitor
Pedro Meléndez-Arreaga, Solicitor

URS Group, Inc.
Suzanne Richert, NEPA Specialist, Project Manager
Ida Namur, Senior Environmental Scientist, Project Director
Angela Chaisson, Principal NEPA Specialist, NEPA Technical Reviewer
Erica Antill, Environmental Scientist, Military Use, Infrastructure, Port Facilities
Louise Kling, Visual Resources Specialist, Visual Resources Assessment, Recreation
Vijay Apte, Principal Air Quality Scientist, Air Quality
Stephanie Liguori, Environmental Scientist, Air Quality
Jagadish Prakash, Socioeconomic Scientist, Demographics and Employment, Environmental Justice
Brian Coolidge, GIS Specialist, Figures
Jennifer Merritt, GIS Specialist, Figures
JB Pelletier, Principal Underwater Archaeologist
Young Cho, Formatting Specialist
Amy Siegel, Technical Editor

RPS ASA
Jill Rowe, Project Manager/Senior Biologist, and Internal Technical Reviewer
Paul Hall, Senior Project Manager, Water Quality
Zach Singer-Leavitt, Environmental Scientist, Benthic Resources
Alicia Morandi, Biologist, Coastal Habitats
Conor McManus, Biologist, Commercial and Recreational Fisheries

Normandeau Associates, Inc.
Eric Nestler, Principal Marine Ecologist, Project Manager/Internal Technical Reviewer
Greg Forcey, Senior Avian and Wildlife Ecologist, Birds/Internal Technical Reviewer
Paul Geoghegan, Senior Principal Fisheries Scientist, Fish/Internal Technical Reviewer
Robert Kenney, Senior Principal Marine Ecologist, Marine Mammals
Adam Kent, Senior Ornithologist, Birds
Ann Pembroke, Senior Principal Marine Ecologist, Marine Mammals and Sea Turtles/Internal Technical Reviewer
Deborah Rutecki, Senior Marine Ecologist, Finfish, Invertebrates, and Essential Fish Habitat
Christine Sutter, Senior Principal Bat Biologist, Bats/Internal Technical Reviewer
Melinda Sweeny, Senior Marine Ecologist, Marine Mammals and Sea Turtles
Julia Robinson Willmott, Senior Avian and Wildlife Ecologist, Bats

Appendix A
Announcement of Area Identification for Commercial Wind Energy Leasing on the Outer Continental Shelf Offshore New York

ANNOUNCEMENT OF AREA IDENTIFICATION

Commercial Wind Energy Leasing on the Outer Continental Shelf Offshore New York

March 16, 2016

Pursuant to 30 C.F.R. § 585.211(b), the Bureau of Ocean Energy Management (BOEM) has completed the Area Identification process to delineate a Wind Energy Area (WEA) offshore New York.

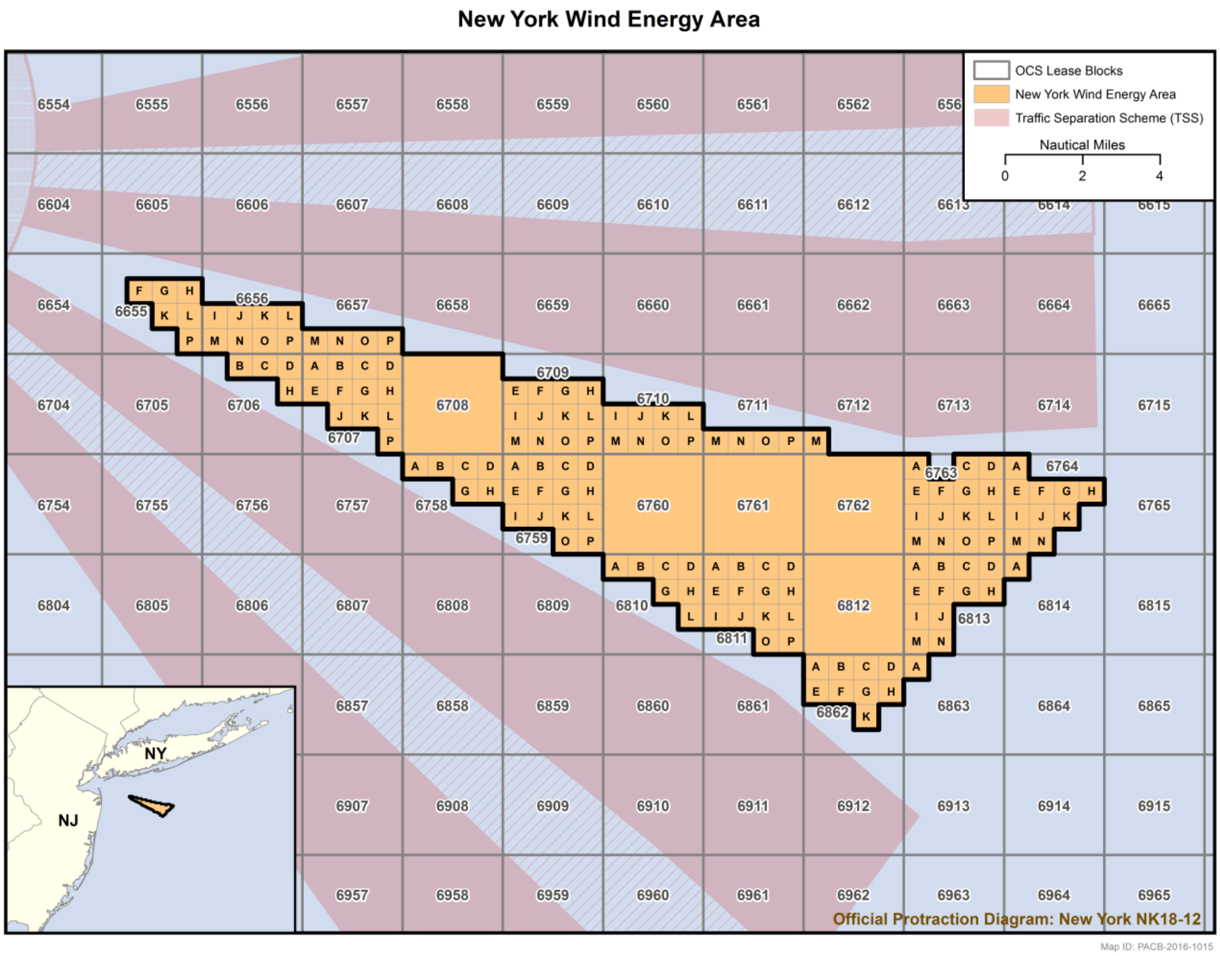
BOEM is announcing the New York WEA after concluding more than four years of review and consideration of the proposed area. The goal of BOEM's Area Identification process is to identify the offshore locations that appear most suitable for wind energy development. The New York WEA consists of five OCS blocks and 148 sub-blocks. It begins approximately 11 nautical miles (nmi) south of Long Beach, New York, and extends approximately 26 nmi southeast along its longest portion. The entire area is approximately 127 square miles, 81,130 acres, or 32,832 hectares.

The WEA being considered for leasing offshore New York is based upon an unsolicited lease application that BOEM received on September 8, 2011, from the New York Power Authority (NYPA). In that request, NYPA proposes to construct a 350-700 megawatt (MW) wind facility offshore Long Island. In analyzing this proposed area, BOEM published a Request for Interest (2013), a Call for Information and Nominations (2014), and a Notice of Intent to Prepare an Environmental Assessment (2014); held numerous stakeholder meetings; and worked with BOEM's New York Intergovernmental Renewable Energy Task Force to gather data and information about the area.

As a next step toward leasing the New York WEA, BOEM may publish a Proposed Sale Notice for public comment, which will describe the area being offered for leasing and the proposed terms and conditions of a wind energy auction. Then, upon considering public comments and completing the necessary environmental assessment (EA) and consultations, BOEM may publish a Final Sale Notice that announces the date, time, and specific conditions of the auction. BOEM expects the environmental review to be completed and the notices to be published later in 2016.

In BOEM's EA, conducted pursuant to the National Environmental Policy Act (NEPA), BOEM is only considering the issuance of a lease and approval of a site assessment plan for the New York WEA. BOEM is not considering, and the EA will not support, any decisions regarding the construction and operation of a wind energy facility. In the future, should a lessee propose to construct a commercial wind energy facility, the lessee will be required to submit a construction and operations plan for BOEM's review and approval. BOEM would then prepare a site-specific NEPA document and conduct necessary environmental consultations before making a final decision to approve the construction of the proposed project. As the process moves forward, BOEM will continue to analyze issues and work with stakeholders before a decision is made to authorize the development of a wind power facility offshore New York.

Figure 1. The New York Wind Energy Area



Appendix B
Standard Operating Conditions

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B. STANDARD OPERATING CONDITIONS FOR PROTECTED SPECIES

This section outlines and provides the substance of the standard operating conditions (SOCs) that are part of the proposed action (Alternative A) and action alterative (Alternative B), which minimize or eliminate potential impacts to protected species, including Endangered Species Act (ESA)-listed species of marine mammals and sea turtles.

These SOCs were developed by the Bureau of Ocean Energy Management (BOEM), and refined during previous consultations with the National Marine Fisheries Service (NMFS) under Section 7 of the ESA. Additional conditions and/or revisions to the conditions below may be developed as new information becomes available and during future consultation with NMFS.

B.1 GENERAL REQUIREMENTS

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 (PSOs). New personnel must be briefed as they join the work in progress.
2. The Lessee must ensure that all vessel operators and crew members, including PSOs, are familiar with, and understand, the requirements specified in Appendix B.
3. The Lessee must ensure that a copy of the SOCs (Appendix B) is made available on every project-related vessel.

B.1.1 Vessel Strike Avoidance Measures

The Lessee must ensure that all vessels conducting activity in support of a plan (i.e., Site Assessment Plan [SAP] and/or Construction and Operation Plan [COP]) submittal, including those transiting to and from local ports and the lease area, comply with the vessel strike avoidance measures specified below except under extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk.

1. The Lessee must ensure that vessel operators and crews maintain a vigilant watch for cetaceans, pinnipeds, and sea turtles, and slow down or stop their vessel to avoid striking protected species.
2. The Lessee must ensure that all vessel operators comply with 10 knot (18.5 kilometers per hour [km/hr]) speed restrictions in any Dynamic Management Area (DMA) within the project area.
3. The Lessee must ensure that vessels 19.8 meters (m; 65 feet [ft]) in length or greater, operating within the project area from November 1 through July 31, operate at speeds of 10 knots (18.5 km/hr) or less.
4. The Lessee must ensure that all vessel operators reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of non-delphinoid cetaceans are observed near an underway vessel.

5. North Atlantic right whales.

   a. The Lessee must ensure all vessels maintain a separation distance of 500 m (1,640 ft) or greater from any sighted North Atlantic right whale (NARW).

   b. The Lessee must ensure that the following avoidance measures are taken if a vessel comes within 500 m (1,640 ft) of any NARW:

      i. If underway, any vessel must steer a course away from any NARW at 10 knots (18.5 km/h) or less until the 500 m (1,640 f t) minimum separation distance has been established (unless [ii] below applies).

      ii. If a NARW is sighted within 100 m (328 ft) of an underway vessel, the vessel operator must immediately reduce speed and promptly shift the engine to neutral. The vessel operator must not engage the engines until the NARW has moved beyond 100 m (328 ft), at which point the vessel operator must comply with 5.b.i. above.

      iii. If a vessel is stationary, the vessel must not engage engines until the NARW has moved beyond 100 m (328 ft), at which point the Lessee must comply with 5.b.i. above.

6. Non-delphinoid cetaceans other than the North Atlantic right whale.

   a. The Lessee must ensure that all vessels maintain a separation distance of 100 m (328 ft) or greater from any sighted non-delphinoid cetacean.

   b. The Lessee must ensure that the following avoidance measures are taken if a vessel comes within 100 m (328 ft) of a non-delphinoid cetacean:

      i. If any non-delphinoid cetacean is sighted, the vessel underway must reduce speed and shift the engine to neutral, and must not engage the engines until the non-delphinoid cetacean has moved beyond 100 m (328 ft).

      ii. If a vessel is stationary, the vessel must not engage engines until the non-delphinoid cetacean has moved beyond 100 m (328 ft).

7. Delphinoid cetaceans and Pinnipeds.

   a. The Lessee must ensure that all vessels underway do not divert to approach any delphinoid cetacean and/or pinniped.

   b. The Lessee must ensure that all vessels maintain a separation distance of 50 m (164 ft) or greater from any sighted delphinoid cetacean or pinniped, except if the delphinoid and/or pinniped approach the vessel, then refer to 7.c. below.

   c. The Lessee must ensure that if a delphinoid cetacean and/or pinniped approaches any vessel underway, the vessel underway must avoid excessive speed or abrupt changes in direction to avoid injury to the delphinoid cetacean and/or pinniped.

8. Sea Turtles.

   a. The Lessee must ensure that all vessels maintain a separation distance of 50 m (164 ft) or greater from any sighted sea turtle.

B.2 MARINE TRASH AND DEBRIS PREVENTION

Marine debris prevention measures are intended to reduce the risk marine debris poses to protected species from ingestion and entanglement. These simple measures will reduce the potential for debris ending up in the marine environment.

The Lessee must ensure that vessel operators, employees, and contractors actively engaged in activity in support of plan (i.e., SAP and/or COP) submittal are briefed on marine trash and debris awareness and elimination, as described in the Bureau of Safety and Environmental Enforcement (BSEE) Notice to Lessee (NTL) No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination") or any NTL that supersedes this NTL, except that the Lessor will not require the Lessee, vessel operators, employees, and contractors to undergo formal training or post placards. The Lessee must ensure that these vessel operator employees and contractors are made aware of the environmental and socioeconomic impacts associated with marine trash and debris, and their responsibilities for ensuring that trash and debris are not intentionally or accidentally discharged into the marine environment. The above-referenced NTL provides information the Lessee may use for this awareness training.

B.3 GEOLOGICAL AND GEOPHYSICAL (G&G) SURVEY REQUIREMENTS

The Lessee must ensure that all vessels conducting activity in support of a plan (i.e., SAP and/or COP) submittal comply with the geological and geophysical (G&G) survey requirements specified below except under extraordinary circumstances when complying with these requirements would put the safety of the vessel or crew at risk.

1. Visibility. The Lessee must not conduct G&G surveys in support of plan (i.e., SAP and/or COP) submittal at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevent visual monitoring of the exclusion zones for high-resolution geophysical (HRG) surveys and geotechnical surveys as specified below. This requirement may be modified as specified below.
2. Modification of Visibility Requirement. If the Lessee intends to conduct G&G survey operations in support of plan submittal at night or when visual observation is otherwise impaired, the Lessee must submit an alternative monitoring plan detailing the alternative monitoring methodology (e.g., active or passive monitoring technologies) to the Lessor for approval. The alternative monitoring plan must demonstrate the effectiveness of the methodology proposed to the Lessor's satisfaction. The Lessor may, after consultation with NMFS, decide to approve or disapprove the alternative monitoring plan.
3. Protected Species Observer. The Lessee must ensure that the exclusion zone for all G&G surveys performed in support of plan (i.e., SAP and/or COP) submittal is monitored by NMFS-approved PSOs around the sound source. The number of PSOs must be sufficient to effectively monitor the exclusion zone at all times. In order to ensure effective monitoring, PSOs must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch, unless otherwise accepted by the Lessor. PSOs must not work for more than 12 hours of any 24-hour period. PSO reporting requirements are provided in Section B.7. Prior to the scheduled start of the surveys performed in support of plan submittal, the Lessee must provide to the Lessor a list of PSOs currently approved by NMFS for G&G surveys. For PSOs not currently approved by NMFS, the Lessee must provide to the Lessor

PSO résumés, no later than 45 calendar days prior to the scheduled start of such surveys. If additional PSO approvals are required after this time, the Lessee must provide the additional résumés to the Lessor at least 15 calendar days prior to each PSO's start date. The Lessor will send the PSO résumés to NMFS for approval.

4. Observation Location. The Lessee must ensure that monitoring occurs from the highest available vantage point on the associated operational platform and allows for 360-degree scanning.

5. Optical Device Availability. The Lessee must ensure that reticle binoculars and other suitable equipment are available to each PSO to adequately perceive and monitor protected marine species within the exclusion zone during surveys conducted in support of plan (i.e., SAP and/or COP) submittal.

B.3.1 High Resolution Geophysical Survey Requirements

The following requirements will apply to all HRG surveys conducted in support of plan (i.e., SAP and/or COP) submittal where one or more acoustic sound sources are operating at frequencies below 200 kilohertz (kHz).

1. Establishment of Default HRG Survey Exclusion Zone. The Lessee must ensure a 200- m radius exclusion zone for marine mammals and sea turtles. In the case of the NARW, the minimum separation distance of 500 m (1,640 ft), as required under B.1.1, must be observed.
   a. The Lessee may not use HRG survey devices that emit sound levels that exceed the 180-dB Level A harassment radius (200-m) boundary without approval by the Lessor.
   b. If the Lessor determines that the exclusion zone does not encompass the 180-dB Level A harassment radius, the Lessor may impose additional, relevant requirements on the Lessee including, but not limited to, required expansion of this exclusion zone.

2. Field Verification of HRG Survey Exclusion Zone. The Lessee must submit field results to verify the exclusion zone for the HRG survey equipment operating at frequencies below 200 kHz. If no applicable data are available, the Lessee must conduct field verification of the exclusion zone for HRG survey equipment operating below 200 kHz. As part of such field verification, the Lessee must take acoustic measurements at a minimum of two reference locations and in a manner that is sufficient to establish the following: source level (Peak, SEL, and RMS sound levels at 1 meter), pattern of spreading loss, and the sound-exposure distance for ear injury for each marine mammal hearing group, sea turtles, and fish. The distance to the 166, 160, and 150 dB RMS behavioral thresholds (Level B harassment) must also be reported. The first location must be at a distance of 200 m from the sound source, and the second location must be as close to the sound source as technically feasible. The Lessee must take such sound measurements at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 m [3.28 ft] above the seafloor). Sound pressure levels must be measured in the field in dB re 1 μPa (RMS) and reported by the Lessee to the Lessor and NMFS (per Section B.7.3).

3. Modification of Exclusion Zone Per Lessee Request. The Lessee may use the field verification results to request modification of the exclusion zone for the specific HRG survey equipment under consideration. The Lessee must base any proposed new exclusion

zone radius on the largest safety zone configuration of the target 160 dB threshold zone as defined by NMFS. The Lessee must use this modified zone for all subsequent use of field-verified equipment. The Lessee may periodically reevaluate the modified zone using the field verification procedures described in B.3.1.2. The Lessee must obtain Lessor approval of any new exclusion zone before it is implemented.

4. Clearance of HRG Survey Exclusion Zone. The Lessee must ensure that active acoustic sound sources must not be activated until the PSO has reported the exclusion zone clear of all marine mammals and sea turtles for at least 60 minutes.

5. HRG Survey Mid-Atlantic Seasonal Management Areas Right Whale Monitoring. The Lessee must ensure that between November 1 and April 30, vessel operators monitor NMFS North Atlantic Right Whale reporting systems (e.g., the Early Warning System, Sighting Advisory System, and Mandatory Ship Reporting System) for the presence of NARWs during HRG survey operations.

6. Dynamic Management Area Shutdown Requirement. The Lessee must cease HRG survey activities within 24 hours of NMFS establishing a DMA in the HRG survey area. The Lessee may resume HRG surveys as soon as the DMA has expired.

7. Electromechanical Survey Equipment “Ramp Up”. The Lessee must ensure that, when technically feasible, a “ramp up” of the electromechanical survey equipment occurs at the start or re-start of HRG survey activities. A ramp up must begin with the power of the smallest acoustic equipment for the HRG survey at its lowest power output. The power output must be gradually turned up and other acoustic sources added in a way such that the source level would increase in steps not exceeding 6 dB per 5-minute period.

8. Shutdown for Non-Delphinoid Cetaceans and Sea Turtles. The Lessee must ensure that any time a non-delphinoid cetacean or sea turtle is sighted at or within the exclusion zone, the PSO will notify the Resident Engineer, or other authorize individual, and call for a shutdown of the electromechanical survey equipment. The vessel operator must comply immediately with such a call by the PSO. Any disagreement or discussion must occur only after shutdown. Subsequent restart of the electromechanical survey equipment may only occur following clearance of the exclusion zone (per Section B.3.1.4) and implementation of ramp up procedures (per Section B.3.1.7).

9. Power Down for Delphinoid Cetaceans and Pinnipeds. The Lessee must ensure that any time a delphinoid cetacean or pinniped is observed within the exclusion zone, the PSO will notify the Resident Engineer, or other authorized individual, and call for a power down of the electromechanical survey equipment to the lowest power output that is technically feasible. The vessel operator must comply immediately with such a call by the PSO. Any disagreement or discussion must occur only after power down. Subsequent power up of the electromechanical survey equipment must use the ramp up provisions described in Section B.3.1.7 and may occur after: (1) the exclusion zone is clear of delphinoid cetaceans and pinnipeds; or (2) a determination by the PSO after a minimum of 10 minutes of observation that the delphinoid cetacean or pinniped is approaching the vessel or towed equipment at a speed and vector that indicates voluntary approach to bow-ride or chase towed equipment.

10. Pauses in Electromechanical Survey Sound Source. If the electromechanical sound source shuts down for reasons other than encroachment into the exclusion zone by a non-delphinoid

cetacean or sea turtle, (for instance, mechanical or electronic failure), resulting in the cessation of the sound source for a period greater than 20 minutes, the Lessee must ensure that restart of the electromechanical survey equipment commences only after clearance of the exclusion zone (per Section B.3.1.4) and implementation of ramp-up procedures (per Section B.3.1.7). If the pause is 20 minutes or less, the equipment may be restarted as soon as practicable at its operational level as long as the Lessee has continued visual surveys diligently throughout the silent period and the exclusion zone remained clear of all marine mammals and sea turtles. If visual surveys were not continued diligently during the pause of 20 minutes or less, the Lessee must restart the electromechanical survey equipment following clearance of the exclusion zone (per Section B.3.1.4) and implementation of ramp-up procedures (per Section B.3.1.7).

B.3.2 Geotechnical Exploration Requirements

The following requirements will apply to geotechnical exploration limited to borings and vibracores and conducted in support of plan (i.e., SAP and/or COP) submittal.

1. Establishment of Default Exclusion Zone. The Lessee must ensure that a PSO monitors the 200-m (656-ft) radius exclusion zone for all marine mammals and sea turtles around any vessel conducting geotechnical surveys.

2. Modification of Default Geotechnical Exclusion Zone Per Lessee Request. If the Lessee wishes to modify the 200-m (656-ft) default exclusion zone for specific geotechnical exploration equipment, the Lessee must submit a plan for verifying the sound source levels of the specific geotechnical exploration equipment to the Lessor. The plan must demonstrate how the field verification activities will comply with the requirements in Section B.3.2.3. The Lessor may require that the Lessee modify the plan to address any comments the Lessor submits to the Lessee on the contents of the plan in a manner deemed satisfactory to the Lessor prior to the commencement of field verification activities. Any new exclusion zone radius proposed by the Lessee must be based on the largest safety zone configuration of the target Level A or Level B harassment acoustic threshold zone as defined by NMFS. The Lessee must use this modified zone for all subsequent use of field-verified equipment. The Lessee may periodically reevaluate the modified zone using the field verification procedures (per Section B.3.2.3). The Lessee must obtain Lessor approval of any new exclusion zone before it is implemented.

3. Field Verification of Geotechnical Exclusion Zone. If the Lessee wishes to modify the existing exclusion zone, the Lessee must submit the results to verify the exclusion zone for the specific active geotechnical sound sources operating below 200 kHz. The Lessee must use the results to establish a new exclusion zone. If no applicable data are available, the Lessee must conduct field verification of the exclusion zone for the specific active geotechnical sound sources being used. As part of such field verification, the Lessee must take acoustic measurements at a minimum of two reference locations and in a manner that is sufficient to establish the following: source level (Peak, SEL, and RMS sound levels at 1 meter), pattern of spreading loss, and the sound exposure distance for ear injury for each marine mammal hearing group, sea turtles, and fish. The distance to the 166, 160, and 150 dB RMS behavioral thresholds (Level B harassment) must also be reported. The first location must be at a distance of 200 m from the sound source and the second location must be as close to the sound source as technically feasible. The Lessee must take these sound

measurements at the reference locations at two depths (i.e., a depth at mid-water and a depth at approximately 1 m above the seafloor). The Lessee must use the results to establish a new exclusion zone, which may be greater than or less than the 200 meter (656 ft) default exclusion zone. Sound pressure levels must be measured in the field in dB re 1 μPa (RMS) and reported by the Lessee to the Lessor and NMFS (per Section B.7.10).

4. Clearance of Geotechnical Exclusion Zone. The Lessee must ensure that geotechnical sound sources must not be activated until the PSO has reported the exclusion zone clear of all marine mammals and sea turtles for at least 60 minutes.

5. Shutdown for Non-Delphinoid Cetaceans and Sea Turtles. The Lessee must ensure that any time a marine mammal or sea turtle is observed within the exclusion zone, the PSO will notify the Resident Engineer (or other authorized individual) and call for a shutdown of the geotechnical survey equipment. Any disagreement or discussion should occur only after shutdown, unless such discussion relates to the safety of the timing of the cessation of the geotechnical activity. Subsequent restart of the geotechnical survey equipment may only occur following clearance of the exclusion zone (per Section B.3.2.4).

6. Pauses in Geotechnical Exploration Sound Source. The Lessee must ensure that if the geotechnical sound source shuts down for reasons other than encroachment into the exclusion zone by a non-delphinoid cetacean or sea turtle (for instance, mechanical or electronic failure) resulting in the cessation of the sound source for a period greater than 20 minutes, the Lessee must ensure that restart of the geotechnical survey equipment commences only after clearance of the exclusion zone (per Section B.3.2.4.). If the pause is 20 minutes or less, the equipment may be restarted as soon as practicable at its operational level as long as visual surveys were continued diligently throughout the silent period and the exclusion zone remained clear of marine mammals and sea turtles. If visual surveys were not continued diligently during the pause of 20 minutes or less, the Lessee must restart the geotechnical survey equipment following clearance of the exclusion zone (per Section B.3.2.4).

B.4 CONSTRUCTION OF A METEOROLOGICAL TOWER

BOEM has developed SOCs that would be required during meteorological tower installation by a lessee. These SOCs would minimize or eliminate potential impacts to protected species including ESA-listed species of marine mammals and sea turtles. These SOCs were developed by BOEM and refined during consultations under Section 7 of the ESA with NMFS and may be revised as additional information becomes available.

The exclusion zone during pile driving is based upon the updated NMFS acoustic guidance for the onset of PTS for impact pile driving activities. The exact size of the exclusion zone will be determined upon BOEM’s review of a complete SAP. The following outlines the SOCs that BOEM will require to minimize or eliminate potential impacts on marine mammals.

1. Visibility. The Lessee must not conduct pile driving for a meteorological tower foundation at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevents visual monitoring of the exclusion zones for meteorological tower foundation pile driving as specified below. This requirement may be modified as specified below.

2. Modification of Visibility Requirement. If the Lessee intends to conduct pile driving for a meteorological tower foundation at night or when visual observation is otherwise impaired, an alternative monitoring plan detailing the alternative monitoring technologies (e.g., active or passive acoustic monitoring technologies) must be submitted to BOEM. The alternative monitoring plan must demonstrate the effectiveness of the methodology proposed to BOEM's satisfaction. BOEM may, after consultation with NMFS, decide to approve, approve with conditions, or disapprove the alternative monitoring plan.

3. Continuation of Pile Driving After Daylight Hours. If the driving of a pile commenced during daylight hours, then the Lessee may complete driving that pile after daylight hours. However, the Lessee may not start driving a new pile after daylight hours, unless allowed to pursuant to an alternative monitoring plan as described in B.4.2.

4. Protected Species Observer. The Lessee must ensure that the exclusion zone for all pile driving for a meteorological tower foundation is monitored by NMFS-approved PSOs around the sound source. The number of PSOs must be sufficient to effectively monitor the exclusion zone at all times. In order to ensure effective monitoring, PSOs must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch, unless otherwise accepted by BOEM. PSOs must not work for more than 12 hours of any 24-hour period. PSO reporting requirements are provided in Section B.7. Prior to the scheduled start of the surveys performed in support of plan submittal, the Lessee must provide to the Lessor a list of PSOs currently approved by NMFS for G&G surveys. For PSOs not currently approved by NMFS, the Lessee must provide to the Lessor PSO résumés, no later than 45 calendar days prior to the scheduled start of such surveys. If additional PSO approvals are required after this time, the Lessee must provide the additional résumés to the Lessor at least 15 calendar days prior to each PSO's start date. The Lessor will send the PSO résumés to NMFS for approval.

5. Observation Location. The Lessee must ensure that monitoring occurs from the highest available vantage point on the associated operational platform and allows for 360-degree scanning.

6. Optical Device Availability. The Lessee must ensure that reticle binoculars and other suitable equipment are available to each PSO to adequately perceive and monitor protected species within the exclusion zone during construction activities.

7. Limitations on Pile Driving. The Lessee must ensure that no pile driving activities occur from November 1–April 30, or within an active DMA, as established by NMFS. Any pile driving activities outside of the DMA are required to remain beyond 1 km of the boundaries of the DMA.

8. Establishment of Exclusion Zone. The Lessee must ensure the establishment of a default radius exclusion zone for marine mammals and sea turtles around each impact pile driving site. The exclusion zone must be effectively monitored and may require monitoring from two locations. At least two PSOs on simultaneous watch must be based at or near the sound source and will be responsible for monitoring out from the sound source. If necessary, at least two additional PSOs on simultaneous watch will be located on a separate vessel navigating at the boundary of the exclusion zone, around the impact pile driving site, and will be responsible for monitoring the area between the boundary and approximately halfway to the sound source.

9. Field Verification of Exclusion Zone. The Lessee must submit results to verify the cumulative sound exposure distance for PTS during pile driving activities. If no applicable data are available, the Lessee must conduct acoustic monitoring of pile driving activities during the installation of each pile. The Lessee must take acoustic measurements during the driving of the last half (deepest pile segment) for any given open water pile. As part of such field verification, the Lessee must take acoustic measurements at a minimum of two reference locations that would be sufficient to establish the following: source level (Peak, SEL, and RMS sound levels at 1 meter), pattern of spreading loss, and the sound exposure distance for ear injury for each marine mammal hearing group, sea turtles, and fish. The distance to the 166, 160, and 150 dB RMS behavioral thresholds (Level B harassment) must also be reported. The first location must be at a distance of 200 m from the sound source and the second location must be as close to the sound source as technically feasible. Such sound measurements must be taken at the reference locations at two depths (i.e., a depth at midwater and a depth at approximately 1 m above the seafloor). SPLs must be measured in the field in dB re 1 μPa (RMS) and reported by the Lessee to BOEM and NMFS (per Section B.7.5). The Lessee must report the azimuthal bearing from the central pile to the receivers. Additionally, the Lessee must record the bearings from the central caisson to the strike surfaces of each brace pile, as well as the bearing from the central caisson to where each brace pile enters the ocean floor.

10. Modification of Exclusion Zone. The Lessee must submit results of the acoustic monitoring for field verification of the exclusion zone to BOEM (per Section B.7.3). Based on the results of this field verification:

    a. If the exclusion zone does not encompass the cumulative sound exposure distance for PTS for each marine mammal hearing group (per Section B.7.6), BOEM may impose additional, relevant requirements on the Lessee, including but not limited to, the implementation of a sound reduction system. Field verification would be required for any sound reduction system per Section B.7.5.

    b. If multiple piles are being driven, the Lessee may modify the default exclusion zone for pile driving activities. The Lessee should use the results of its field verification in establishing any new exclusion zone, regardless of whether it is greater than or less than the default exclusion zone. Any new exclusion zone radius must be based on the average SEL measurement (SEL_{50}) obtained from field verification. The new exclusion zone must minimize the risk of PTS for the most sensitive species in the project area. The Lessee must obtain BOEM's approval for any new exclusion zone before it may be implemented.

11. Clearance of Exclusion Zone. The Lessee must ensure that visual monitoring of the exclusion zone begins no less than 60 minutes prior to the start of any pile driving operations, and continues for at least 60 minutes after pile driving operations cease, unless sighting conditions do not allow observation of the sea surface (e.g., fog, rain, darkness) (per Sections B.4.1. and B.4.2. above). If a marine mammal or sea turtle is observed, the PSO must note and monitor the position, relative bearing, and estimated distance to the animal, until the animal dives or moves out of visual range of the observer. The PSO must continue to watch for additional animals that may surface in the area. The Lessee must ensure that pile driving operations do not begin until the PSO has reported the exclusion zone clear of all marine mammals and sea turtles for at least 60 minutes.

12. Implementation of "Soft Start". The Lessee must ensure that a "soft start" be implemented at the beginning of each pile installation in order to provide additional protection to marine mammals and sea turtles near the project area by allowing them to vacate the area prior to the commencement of pile driving activities. The Lessee must ensure the following at the beginning of all in-water pile driving activities or when pile driving has ceased for 1 hour or more: the impact hammer soft start requires three strike sets, with a 1-minute wait period between each strike set; the initial strike set will be at approximately 10 percent energy, the second strike set at approximately 25 percent energy and the third strike set at approximately 40 percent energy; and the soft start procedure must not be less than 20 minutes. Strikes may continue at full operational power following the soft start period.

13. Shutdown for Marine Mammals and Sea Turtles. The Lessee must ensure that any time a marine mammal or sea turtle is observed within the exclusion zone, the PSO will notify the Resident Engineer (or other authorized individual) and call for a shutdown of pile driving activity. Any disagreement or discussion should occur only after shutdown, unless such discussion relates to the safety of the timing of the cessation of the pile driving activity. Subsequent restart of the pile driving equipment may only occur following clearance of the exclusion zone of any marine mammal or sea turtle for 60 minutes. Thereafter the Lessee must undertake a soft start prior to proceeding with pile driving operations (per Section B.4.12).

14. Pauses in Pile Driving Activity. The Lessee must ensure that visual surveys are continued diligently during any pause in pile driving activity. If visual surveys are not able to be continued diligently during any pause in pile driving activity due to diminished lighting or weather conditions (e.g., darkness, rain, fog, sea state), the Lessee must restart the pile driving activity following clearance of the exclusion zone (per Section B.4.11) and implementation of soft start procedures (per Section B.4.12). If pile driving activity shuts down for reasons other than encroachment into the exclusion zone by a non-delphinoid cetacean or sea turtle (for instance, mechanical or electronic failure), resulting in the cessation of the sound source for a period of 60 minutes or more, the Lessee must ensure that restart of the pile driving activity commences only after clearance of the exclusion zone (per Section B.4.11) and implementation of soft start procedures (per Section B.4.12).

B.5 DYNAMIC POSITIONING THRUSTER USE

1. Visibility. The Lessee must not conduct operations using Dynamic Positioning (DP) thrusters for a meteorological tower foundation at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevents visual monitoring of the monitoring zone for DP thruster use as specified below. This requirement may be modified as specified below.

2. Establishment of Default Monitoring Zone. In order to minimize potential entrainment and/or acoustic impacts, the Lessee must ensure the establishment of a 100-m radius monitoring zone for marine mammals and sea turtles. The Lessee must ensure that the monitoring zone is established and maintained from when DP thrusters are engaged, throughout the construction activity, and until the DP thrusters are disengaged.

3. Clearance of DP Thruster Monitoring Zone. The Lessee must ensure that DP thrusters must not be activated until the PSO has reported the monitoring zone clear of all marine mammals and sea turtles for at least 60 minutes.

4. Field Verification of Monitoring Zone. The Lessee must submit results to verify the cumulative sound exposure distance for PTS during DP thruster activities. If no applicable data is available, the Lessee must conduct acoustic field verification of DP thrusters (per Section B.7.2). The Lessee must take acoustic measurements sufficient to establish the following: source level (Peak, SEL, and RMS sound levels at 1 meter), pattern of spreading loss, and the sound exposure distance for ear injury and behavioral harassment thresholds for each marine mammal hearing group, sea turtles, and fish. Sound pressure levels must be reported by the Lessee to BOEM and NMFS (per Section B.7.4).

5. Modification of Monitoring Zone. The Lessee must submit results of the acoustic monitoring for field verification of the monitoring zone to BOEM (per Section B.7.4). If the results indicate that the monitoring zone does not encompass the cumulative sound exposure distance for PTS for each marine mammal hearing group (per Section B.7.6), BOEM may impose additional, relevant requirements on the Lessee, including but not limited to, a requirement to expand this monitoring zone.

6. Protected Species Observer. The Lessee must ensure that the monitoring zone during DP thruster use is monitored by NMFS-approved PSOs around the sound source. The number of PSOs must be sufficient to effectively monitor the monitoring zone at all times. In order to ensure effective monitoring, PSOs must not be on watch for more than 4 consecutive hours, with at least a 2-hour break after a 4-hour watch, unless a different schedule is approved by BOEM. PSOs must not work for more than 12 hours in a 24-hour period. PSO reporting requirements are provided in Section B.7. Prior to the scheduled start of the surveys performed in support of plan submittal, the Lessee must provide to the Lessor a list of PSOs currently approved by NMFS for G&G surveys. For PSOs not currently approved by NMFS, the Lessee must provide to the Lessor PSO résumés, no later than 45 calendar days prior to the scheduled start of such surveys. If additional PSO approvals are required after this time, the Lessee must provide the additional résumés to the Lessor at least 15 calendar days prior to each PSO's start date. The Lessor will send the PSO résumés to NMFS for approval.

6. Observation Location. The Lessee must ensure that monitoring occurs from the highest available vantage point on the associated operational platform and allows for 360-degree scanning.

7. Optical Device Availability. The Lessee must ensure that reticle binoculars and other suitable equipment are available to each PSO to adequately perceive and monitor protected marine species within the monitoring zone during DP thruster use.

8. Mid-Atlantic Seasonal Management Areas Right Whale Monitoring. The Lessee must ensure that between November 1 and April 30, vessel operators monitor NMFS North Atlantic Right Whale reporting systems (e.g., the Early Warning System, Sighting Advisory System, and Mandatory Ship Reporting System) for the presence of NARWs during DP thruster operations.

9. DP Thruster “Ramp Up”. The Lessee must ensure that, when technically feasible, a “ramp up” of the DP thrusters occurs at the start or re-start of DP thruster use. The ramp up must

begin with the power output gradually increased such that power output begins at the minimum output possible and doubles in 5-minute periods, once the monitoring zone is clear of any marine mammal and/or sea turtle for at least 60 minutes.

10. Implementation of Power Down for Marine Mammals and Sea Turtles. The Lessee must ensure that any time a marine mammal or sea turtle is observed within the monitoring zone, the PSO notifies the Resident Engineer, or other authorized individual. The PSO must then call for a power down of the DP thrusters, as long as such a power down would be technically feasible and would not cause damage to equipment and facilities being installed. Power down of the DP thrusters to the minimum output possible must occur as soon as it is safe to do so. Any disagreement or discussion should occur only after power down, unless such discussion relates to the safety of the timing of the power down of the DP thrusters. Following the clearance of the monitoring zone (per Section B.5.3.), the Lessee must follow ramp up procedures (per Section B.5.9.) in order to power up the DP thrusters to full operational power.

B.6 STANDARD OPERATING CONDITIONS FOR BIRDS

The following SOCs are intended to ensure that the potential for adverse impacts on birds is minimized, if not eliminated. These SOCs are considered part of the proposed action and will be incorporated as stipulations to any future lease:

1. The lessee will use only red flashing strobe-like lights for aviation obstruction lights, and must ensure that these aviation obstruction lights emit infrared energy within 675-900 nanometers wavelength to be compatible with Department of Defense night vision goggle equipment. These aviation obstruction lights shall also emit infrared energy within 675-900 nanometers wavelength to be compatible with Department of Defense night vision goggle equipment.
2. Any lights used to aid marine navigation by the lessee during construction, operations, and decommissioning of a meteorological tower or buoys must meet U.S. Coast Guard requirements for private aids to navigation, available at: https://www.uscg.mil/forms/cg/CG_2554.pdf.
3. For any additional lighting not described in (1) or (2) above, the lessee must use such lighting only when necessary, and the lighting must be hooded downward and directed when possible, to reduce upward illumination, and illumination of adjacent waters.
4. A meteorological tower would be designed so as to preclude the necessity for guy wires, which present the birds with something difficult to see that they could potentially collide with.
5. An annual report shall be provided to BOEM and USFWS documenting any dead birds or bats found on structures, as well as during surveys, construction, operations, and decommissioning. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with Federal or research bands must be reported to the U.S. Geological Society Bird Band Laboratory, available at: https://www.pwrc.usgs.gov/bbl/.
6. Anti-perching devices must be installed on the meteorological tower and buoys in order to minimize the attraction of birds.

B.7 PROTECTED SPECIES REPORTING REQUIREMENTS

The Lessee must ensure compliance with the following reporting requirements for site characterization activities performed in support of plan (i.e., SAP and/or COP) submittal and must use the contact information provided, or updated contact information as provided by BOEM, to fulfill these requirements:

1. G&G Plan for Field Verification of the Exclusion Zone. No later than 45 days prior to the commencement of the field verification activities, the Lessee must submit a plan to BOEM for verifying the sound source levels of any G&G survey equipment operating at frequencies below 200 kHz. The Lessee must obtain BOEM's approval of the plan prior to conducting field verification activities.
2. DP Thruster Plan for Field Verification of the Monitoring Zone. No later than 45 calendar days prior to the commencement of the required DP thruster field verification activities, the Lessee must submit a plan to BOEM for verifying the sound source levels of DP thrusters. The Lessee must obtain BOEM's approval of the plan prior to conducting field verification activities.
3. Preliminary Report from the Field Verification of HRG Survey Equipment. The Lessee must ensure that the results of the field verification are reported to BOEM and NMFS prior to the HRG equipment being used for project-related activities. The Lessee must include in its report a preliminary interpretation of the results for all sound sources, which will include details of the operating frequencies, SPLs (RMS), received cSELs, and frequency bands covered, as well as associated latitude/longitude positions, ranges, depths, and bearings between sound sources and receivers.
4. Field Verification of Monitoring Zone Reporting for DP Thruster Use. The Lessee must report the results of the DP thruster use field verification to BOEM within 7 calendar days of the commencement of the field verification activities. The Lessee must include in its report a preliminary interpretation of the results for DP thruster use, which will include details of the operating frequencies, sound pressure levels (RMS), received cSELs, and frequency bands covered, as well as associated latitude/longitude positions, ranges, depths, and bearings between sound sources and receivers.
5. Acoustic Monitoring Reporting and Field Verification of Exclusion Zone Reports for Pile Driving. The Lessee must ensure that the preliminary results of acoustic monitoring of the first pile for a multiple pile foundation are submitted to BOEM and NMFS within 24 hours of installation. The Lessee must include in its report a preliminary interpretation of the results which will include details of the frequencies measured, including the frequency where 95 percent of the main energy is centered, and SPLs (RMS, Peak, single strike SEL) at each recording location, and the daily cumulative SEL expected. The pile sizes (length and diameter), hammer type and power, as well as associated latitude/longitude positions, ranges, depths, and bearings between sound sources and receivers must be provided.
6. Required Modification of Exclusion or Monitoring Zone Notification. The Lessee must notify BOEM and NMFS within 24 hours of receiving any acoustic monitoring results which indicate that any exclusion or monitoring zones do not cover the cumulative sound exposure distances for PTS during pile driving and DP thruster use. The Lessee must cease

the relevant activity and may only modify an exclusion zone or monitoring zone with written approval from BOEM and NMFS.

7. Reporting Injured or Dead Protected Species. The Lessee must ensure that sightings of any injured or dead protected species (e.g., marine mammals, sea turtles, or sturgeon) are reported to BOEM, NMFS, and the NMFS Northeast Region Stranding Hotline within 24 hours of sighting, regardless of how the injury or death was caused. The Lessee must use the form provided in Attachment 2 to report the sighting or incident. If the Lessee's activity is responsible for the injury or death, the Lessee must ensure that the vessel assists in any salvage effort as requested by NMFS.

8. Reporting Observed Impacts to Protected Species.

   a. The Lessee must report any observed take of listed marine mammals, sea turtles, or sturgeon to BOEM and the NMFS Northeast Region Stranding Hotline within 48 hours.

   b. The Lessee must report any observations concerning any impacts on ESA-listed marine mammals, sea turtles, or sturgeon to BOEM and NMFS Northeast Region's Stranding Hotline within 48 hours.

9. Protected Species Observer Reports. The Lessee must ensure that the PSOs record all observations of protected species using standard marine mammal observer data collection protocols. The list of required data elements for these reports is provided in Attachment 1.

10. Final Technical Report for G&G Survey Activities and Observations. The Lessee must provide BOEM and NMFS with reports every 90 calendar days following the commencement of HRG and/or geotechnical exploration activities, and a final report at the conclusion of the HRG and/or geotechnical exploration activities. Each report must include a summary of survey activities, all PSO and incident reports (see Attachments 1 and 2), a summary of the survey activities, and an estimate of the number of listed marine mammals and sea turtles observed and/or taken during these survey activities. The report must also include the results and analysis of the data collected during the sound source field verification of the G&G survey equipment.

11. Final Technical Report for DP Thruster Use and Observations. The Lessee must provide to BOEM and NMFS a final technical report of the observation data recorded during DP thruster use monitoring within 120 calendar days of final DP thruster use. The report must include full documentation of methods and monitoring protocols, summarize the data collected during monitoring, estimate the number of listed marine mammals and sea turtles that may have been taken during DP thruster use, and provide an interpretation of the results and effectiveness of all monitoring tasks. The report must also include the results and analysis of the data collected during the sound source field verification of the DP thrusters.

12. Final Technical Report for Pile Driving and Observations. The Lessee must provide BOEM and NMFS a report within 120 calendar days of completion of the pile driving and other construction activities. The report must include full documentation of methods and monitoring protocols, summarize the data recorded during monitoring, estimate the number of listed marine mammals and sea turtles that may have been taken during construction activities, and provide an interpretation of the results and effectiveness of all monitoring tasks. The report must also include the results and analysis of the sound source field verification data collected during pile driving activity.

13. Marine Mammal Protection Act Authorization(s). If the Lessee is required to obtain an authorization pursuant to section 101(a)(5) of the Marine Mammal Protection Act prior to conducting survey activities in support of plan submittal, the Lessee must provide to BOEM a copy of such authorization prior to commencing such activities.

CONTACT INFORMATION FOR REPORTING REQUIREMENTS

The following contact information must be used for the reporting and coordination requirements specified in the terms and conditions for SAP approval:

United States Fleet Forces (USFF) N46
1562 Mitscher Ave, Suite 250
Norfolk, VA 23551
(757) 836-6206

The following contact information must be used for the reporting requirements in the terms and conditions for SAP approval:

Reporting Injured or Dead Protected Species

NOAA Fisheries Northeast Region's Stranding Hotline: **866-755-6622**
Collected dead sea turtles and/or Atlantic Sturgeon: Fax: (978) 281-9394 or e-mail: incidental.take@noaa.gov; renewable_reporting@boem.gov

All other reporting requirements

Bureau of Ocean Energy Management
Environment Branch for Renewable Energy
Phone: 703-787-1340
Email: renewable_reporting@boem.gov

National Marine Fisheries Service
Northeast Regional Office, Protected Resources Division
Section 7 Coordinator
Phone: 978-281-9328
Email: incidental.take@noaa.gov

Vessel operators may send a blank email to ne.rw.sightings@noaa.gov for an automatic response listing of all current DMAs.

Attachment 1

REQUIRED DATA ELEMENTS FOR PROTECTED SPECIES OBSERVER REPORTS

The Lessee must ensure that the protected species observers record all observations of protected species using standard marine mammal observer data collection protocols. The list of required data elements for these reports is provided below:

1) Vessel name;
2) Observer names and affiliations;
3) Date;
4) Time and latitude/longitude when visual survey began;
5) Time and latitude/longitude when visual survey ended; and
6) Average environmental conditions during visual surveys including:
    a) Wind speed and direction;
    b) Sea state (glassy, slight, choppy, rough, or Beaufort scale);
    c) Swell (low, medium, high, or swell height in meters); and
    d) Overall visibility (poor, moderate, good);
7) Species (or identification to lowest possible taxonomic level);
8) Certainty of identification (sure, most likely, best guess);
9) Total number of animals;
10) Number of juveniles;
11) Description (as many distinguishing features as possible of each individual seen, including length, shape, color and pattern, scars or marks, shape and size of dorsal fin, shape of head, and blow characteristics);
12) Direction of animal's travel relative to the vessel (preferably accompanied by a drawing);
13) Behavior (as explicit and detailed as possible; note any observed changes in behavior);
14) Activity of vessel when sighting occurred.

Attachment 2

Incident Report: Protected Species Injury or Mortality

Photographs/Video should be taken of all injured or dead animals.

Observer's full name: ____

Reporter's full name:____

Species Identification:____

Name and type of platform:____

Date animal observed: ____________________Time animal observed:________________

Date animal collected: ____________________Time animal collected:________________

Environmental conditions at time of observation (i.e., tidal stage, Beaufort Sea State, weather):

____

____

Water temperature (°C) and depth (m/ft) at site:__________________________________

Describe location of animal and events 24 hours leading up to, including and after, the incident (incl. vessel speeds, vessel activity and status of all sound source use):_________________________

____

____

____

____

____

Photograph/Video taken: YES / NO If Yes, was the data provided to NMFS? YES / NO
(Please label *species*, *date*, *geographic site* and *vessel name* when transmitting photo and/or video)

Date and Time reported to NMFS Stranding Hotline:______________________________

<u>Sturgeon Information</u>: *(please designate cm/m or inches and kg or lbs)*

Species: ____

Fork length (or total length):______________________Weight:____________________

Condition of specimen/description of animal:_____________________________________

____

____

Fish Decomposed: NO SLIGHTLY MODERATELY SEVERELY

Fish tagged: YES / NO If Yes, p*lease record all tag numbers.*

Tag #(s):____

Genetic samples collected: YES / NO

Genetics samples transmitted to:______________________________________on____/______/201….

<u>Sea Turtle Species Information</u>: *(please designate cm/m or inches)*

Species:______________________________________Weight (kg or lbs):________________________

Sex: Male Female Unknown

How was sex determined?:____

Straight carapace length:_________________________Straight carapace width:____________________

Curved carapace length:__________________________Curved carapace width:____________________

Plastron length:________________________________Plastron width:___________________________

Tail length:____________________________________Head width:_____________________________

Condition of specimen/description of animal:____

____

____

Existing Flipper Tag Information

Left:____Right:__________________________________

PIT Tag#:____

Miscellaneous:

Genetic biopsy collected: YES NO Photographs taken: YES NO

Turtle Release Information:

Date:____Time:___________________________________

Latitude:_____________________________________Longitude:_______________________________

State:____County:_________________________________

Remarks: (note if turtle was involved with tar or oil, gear or debris entanglement, wounds, or mutilations, propeller damage, papillomas, old tag locations, etc.)________________________________

____

____

____

____

<u>Marine Mammal information</u>: *(please designate cm/m or ft/inches)*

Length of marine mammal (note direct or estimated): ____

Weight (*if possible, kg or lbs*):____

Sex of marine mammal (if possible):____

How was sex determined?:____

Confidence of Species Identification: SURE UNSURE BEST GUESS

Description of Identification characteristics of marine mammal:________________________________

____

____

____

____

Genetic samples collected: YES / NO

Genetic samples transmitted to:____on____/______/201….

Fate of marine mammal:____

____

____

____

Description of Injuries Observed:____

____

____

____

Other Remarks/Drawings:____

____

____

Appendix C
Vessel Trip Calculations

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Avian Surveys							
Alternative	# whole OCS blocks in survey area available for structure placement	# of OCS blocks surveyed per day	# days to complete survey of WEA	# months of surveying - low	# months of surveying - high	# trips for surveying - low	# trips for surveying - high
A	10	10	1	24	36	24	36

HRG Surveys					
Alternative	# whole OCS blocks in entire WEA	time to survey one whole OCS block in days	total # days to survey - 10hr day	ratio of 10hr to 24hr day	total # days to survey - 24hr day
A	13.9375	11	153	0.42	64

Assumptions used to calculate trips associated with surveying of a hypotehtical cable route:

1. 5 nautical miles (9.3 km) of survey line per mile of cable corridor equals 1 hour of survey per mile of cable
2. Survey corridor would be 984 feet (300 meters) wide and surveyed at a 30-meter line spacing, which equals 10 survey lines
3. Perpindicular tie lines would occur every 1,650 feet (500 meters)

HRG surveying of cable route - primary (longitudinal) survey lines - 10 hour long survey days								
Alternative	miles/ route	width of survey corridor (meters)	spacing between primay survey lines	primary survey lines required	total miles of surveying	speed of vessel (knots)	total hours of surveys	total days (round trips)
A	44	300	30	10	440	4.5	98	10

HRG surveying of cable route - perpendicular tie lines - 10 hour long survey days										
Alternative	miles/ route	width of survey corridor (meters)	spacing between perpinducular survey lines (meters)	convert length of route from miles to meters	number of perpinduclar lines	total meters of surveys	total miles of surveys	speed of vessel (knots)	total hours of surveys	total days (round trips)
A	44	300	500	70810.96	142	42487	26.4	4.5	6	0.6

HRG surveying of cable route - primary (longitudinal) survey lines - 24 hour continual surveying								
Alternative	miles/ route	width of survey corridor	spacing between primay survey lines	primary survey lines required	total miles of surveying	speed of vessel (knots)	total hours of surveys	total days but assuming 1 round trip
A	44	300m	30	10	440	4.5	98	4

HRG surveying of cable route - perpendicular tie lines - 24 hour continual surveying										
Alternative	miles/ route	width of survey corridor (meters)	spacing between perpinducular survey lines (meters)	convert length of route from miles to meters	number of perpinduclar lines	total meters of surveys	total miles of surveys	speed of vessel (knots)	total hours of surveys	total days but assuming 1 round trip
A	44	300	500	70810.96	142	42487	26.4	4.5	6	0.2

Construction			
Alternative	# towers	round trips for construction per tower	total round trips
A	1	40	40

Maintenance - quarterly and weekly				
Quarterly				
Alternative	# towers	# visits	years	total trips
A	1	4	5	20
Weekly				
A	1	52	5	260

Decommission			
Alternative	# towers	round trips for construction per tower	total round trips
A	1	40	40

Total		
Alternative	Low Range	High Range
A	100	340

Construction					
Alternative	# buoys	round trips for construction per buoy - low	total round trips - low	round trips for construction per buoy - high	total round trips - high
A	2	1	2	2	4

Maintenance - Quarterly and Monthly				
Quarterly				
Alternative	# buoys	# visits	years	total trips
A	2	4	5	40
Monthly				
A	2	12	5	120

Decommission					
Alternative	# buoys	round trips for construction per buoy - low	total round trips - low	round trips for construction per buoy - high	total round trips - high
A	2	1	2	2	4

Total		
Alternative	Low Range	High Range
A	44	128

Below is the list of assumptions used to calculate the total number of surveys and vessel trips in the WEA associated with geotechnical/sub-bottom sampling:

1. Maximum of 20 wind turbines per whole OCS block
2. Maximum of 10 wind turbines per partial OCS block
3. One sub-bottom sample (vibracore, CPT, and/or deep boring) at every potential wind turbine location
4. One sub-bottom sample every nautical mile of transmission cable corridor
5. One sub-bottom sample at the meteorological tower and/or each buoy site
6. One sample (vibracore, CPT, and/or deep boring) conducted per work day. Each work day would be associated with one round trip

Sub-bottom Sampling Surveys and Vessel Trips for the Proposed Action (Alternative A)	
Description	**No.**
Number of Whole OCS Blocks in WEA[1]	**10**
Approximate Number of Sub-bottom Samples by OCS Block	**200**
Approximate Number of Sub-bottom Samples for Cable Route	**44**
Approximate Number of Sub-bottom Samples for Meteorological Tower and/or Buoy	**3**
Total Number of Sub-bottom Samples	**247**
Total Number of Vessel Round Trips - 1 round trip per day	**247**

[1]See Table 2-2 in Section 2.1 of the EA for an explanation of the value of 10 whole OCS blocks under Alternative A

Sampling trips based on August 13, 2015 Guidelines

1. Trawl Survey Protocols. Demersal fish

2 years x 4 quarters = 8 surveys
30 trawls per survey = 240 samples (trawls)
Vessel trips = 2 days travel RT + 3 days on site = 5 days per survey
5 days/survey x 8 surveys = 40 vessel days

2. Gill Net and Beam Trawls Protocols. Microscale distribution of fish

Gill net:
1 year x 2 quarters (spring and fall) x 3 events/quarter = 6 surveys
6 samples per survey = 36 samples
Vessel trips = 2 days RT + 2 day (1-2 days) on site = 4 days per survey
4 days/survey x 6 surveys = 24 vessel days

Beam Trawl (might be able to piggyback with trawl survey)
1 year x 4 quarters = 4 surveys
6 samples/survey = 24 samples
Vessel Trips = 2 days RT + 1 day on site= 3 days per survey
3 days/survey x 4 surveys = 12 vessel days

3. Ventless Trap Survey

2 years x 4 quarters = 8 surveys
3 locations/survey = 24 samples (each sample consists of a 5 trap trawl)
Vessel Trips = 2 days RT (day 1 travel and set, three days later day 2 travel and haul)
2 days/survey x 8 surveys = 16 vessel days

4. Molluscan Shellfish Survey

Assume piggyback with geotech survey

Survey	Vessel Trips
1. Trawl	40
2a. Gill net	24
2b. Beam trawl	12
3. Ventless trap	16
4. Molluscan shellfish	Piggyback
TOTAL	**92**

Appendix D
Air Emmisions Calculations

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Table D-19
Site Assessment Activities Alternative A and B - Decommission
Offshore Activities - Deconstruction of Pilings
BOEM New York Environmental Assessment

Heavy Equipment Emission Factors [1]

Construction Equipment	Engine Size (hp)	Engine Power (kW)[1]	Load Factor (%)[2]	Emission Factors (g/kW-hr)[1] CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O	CH_4
Concrete Indus. Saw	56	42	59%	5.34	7.11	0.86	0.86	0.89	0.55	792.53	6.48E-03	1.42E-02
Crane	194	145	43%	1.84	7.34	0.51	0.38	0.39	0.50	714.75	6.48E-03	1.42E-02

1. Emission factors for all but N_2O and CH_4 from *Air Emissions Factor Guide to Air Force Mobile Sources* , December 2009, Section 3; converted from g/hp-hr to g/kW-hr.
2. Emission factors for N_2O and CH_4 from EPA's Center for Corporate Climate Leadership GHG Emission Factors Hub, November 2015, Table 5, factors for Diesel Construction Equipment were used and converted from g/gallon to g/kW-hr.

Construction Equipment	Usage (hrs)	Emission (tons/year, metric tons/year for GHG pollutants)								
		CO	NO_x	VOC	$PM_{2.5}$[3]	PM_{10}[3]	SO_x	CO_2	N_2O	CH_4
Concrete/Indust. Saw	200	2.90E-02	3.86E-02	4.66E-03	4.66E-03	4.81E-03	2.99E-03	3.91E+00	3.19E-05	7.00E-05
Cranes	200	2.52E-02	1.01E-01	6.99E-03	5.15E-03	5.33E-03	6.80E-03	8.89E+00	8.06E-05	1.77E-04
TOTAL Alt. A - 1 tower	**-**	**5.42E-02**	**1.39E-01**	**1.17E-02**	**9.81E-03**	**1.01E-02**	**9.79E-03**	**1.28E+01**	**1.12E-04**	**2.47E-04**
TOTAL Alt. B - 1 tower	**-**	**5.42E-02**	**1.39E-01**	**1.17E-02**	**9.81E-03**	**1.01E-02**	**9.79E-03**	**1.28E+01**	**1.12E-04**	**2.47E-04**

1.Only concrete/industrial saws and cranes were assumed to be used off shore during the deconstruction of the pilings.
2.Assume that the equipment operates for four weeks, 10 hours per day (i.e., 200 hours) for the tower.
3.Assume PM10 = PM2.5. See EF Construction Equip tab for emission factors.
4.Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) ÷ 453.59 ÷ 2000. For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.

Offshore Activities - Fuel Spill

Spill Volume (gal)[1]	Fuel Type	Density (lb/gal)[2]	Percent Recovered[3] (%)	Amount Not Recovered[3] (gal)	VOC Emissions (lb/yr)	VOC Emissions (tpy)
88	Diesel	7.1	0%	88	624.8	**0.31**

1.Assume a spill of 88 gallons of diesel occurs each year.
2.Liquid fuel density values obtained from *Air Emissions Factor Guide to Air Force Stationary Sources* , December 2009, Table 14-2.
3. To be conservative, assume none of the spill could be recovered, and that 100% of the fuel evaporates.

Table D-1
Summary of Annual Estimated Criteria Emissions by Activity for Alternatives A and B
BOEM New York Environmental Assessment

Action Alternative	Activity	Average Emissions by Activity for One Year: CO	NO_x	VOCs	$PM_{2.5}$	PM_{10}	SO_x
A or B	Site Characterization Surveys	1.99	22.36	1.17	1.22	1.22	2.20
	Site Assessment: Installation of Meteorological Tower and Buoys	0.57	5.81	0.55	0.32	0.32	0.56
	Site Assessment: Operation of Meteorological Tower and Buoys	5.07	24.52	2.23	1.71	1.71	1.68
	Site Assessment: Decommissioning of Meteorological Tower and Buoys	0.28	2.65	0.42	0.15	0.15	0.26
C	No Action	No Action and, therefore, no emissions					

This appendix and its calculations are adapted from Appendix D of *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina: Revised Environmental Assessment (NC EA).*
BOEM 2015-038, September 2015. Available at: http://www.boem.gov/North-Carolina/
Assumptions, data, table footnotes, and references—other than NY/NJ-specific WEA locations, port locations, vessel trip volumes and distances—are taken from the NC EA.

Table D-2
Summary of Annual Criteria Emissions by Activity for Alternatives A and B
Project Lifecycle Emission Estimate on Annual Basis
BOEM New York Environmental Assessment

		Emissions (tons/year)						Emissions (metric tons/year)		
Action Alternative	**Activity/Year[1]**	**CO**	**NO_x**	**VOCs**	**$PM_{2.5}$**	**PM_{10}**	**SO_x**	**CO_2 [2]**	**N_2O [3]**	**CH_4 [3]**
A or B	Year 1 - Site Characterization	1.99	22.36	1.17	1.22	1.22	2.20	1070.67	0.03	0.14
	Year 2 - Site Characterization, Construction, and Operation	7.63	52.70	3.95	3.25	3.25	4.44	2266.32	0.04	0.19
	Year 3 - Site Characterization and Operation	7.06	46.88	3.39	2.93	2.93	3.88	1952.93	0.03	0.15
	Year 4- Site Characterization and Operation	7.06	46.88	3.39	2.93	2.93	3.88	1952.93	0.03	0.15
	Year 5 - Site Characterization and Operation	7.06	46.88	3.39	2.93	2.93	3.88	1952.93	0.03	0.15
	Year 6 - Operation	5.07	24.52	2.23	1.71	1.71	1.68	882.26	0.00	0.01
	Year 7 - Decommissioning	0.28	2.65	0.42	0.15	0.15	0.26	135.51	0.00	0.02
C	No Action	No Action and, therefore, no emissions								

This appendix and its calculations are adapted from Appendix D of *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina: Revised Environmental Assessment (NC EA).*
BOEM 2015-038, September 2015. Available at: http://www.boem.gov/North-Carolina/
Assumptions, data, table footnotes, and references—other than NY/NJ-specific WEA locations, port locations, vessel trip volumes and distances—are taken from the NC EA.

1. Construction (installation) of a meteorological tower and buoys could take 8 days to 10 weeks and decommission could take one day to one week. Because the installation and decommissioning timeframes are variable, operational years were not prorated to account for the installation and decommission in order to provide a conservative estimate.
2. The CO_2 value for generators (included in the Operation) is in CO_2^e (carbon dioxide equivalent) which provides an expression of CO_2, N_2O, and CH_4 emissions combined.

Table D-3

Detail Emission Estimation of Annual Criteria Emissions by Activities for Average Year

Alternative A and B

BOEM New York Environmental Assessment

Emissions Summary for Average Year -- Alternative A or B

Phase/Source Description	Emissions (tons/year)						Emissions (metric tons/year)		
	CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2 [1]	N_2O [2]	CH_4 [2]
Site Characterization - Staff Commuting for Surveys									
- POVs	1.26E-01	5.72E-03	7.62E-03	4.45E-04	7.62E-04	3.18E-04	1.06E+01	1.04E-04	4.98E-04
Site Characterization - Offshore Surveys									
- Vessel Travel	1.86	22.35	0.85	1.22	1.22	2.20	1060.07	0.03	0.14
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
SUBTOTAL Site Characterization - One Year from Years 1-5	**1.99**	**22.36**	**1.17**	**1.22**	**1.22**	**2.20**	**1070.67**	**3.08E-02**	**1.39E-01**
One Meteorological Tower and Two Buoys									
Site Assessment - Onshore Construction									
- POVs	1.94E-02	3.91E-03	2.99E-03	4.02E-04	6.13E-04	2.11E-04	1.11E+01	3.62E-05	7.07E-05
- Construction Equipment	6.78E-02	2.02E-01	1.44E-02	1.20E-02	1.24E-02	1.40E-02	1.82E+01	1.64E-04	3.59E-04
Site Assessment - Offshore Construction									
- Vessel Travel	4.59E-01	5.51E+00	2.16E-01	3.01E-01	3.01E-01	5.43E-01	2.76E+02	8.00E-03	1.55E-02
- Construction Equipment	2.63E-02	9.62E-02	7.02E-03	5.23E-03	5.43E-03	6.23E-03	8.12E+00	7.34E-05	2.06E-02
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
SUBTOTAL Construction - Year 2	**0.57**	**5.81**	**0.55**	**0.32**	**0.32**	**0.56**	**313.39**	**8.27E-03**	**3.66E-02**
Site Assessment - Onshore O&M									
- POVs	1.68E-02	7.64E-04	1.02E-03	5.94E-05	1.02E-04	4.24E-05	1.42E+00	1.39E-05	6.66E-05
Site Assessment - Offshore O&M									
- Vessel Travel	1.47E-01	1.76E+00	6.67E-02	9.61E-02	9.61E-02	1.73E-01	8.35E+01	2.42E-03	1.09E-02
- Generators	4.90	22.76	1.85	1.62	1.62	1.51	797.31	-	-
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
SUBTOTAL O&M - One Year from Years 2-6	**5.07**	**24.52**	**2.23**	**1.71**	**1.71**	**1.68**	**882.26**	**2.44E-03**	**1.10E-02**
Site Assessment - Onshore Decommission									
- POVs	1.41E-02	2.38E-03	1.32E-03	1.27E-04	2.01E-04	7.34E-05	3.65E+00	1.84E-05	5.75E-05
Site Assessment - Offshore Decommission									
- Vessel Travel	2.09E-01	2.51E+00	9.51E-02	1.37E-01	1.37E-01	2.47E-01	1.19E+02	3.45E-03	1.55E-02
- Construction Equipment	5.42E-02	1.39E-01	1.17E-02	9.81E-03	1.01E-02	9.79E-03	1.28E+01	1.12E-04	2.47E-04
- Fuel Spills	-	-	0.31	-	-	-	-	-	-
SUBTOTAL Decommissioning - Year 7	**0.28**	**2.65**	**0.42**	**0.15**	**0.15**	**0.26**	**135.51**	**3.58E-03**	**1.58E-02**

CO = carbon monoxide, NO_x = nitrogen oxides, VOCs = volatile organic compounds, PM_{10} = particulate matter with aerodynamic diameters of 10 microns or less, $PM_{2.5}$ = particulate matter with aerodynamic diameters of 2.5 microns or less, SO_x = sulfur oxides, CO_2 = carbon dioxide, N_20 = nitrogen dioxide, CH_4 = methane

Table D-4
Site Characterization Activities Alternative A and B
Onshore Activities - Staff Commuting to Job Site
BOEM New York Environmental Assessment

Personal Vehicle Round Trips for Vessel Trips Associated with Site Characterization Activities

	Alternative A or B[4]			
Survey Task	**Total No. of Vessel Round Trips[1]**	**Duration of Survey Task (years)**	**No. of Vessel Round Trips (per year)[2]**	**No. of POV Round Trips (per year)[3]**
HRG Survey of OCS blocks within WEA	153	5	31	92
HRG surveys of 3 cable routes	10	5	2	6
Geotechnical Sampling	247	5	49	148
Avian surveys (max. of 171-252 range)	36	3	12	36
Fish surveys	92	2	46	138
Marine mammal surveys	60	3	20	60
TOTAL	**598**	**--**	**160**	**480**

1. Total number of vessel round trips conservatively based on 10-hour survey days.
2.Round trips per year estimated by dividing total round trips per task by the number of years over which the surveys will be conducted.
3.Assume an average of three staff per vessel. Therefore, personal vehicle (POV) round trips assumed to equal three times the number of vessel round trips per year.
4. Since site characterization activities for Alternative A and B take place over an area of the same size, the total number of POV round trips is assumed to be the same for each Alternative.

Personal Vehicle Emission Factors[1]

Personal Vehicle Type	Model Year[2]	Calendar Year[2]	Emission Factors (grams/mile)								
			CO	**NO_x**	**VOC**	**PM2.5[3]**	**PM10[3]**	**SOx**	**CO_2**	**N_2O**	**CH_4**
Light Duty Gasoline Vehicles	2009	2015	3.97	0.18	0.24	0.014	0.024	0.01	368.00	3.60E-03	1.73E-02

Personal Vehicle Emissions -- Average Year Over 5 Years

Personal Vehicle Type	Total No. of Round Trips	Total Miles (per trip)[4]	Emission (tons/year, metric tons/year for GHG pollutants)								
			CO	**NO_x**	**VOC**	**PM2.5[3]**	**PM10[3]**	**SOx**	**CO_2**	**N_2O**	**CH_4**
Light Duty Gasoline Vehicles - Alt. A	480	60	**1.26E-01**	**5.72E-03**	**7.62E-03**	**4.45E-04**	**7.62E-04**	**3.18E-04**	**1.06E+01**	**1.04E-04**	**4.98E-04**
Light Duty Gasoline Vehicles - Alt. B	480	60	**1.26E-01**	**5.72E-03**	**7.62E-03**	**4.45E-04**	**7.62E-04**	**3.18E-04**	**1.06E+01**	**1.04E-04**	**4.98E-04**

1.Emission factors and methodology from *Air Emissions Factor Guide to Air Force Mobile Sources* , December 2009, Section 4. Emission Factors for N_2O and CH_4 obtained from the Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document (2010), Table D-4, for Tier 2 gasoline passenger cars.
2.Assume staff drive Light Duty Gasoline Vehicles, with average of Model Year 2009 in Calendar Year 2015. CY2015 is the latest year provided in the guidance, and provides an approximate median year for the project.
3.Emission factors for $PM_{2.5}$ an PM_{10} include fugitive sources of PM from brake and tire.
4.Assume each employee drives 60 miles round trip.

Table D-5

Site Characterization Activities Alternative A and B

HRG Survey Details

BOEM New York Environmental Assessment

HGR Survey of Cable Routes		
Line spacing (m)	30	
Cable corridor width (m)	300	
No. of survey lines = Survey miles/corridor mile (nm)	5	
Results by EA Alternative	**A**	**B**
Cable corridor length (nm)	44	44
Total survey distance (nm)	220	220
Vessel-hours required	40	40

Calculation of HRG Survey Vessel-Hours		
HRG Survey of OCS Blocks		
Length of surveys per OCS block (nm)	500	
Vessel speed (kt)	4.5	
Survey time required per OCS block (hr)	111	
Survey period duration (yr)	5	
Results by EA Alternative	**A**	**B**
No. of OCS blocks	10	10
Vessel-hours required	5,550	5,550
Vessel-hours required/yr	1,110	1,110

Table D-6
Site Characterization Activities Alternative A and B
Offshore Activities - Surveys
BOEM New York Environmental Assessment

Survey Vessel Details

Survey Task	Vessel Type	Alternative A or B[8]					
		Total No. of Vessel Round Trips[2]	Duration of Survey Task (years)	No. of Vessel Round Trips (per year)[3]	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/yr)[5]	Activity (hrs/yr)[6]
HRG survey of OCS Blocks within WEA	Crew Boat	153	5	31	-	4,995	1,110
HRG Surveys of Cable Route	Crew Boat	10	5	2	-	180	40
Geotechnical Sampling[1]	Small Tug Boat	247	5	49	92	4,525	377
Geotechnical Sampling[1]	Cargo Barge	247	5	49	92	4,525	377
Avian Surveys[7]	Crew Boat	36	3	12	92	1,099	116
Fish Surveys[7]	Crew Boat	92	2	46	92	4,214	1455
Marine Mammal Surveys	Crew Boat	60	3	20	92	1,832	353

1. Assume all round trips over the 5 year period were performed using Small Tug Boat in conjunction with small Cargo Barge, which does not have an engine. Assume all Avian surveys completed by boat to obtain worst case scenario.
2. Total number of vessel round trips conservatively based on 10-hour survey days.
3. Round trips per year estimated by dividing total round trips per task by the number of years over which the surveys will be conducted.
4. Average miles per round trip was calculated by averaging the round trip to the centroid of the WEA from the 7 potential staging ports identified within the EA.
5. Distances for HRG Survey and HRG Survey Cable Routes are based on vessel-hours and speed. Distances for other surveys based on calculated round trips multiplied by average round trip nm.
6. Assume an average speed of 4.5 knots for HRG surveys, 12 knots for the tug boats/barges, and 12 knots (average based on a speed of 18 knots while traveling to and from WEA and a speed of 6 knots while surveying) for avian and fish surveys to estimate activity hours based upon total nautical miles traveled. No time for the vessels spent at idle was captured in this calculation.
http://www.scrutonmarine.com/Crew%20Boats.htm and http://www.chacha.com/question/what-is-the-average-top-speed-of-a-tug-boat
7. Assume each avian survey takes 2 hours, and each fish survey takes 24 hours.
8. Since site characterization activities for Alternative A and B take place over an area of the same size, the total number of vessel round trips is assumed to be the same for each alternative.

Table D-7
Site Characterization Activities Alternative A and B
Estimated Annual Emissions for Vessels
BOEM New York Environmental Assessment

Emission Factors for Vessels

				Emission Factors (g/kW-hr)[3]								
Vessel Type	**Engine Size (hp)**	**Engine Power (kW)[1]**	**Load Factor (%)[2]**	**CO**	**NO_x**	**VOC**	**$PM_{2.5}$[4]**	**PM_{10}**	**SO_x[5]**	**CO_2**	**N_2O**	**CH_4**
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Small Tug Boat	2,000	1,493	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09

1.Engine power (kW) estimated by dividing horsepower by a factor of 1.341.
2.Load factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories* , U.S. EPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors (Table 3.8) are for Harbor Vessels.
3.Emission factors were provided in the *Current Methodologies* document, Table 3-8. Category 2 (typically between 1,000 and 3,000 kW) factors were used for both types of boats since the crew boat is almost within that category, and it provides a conservative assumption for pollutants for which the areas are in non-attainment.
4.Assume $PM_{2.5} = PM_{10}$
5.SOx emission factor overestimates emissions since it assumes a higher sulfur content fuel than will likely be used.

Emissions from Vessels -- Average Year Over 5 Years

		Emission (tons/year, metric tons/year for GHG pollutants)[1,2]								
Alternative	**Vessel Type**	**CO**	**NO_x**	**VOC**	**$PM_{2.5}$**	**PM_{10}**	**SO_x**	**CO_2**	**N_2O**	**CH_4**
Alt. A & B	Crew Boat	1.55E+00	1.85E+01	7.03E-01	1.01E+00	1.01E+00	1.83E+00	879.49	2.55E-02	1.15E-01
	Small Tug Boat	3.17E-01	3.81E+00	1.44E-01	2.08E-01	2.08E-01	3.75E-01	180.58	5.23E-03	2.36E-02
	TOTAL Alt. A	**1.86**	**22.35**	**0.85**	**1.22**	**1.22**	**2.20**	**1060.07**	**0.03**	**0.14**
	TOTAL Alt. B	**1.86**	**22.35**	**0.85**	**1.22**	**1.22**	**2.20**	**1060.07**	**0.03**	**0.14**

1.Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) x Power Adjustment ÷ 453.59 ÷ 2000. For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.
2.Power adjustment of 1.1 was assumed for a crew boat to account for auxiliary engines, and 1.5 for a harbor tug, based upon Table 3.5 of the *Current Methodologies* document.

Offshore Activities - Fuel Spill

Spill Volume (gal)[1]	**Fuel Type**	**Density (lb/gal)[2]**	**Percent Recovered[3] (%)**	**Amount Not Recovered[3] (gal)**	**VOC Emissions (lb/yr)**	**VOC Emissions (tpy)**
88	Diesel	7.1	0%	88	624.8	**0.31**

1.Assume a spill of 88 gallons of diesel occurs each year.
2.Liquid fuel density values obtained from *Air Emissions Factor Guide to Air Force Stationary Sources* , December 2009, Table 14-2.
3. To be conservative, assume none of the spill could be recovered, and that 100% of the fuel evaporates.

Table D-8
Site Assessment Activities Alternative A and B - Installation
Onshore Activities - Staff Commuting to Job Site and Material/Equipment Delivery
BOEM New York Environmental Assessment

Vehicle Emission Factors [1]

Personal Vehicle Type	Model Year[2]	Calendar Year[2]	Emission Factors (grams/mile)								
			CO	NO_x	VOC	$PM_{2.5}$ [3]	PM_{10} [3]	SO_x	CO_2	N_2O	CH_4
Heavy Duty Diesel Vehicles	2009	2015	0.15	1.68	0.18	0.02	0.03	0.01	1,029.9	4.80E-03	5.10E-03
Light Duty Gasoline Vehicles	2009	2015	3.97	0.18	0.24	0.014	0.024	0.01	368.0	3.60E-03	1.73E-02
Light Duty Diesel Trucks	2009	2015	0.35	0.11	0.12	0.02	0.03	0.01	598.6	1.40E-03	9.00E-04

Personal Vehicle Emissions -- One Year

Personal Vehicle Type	Total No. of Round Trips/year[4]	Total Miles (per trip)[5]	Emission (tons/year, metric tons/year for GHG pollutants)								
			CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O	CH_4
Heavy Duty Diesel Vehicles	13	60	1.29E-04	1.44E-03	1.55E-04	1.72E-05	2.58E-05	8.60E-06	8.03E-01	3.74E-06	3.98E-06
Light Duty Gasoline Vehicles	51	60	1.34E-02	6.07E-04	8.10E-04	4.72E-05	8.10E-05	3.37E-05	1.13E+00	1.10E-05	5.29E-05
Light Duty Diesel Trucks	51	60	5.90E-03	1.86E-03	2.02E-03	3.37E-04	5.06E-04	1.69E-04	9.16E+00	2.14E-05	1.38E-05
TOTAL Alt. A - 1 tower, 2 buoys	-	-	**1.94E-02**	**3.91E-03**	**2.99E-03**	**4.02E-04**	**6.13E-04**	**2.11E-04**	**1.11E+01**	**3.62E-05**	**7.07E-05**
TOTAL Alt. B - 1 tower, 2 buoys	-	-	**1.94E-02**	**3.91E-03**	**2.99E-03**	**4.02E-04**	**6.13E-04**	**2.11E-04**	**1.11E+01**	**3.62E-05**	**7.07E-05**

1.Emission factors and methodology from *Air Emissions Factor Guide to Air Force Mobile Sources* , December 2009, Section 4. Emission factors for N_2O and CH_4 obtained from the Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document (2010), Table D-1 for Tier 2 gasoline passenger cars, moderate diesel light trucks, and moderate diesel heavy-duty trucks.
2.Assume contractors drive Light Duty Diesel Trucks (Type 3/4), staff drive Light Duty Gasoline Vehicles, and material/equipment deliveries are made using Heavy Duty Diesel Trucks (Type 5), with average of Model Year 2009 in Calendar Year 2015. CY2015 is the latest year provided in the guidance, and provides an approximate median year for the project.
3.Emission factors for $PM_{2.5}$ an PM_{10} include fugitive sources of PM from brake and tire.
4.Assume construction, transportation, and installation of tower and buoys will take place over the course of one year. Assume an average of 5 contractors travel to the site over 51 days total. In addition, assume an average of one staff travel to the site over 51 days total. Lastly, assume one heavy duty truck travels to the site over 13 days total.
5.Assume each employee drives 60 miles round trip.

Table D-9
Site Assessment Activities Alternative A and B - Installation
Onshore Activities - Heavy Equipment Use - One Year
BOEM New York Environmental Assessment

Heavy Equipment Emission Factors [1]

Construction Equipment	Engine Size (hp)	Engine Power (kW)[1]	Load Factor (%)[2]	Emission Factors (g/kW-hr)[1]								
				CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O	CH_4
Crane	194	145	43%	1.84	7.34	0.51	0.38	0.39	0.50	714.75	6.48E-03	1.42E-02
Rubber Tired Loader	158	118	59%	2.96	7.15	0.52	0.48	0.50	0.51	722.80	6.48E-03	1.42E-02

1. Emission factors from *Air Emissions Factor Guide to Air Force Mobile Sources*, December 2009, Section 3; converted from g/hp-hr to g/kW-hr. Emission factors for N_2O and CH4 were not available.

2. Emission factors for N_2O and CH_4 from EPA's Center for Corporate Climate Leadership GHG Emission Factors Hub, November 2015, Table 5, factors for Diesel Construction Equipment were used and converted from g/gallon to g/kW-hr.

Construction Equipment	Usage (hrs)	Emission (tons/year, metric tons/year for GHG pollutants)[4]								
		CO	NO_x	VOC	$PM_{2.5}$[3]	PM_{10}[3]	SO_x	CO_2	N_2O	CH_4
Cranes	192	2.42E-02	9.66E-02	6.71E-03	4.94E-03	5.12E-03	6.53E-03	8.54E+00	7.73E-05	1.70E-04
Rubber Tired Loaders	192	4.36E-02	1.05E-01	7.69E-03	7.10E-03	7.30E-03	7.50E-03	9.65E+00	8.64E-05	1.89E-04
TOTAL Alt. A - 1 tower	-	**6.78E-02**	**2.02E-01**	**1.44E-02**	**1.20E-02**	**1.24E-02**	**1.40E-02**	**1.82E+01**	**1.64E-04**	**3.59E-04**
TOTAL Alt. B - 1 tower	-	**6.78E-02**	**2.02E-01**	**1.44E-02**	**1.20E-02**	**1.24E-02**	**1.40E-02**	**1.82E+01**	**1.64E-04**	**3.59E-04**

1.Only cranes and loaders were assumed to be used on shore during assembly of the tower to move and lift the pieces into place.

2.Assume crane and rubber tire loader operate half of the 48 days estimated to complete the construction of the tower, for 8 hours per day (i.e., 192 hours).

3.Assume $PM_{2.5} = PM_{10}$

4.Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) ÷ 453.59 ÷ 2000. For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.

Table D-10
Site Assessment Activities Alternative A and B - Installation
Offshore Activities - Transport of Tower and Buoys to Sites from Ports
BOEM New York Environmental Assessment

Vessel Details for Construction of Tower and Buoys

Vessel Type	Total No. of Vessel Round Trips/Yr[1]	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/yr)	Activity (hrs/yr)[2]
Crane Barge	2	92	184	15
Deck Cargo	2	92	184	15
Small Cargo Barge	2	92	184	15
Crew Boat	21	92	1932	107
Small Tug Boat	4	92	368	31
Large Tug Boat	10	92	920	77

1. Average to build one meteorological tower, per note in corresponding table in NC EA Appendix D, plus two trips for each of the 2 buoys being transported by a large tug-boat.
2.Assume an average speed of 12 knots for the tug boats/barges and 18 knots for the crew boat to estimate Activity hours based upon Total nautical miles traveled. No time for the vessels spent at idle at the towers was captured in this calculation.
http://www.scrutonmarine.com/Crew%20Boats.htm and http://www.chacha.com/question/what-is-the-average-top-speed-of-a-tug-boat

Table D-11
Site Assessment Activities Alternative A and B - Installation
Estimated Annual Emissions for Vessels
BOEM New York Environmental Assessment

Emission Factors for Vessels

Vessel Type[1]	Engine Size (hp)	Engine Power (kW)[2]	Load Factor (%)[3]	Emission Factors (g/kW-hr)[4]								
				CO	NO_x	VOC	$PM_{2.5}$[5]	PM_{10}	SO_x[6]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Small Tug Boat	2,000	1,491	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Large Tug Boat	4,200	3,132	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09

1.The Small and Large Tug Boats are used in conjunction with the Crane Barge, Deck Cargo, and Small Cargo Barge, which do not have an engine. Therefore, only the Crew Boat, Small Tug Boat, and Large Tug Boat have emission factors.
2.Engine power (kW) estimated by dividing horsepower by a factor of 1.341.
3.Load factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories* , U.S. EPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors (Table 3.8) are for Harbor Vessels.
4.Emission factors were provided in the *Current Methodologies* document, Table 3-8. Category 2 (typically between 1,000 and 3,000 kW) factors were used for the crew boat, small tug boat, and large tug boat since the crew boat and large tug boat are approximately within that category.
5.Assume $PM_{2.5} = PM_{10}$
6.SOx emission factor overestimates emissions since it assumes a higher sulfur content fuel than will likely be used.

Emissions from Vessels -- One Year

Vessel Type	Emission (tons/year, metric tons/year for GHG pollutants)[1,2]								
	CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O	CH_4
Crew Boat	4.81E-02	5.77E-01	2.18E-02	3.15E-02	3.15E-02	5.68E-02	2.73E+01	7.93E-04	3.57E-03
Small Tug Boat	2.58E-02	3.09E-01	1.17E-02	1.69E-02	1.69E-02	3.05E-02	1.47E+01	4.25E-04	1.91E-03
Large Tug Boat	1.35E-01	1.62E+00	6.15E-02	8.86E-02	8.86E-02	1.60E-01	7.70E+01	2.23E-03	1.00E-02
TOTAL Alt. A - 1 tower, 2 buoys	**2.09E-01**	**2.51E+00**	**9.51E-02**	**1.37E-01**	**1.37E-01**	**2.47E-01**	**1.19E+02**	**3.45E-03**	**1.55E-02**
TOTAL Alt. B - 1 tower, 2 buoys	**2.09E-01**	**2.51E+00**	**9.51E-02**	**1.37E-01**	**1.37E-01**	**2.47E-01**	**1.19E+02**	**3.45E-03**	**1.55E-02**

1.Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) x Power Adjustment ÷ 453.59 ÷ 2000. For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.
2.Power adjustment of 1.1 was assumed for a crew boat to account for auxiliary engines, and 1.5 for a harbor tug, based upon Table 3.5 of the *Current Methodologies* document.

Table D-12
Site Assessment Activities Alternative A and B - Installation
Offshore Activities - Construction of Pilings -- One Year
BOEM New York Environmental Assessment

Heavy Equipment Emission Factors [1]

Construction Equipment	Engine Size (hp)	Engine Power (kW)	Load Factor (%)[2]	Emission Factors (g/kW-hr)[1] CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O	CH_4
Bore/Drill Rigs	209	156	43%	3.34	9.35	0.80	0.62	0.64	0.51	722.80	6.48E-03	1.42E-02
Crane	194	145	43%	1.84	7.34	0.51	0.38	0.39	0.50	714.75	6.48E-03	1.42E-02

1. Emission factors from *Air Emissions Factor Guide to Air Force Mobile Sources* , December 2009, Section 3; converted from g/hp-hr to g/kW-hr. Emission factors for N_2O and CH_4 were not available.
2. Emission factors for N_2O and CH_4 from EPA's Center for Corporate Climate Leadership GHG Emission Factors Hub, November 2015, Table 5, factors for Diesel Construction Equipment were used and converted from g/gallon to g/kW-hr.

Construction Equipment[1]	Usage[2] (hrs)	Emission (tons/year, metric tons/year for GHG pollutants) CO	NO_x	VOC	$PM_{2.5}$[3]	PM_{10}[3]	SO_x	CO_2	N_2O	CH_4
Bore/Drill Rigs	30	7.40E-03	2.07E-02	1.78E-03	1.37E-03	1.43E-03	1.13E-03	1.45E+00	1.30E-05	2.85E-05
Cranes	150	1.89E-02	7.54E-02	5.24E-03	3.86E-03	4.00E-03	5.10E-03	6.67E+00	6.04E-05	1.32E-04
TOTAL Alt. A - 1 tower	**-**	**2.63E-02**	**9.62E-02**	**7.02E-03**	**5.23E-03**	**5.43E-03**	**6.23E-03**	**8.12E+00**	**7.34E-05**	**1.61E-04**
TOTAL Alt. B - 1 tower	**-**	**2.63E-02**	**9.62E-02**	**7.02E-03**	**5.23E-03**	**5.43E-03**	**6.23E-03**	**8.12E+00**	**7.34E-05**	**1.61E-04**

1.Only bore/drill rigs and cranes were assumed to be used off shore during the construction of the pilings.
2.Assume bore/drill rigs operate for three days, 10 hours per day (i.e., 30 hours) and cranes operate for three weeks total, 10 hours per day (i.e., 150 hours) for the tower.
3.Assume $PM_{2.5}$ = PM_{10}
4.Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) ÷ 453.59 ÷ 2000. For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.

Offshore Activities - Fuel Spill

Spill Volume (gal)[1]	Fuel Type	Density (lb/gal)[2]	Percent Recovered[3] (%)	Amount Not Recovered[3] (gal)	VOC Emissions (lb/yr)	VOC Emissions (tpy)
88	Diesel	7.1	0%	88	624.8	**0.31**

1.Assume a spill of 88 gallons of diesel occurs each year.
2.Liquid fuel density values obtained from *Air Emissions Factor Guide to Air Force Stationary Sources* , December 2009, Table 14-2.
3. To be conservative, assume none of the spill could be recovered, and that 100% of the fuel evaporates.

Table D-13

Site Assessment Activities Alternative A and B - Operation and Maintenance

Onshore Activities - Staff Commuting to Job Site

BOEM New York Environmental Assessment

Personal Vehicle Emission Factors [1]

Personal Vehicle Type	Model Year[2]	Calendar Year[2]	Emission Factors (grams/mile)								
			CO	NOx	VOC	PM2.5[3]	PM10[3]	SOx	CO_2	N_2O	CH_4
Light Duty Gasoline Vehicles	2009	2015	3.97	0.18	0.24	0.014	0.024	0.01	368.00	3.60E-03	1.73E-02

Personal Vehicle Emissions -- Average Year Over 5 Years

Personal Vehicle Type	Total No. of Round Trips/Yr[4]	Total Miles (per trip)[5]	Emission (tons/year, metric tons/year for GHG pollutants)								
			CO	NOx	VOC	PM2.5	PM10	SOx	CO_2	N_2O	CH_4
Light Duty Gasoline Vehicles	64	60	1.68E-02	7.64E-04	1.02E-03	5.94E-05	1.02E-04	4.24E-05	1.42E+00	1.39E-05	6.66E-05
TOTAL Alt. A - 1 tower, 2 buoys	**-**	**-**	**1.68E-02**	**7.64E-04**	**1.02E-03**	**5.94E-05**	**1.02E-04**	**4.24E-05**	**1.42E+00**	**1.39E-05**	**6.66E-05**
TOTAL Alt. B - 1 tower, 2 buoys	**-**	**-**	**1.68E-02**	**7.64E-04**	**1.02E-03**	**5.94E-05**	**1.02E-04**	**4.24E-05**	**1.42E+00**	**1.39E-05**	**6.66E-05**

1.Emission factors and methodology from *Air Emissions Factor Guide to Air Force Mobile Sources* , December 2009, Section 4. Emission Factors for N_2O and CH_4 obtained from the Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document (2010), Table D-1, for Tier 2 gasoline passenger cars.

2.Assume staff drive Light Duty Gasoline Vehicles, with average of Model Year 2009 in Calendar Year 2015. CY2015 is the latest year provided in the guidance, and provides an approximate median year for the project.

3.Emission factors for $PM_{2.5}$ an PM_{10} include fugitive sources of PM from brake and tire.

4.Assume one weekly trip by one person to observe/service the tower, and to refuel/perform maintenance of the potential generator. Assume one monthly trip by one person to observe/service the buoys.

5.Assume 60 miles round trip.

Table D-14
Site Assessment Activities Alternative A and B - Operation and Maintenance
Offshore Activities - Routine Maintenance and Evaluation
BOEM New York Environmental Assessment

Maintenance Vessel Details

Task	Vessel Type	Total No. of Vessel Round Trips	Duration of Task (years)	No. of Vessel Round Trips (per year)[2]	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/yr)	Activity (hrs/yr)[3]
Routine Maintenance	Crew Boat	321	5	64	92	5,901	328

1.Assume one round trip each week using a crew boat to observe/service the tower, including fueling/performing maintenance on the assumed generators. Assume one monthly trip by crew boat to observe/service the buoys.
2.Round trips per year estimated by dividing total round trips per task by the number of years (only one year was modeled) needed to complete task.
3.Assume an average speed of 18 knots to estimate Activity hours based upon Total nautical miles traveled. No time for the vessels spent at idle at the towers was captured in this calculation.

Emission Factors for Vessels

				Emission Factors (g/kW-hr)[3]								
Vessel Type	Engine Size (hp)	Engine Power (kW)[1]	Load Factor (%)[2]	CO	NO_x	VOC	$PM_{2.5}$[4]	PM_{10}	SO_x[5]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.72	0.72	1.3	690.0	0.02	0.09

1.Engine power (kW) estimated by dividing horsepower by a factor of 1.341.
2.Load factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories* , U.S. EPA, April 2009. Table 3-1 describes crew boats as Harbor Vessels; therefore, the load factor (Table 3.8) is for Harbor Vessels.
3.Emission factors were provided in the *Current Methodologies* document, Table 3-8. Category 2 (typically between 1,000 and 3,000 kW) factors were used for the crew boat since it is almost within that category, and it provides a conservative assumption for pollutants for which the areas are in non-attainment.
4.Assume $PM_{2.5} = PM_{10}$
5.SOx emission factor overestimates emissions since it assumes a higher sulfur content fuel than will likely be used.

Emissions from Vessels -- Average Year Over 5 Years

Vessel Type	Emission (tons/year, metric tons/year for GHG pollutants)[1,2]								
	CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	Sox	CO_2	N_2O	CH_4
Crew Boat	1.47E-01	1.76E+00	6.67E-02	9.61E-02	9.61E-02	1.73E-01	8.35E+01	2.42E-03	1.09E-02
TOTAL Alt. A - 1 tower, 2 buoys	**1.47E-01**	**1.76E+00**	**6.67E-02**	**9.61E-02**	**9.61E-02**	**1.73E-01**	**8.35E+01**	**2.42E-03**	**1.09E-02**
TOTAL Alt. B - 1 tower, 2 buoys	**1.47E-01**	**1.76E+00**	**6.67E-02**	**9.61E-02**	**9.61E-02**	**1.73E-01**	**8.35E+01**	**2.42E-03**	**1.09E-02**

1.Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) x Power Adjustment ÷ 453.59 ÷ 2000.
2.Power adjustment of 1.1 was assumed for a crew boat to account for auxiliary engines, and 1.5 for a harbor tug, based upon Table 3.5 of the *Current Methodologies* document.

Table D-15
Site Assessment Activities Alternative A and B - Operation and Maintenance
Offshore Activities - Operation of Prime Generator
BOEM New York Environmental Assessment

Unit Information

Source	Estimated Rated Capacity (hp)	Operating Hours (hours/year)	Fuel
One 75 kW diesel-fired generator to serve as primary source of electricity for tower	101	8,760	Diesel
One 25 kW diesel-fired generator to serve as primary source of electricity for buoy	34	8,760	Diesel
One 25 kW diesel-fired generator to serve as primary source of electricity for buoy	34	8,760	Diesel

Emission Factors [1,2]

Pollutant	NO_x	CO	PM	SO_2	VOC	CO_2e [3]
Diesel (lb/hp-hr)	0.031	0.007	0.002	0.002	0.003	1.15

Potential Criteria Pollutant Emissions [4]

Source	NO_x (tpy)	CO (tpy)	PM/ PM_{10}/ $PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)	CO_2^e (metric tpy) [3]
One 75 kW diesel-fired generator to serve as primary source of electricity for tower	13.66	2.94	0.97	0.90	1.11	459.58
One 25 kW diesel-fired generator to serve as primary source of electricity for buoy	4.55	0.98	0.32	0.30	0.37	168.87
One 25 kW diesel-fired generator to serve as primary source of electricity for buoy	4.55	0.98	0.32	0.30	0.37	168.87
TOTAL Alt. A - 3 generators	**22.76**	**4.90**	**1.62**	**1.51**	**1.85**	**797.31**
TOTAL Alt. B - 3 generators	**22.76**	**4.90**	**1.62**	**1.51**	**1.85**	**797.31**

1.Emission factors were obtained from AP-42, Section 3.3.
2.Conservatively assumed PM = PM_{10} = $PM_{2.5}$.
3.CO_2^e (carbon dioxide equivalent) provides an expression of CO_2, N_2O, and CH_4 emissions combined.
4.Emissions were calculated for one year.

Offshore Activities – Fuel Spill

Spill Volume (gal)[1]	Fuel Type	Density (lb/gal)[2]	Percent Recovered[3] (%)	Amount Not Recovered[3] (gal)	VOC Emissions (lb/yr)	VOC Emissions (tpy)
88	Diesel	7.1	0%	88	624.8	**0.31**

1.Assume a spill of 88 gallons of diesel occurs each year.
2.Liquid fuel density values obtained from *Air Emissions Factor Guide to Air Force Stationary Sources* , December 2009, Table 14-2.
3.Assume none of the spill could be recovered, and that 100% of the fuel evaporates.

Table D-16
Site Assessment Activities Alternative A and B - Decommission
Onshore Activities - Contractors Commuting to Job Site for Decommission
BOEM New York Environmental Assessment

Vehicle Emission Factors [1]

Personal Vehicle Type	Model Year[2]	Calendar Year[2]	Emission Factors (grams/mile)								
			CO	NO_x	VOC	$PM_{2.5}$ [3]	PM_{10} [3]	SO_x	CO_2	N_2O	CH_4
Heavy Duty Diesel Vehicles	2009	2015	0.15	1.68	0.18	0.02	0.03	0.01	1,029.90	4.80E-03	5.10E-03
Light Duty Gasoline Vehicles	2009	2015	3.97	0.18	0.24	0.014	0.024	0.01	368.00	3.60E-03	1.73E-02
Light Duty Diesel Trucks	2009	2015	0.35	0.11	0.12	0.02	0.03	0.01	598.60	1.40E-03	9.00E-04

Personal Vehicle Emissions -- One Year

Personal Vehicle Type	Total No. of Round Trips[4]	Total Miles (per trip)[5]	Emission (tons/year, metric tons/year for GHG pollutants)								
			CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O	CH_4
Heavy Duty Diesel Vehicles	13	60	1.29E-04	1.44E-03	1.55E-04	1.72E-05	2.58E-05	8.60E-06	8.03E-01	3.74E-06	3.98E-06
Light Duty Gasoline Vehicles	49	60	1.29E-02	5.83E-04	7.78E-04	4.54E-05	7.78E-05	3.24E-05	1.08E+00	1.06E-05	5.09E-05
Light Duty Diesel Trucks	49	60	1.13E-03	3.57E-04	3.89E-04	6.48E-05	9.72E-05	3.24E-05	1.76E+00	4.12E-06	2.65E-06
TOTAL Alt. A - 1 tower, 2 buoys	**-**	**-**	**1.41E-02**	**2.38E-03**	**1.32E-03**	**1.27E-04**	**2.01E-04**	**7.34E-05**	**3.65E+00**	**1.84E-05**	**5.75E-05**
TOTAL Alt. B - 1 tower, 2 buoys	**-**	**-**	**1.41E-02**	**2.38E-03**	**1.32E-03**	**1.27E-04**	**2.01E-04**	**7.34E-05**	**3.65E+00**	**1.84E-05**	**5.75E-05**

1.Emission factors and methodology from *Air Emissions Factor Guide to Air Force Mobile Sources*, December 2009, Section 4. Emission factors for N_2O and CH_4 obtained from the *Federal Greenhouse Gas Accounting and Reporting Guidance Technical Support Document* (2010), Table D-1 for Tier 2 gasoline passenger cars, moderate diesel light trucks, and moderate diesel heavy-duty trucks.
2.Assume contractors drive Light Duty Diesel Trucks (Type 3/4), staff drive Light Duty Gasoline Vehicles, and material/ equipment deliveries are made using Heavy Duty Diesel Trucks (Type 5), with average of Model Year 2009 in Calendar Year 2015. CY2015 is the latest year provided in the guidance, and provides an approximate median year for the project.
3.Emission factors for $PM_{2.5}$ an PM_{10} include fugitive sources of PM from brake and tire.
4.Assume decommissioning of tower and buoys will take place over one year. Assume an average of 5 contractors travel to the site over 49 days total. In addition, assume an average of one staff travel to the site over 49 days total. Lastly, assume one heavy duty trucks travel to the site over 13 days total.
5.Assume each employee drives 60 miles round trip.

Table D-17
Site Assessment Activities Alternative A and B - Decommission
Offshore Activities - Vessel Details for Decommissioning
BOEM New York Environmental Assessment

Vessel Details for Decommissioning of Tower and Buoys

Vessel Type	Total No. of Vessel Round Trips	Avg. Miles Per Round Trip (nautical miles)	Total (nautical miles/yr)	Activity (hrs/yr)[1]
Crane Barge	2	92	184	15
Deck Cargo	2	92	184	15
Small Cargo Barge	2	92	184	15
Crew Boat	21	92	1932	107
Small Tug Boat	4	92	368	31
Large Tug Boat	10	92	920	77

1.Average to decommission one meteorological tower, per note in corresponding table in NC EA Appendix D, plus 2 trips for each of the 2 buoys being transported by a large tug-boat.
2.Assume an average speed of 12 knots for the tug boats/barges and 18 knots for the crew boat to estimate Activity hours based upon Total nautical miles traveled. No time for the vessels spent at idle at the towers was captured in this calculation.
http://www.scrutonmarine.com/Crew%20Boats.htm and http://www.chacha.com/question/what-is-the-average-top-speed-of-a-tug-boat

Table D-18
Site Assessment Activities Alternative A and B - Decommission
Estimated Annual Emissions for Vessels
BOEM New York Environmental Assessment

Emission Factors for Vessels

Vessel Type[1]	Engine Size (hp)	Engine Power (kW)[2]	Load Factor (%)[3]	Emission Factors (g/kW-hr)[4]								
				CO	NO_x	VOC	$PM_{2.5}$[5]	PM_{10}	SO_x[6]	CO_2	N_2O	CH_4
Crew Boat	1,000	746	45%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Small Tug Boat	2,000	1,491	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09
Large Tug Boat	4,200	3,132	31%	1.1	13.2	0.5	0.72	0.72	1.3	690	0.02	0.09

1.The Small and Large Tug Boats are used in conjunction with the Crane Barge, Deck Cargo, and Small Cargo Barge, which do not have an engine. Therefore, only the Crew Boat, Small Tug Boat, and Large Tug Boat have emission factors. Assume decommissioning of towers instead of buoys for a worst case scenario.
2.Engine power (kW) estimated by dividing horsepower by a factor of 1.341.
3.Load factor based upon Table 3.4 of *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories* , U.S. EPA, April 2009. Table 3-1 describes both crew boats and tug boats as Harbor Vessels; therefore, load factors (Table 3.8) are for Harbor Vessels.
4.Emission factors were provided in the *Current Methodologies* document, Table 3-8. Category 2 (typically between 1,000 and 3,000 kW) factors were used for the crew boat, small tug boat, and large tug boat since the crew boat and large tug boat are approximately within that category.
5.Assume $PM_{2.5} = PM_{10}$
6.SOx emission factor overestimates emissions since it assumes a higher sulfur content fuel than will likely be used.

Emissions from Vessels -- One Year

Vessel Type	Emission (tons/year, metric tons/year for GHG pollutants)[1,2]								
	CO	NO_x	VOC	$PM_{2.5}$	PM_{10}	SO_x	CO_2	N_2O	CH_4
Crew Boat	4.81E-02	5.77E-01	2.18E-02	3.15E-02	3.15E-02	5.68E-02	2.73E+01	7.93E-04	3.57E-03
Small Tug Boat	2.58E-02	3.09E-01	1.17E-02	1.69E-02	1.69E-02	3.05E-02	1.47E+01	4.25E-04	1.91E-03
Large Tug Boat	1.35E-01	1.62E+00	6.15E-02	8.86E-02	8.86E-02	1.60E-01	7.70E+01	2.23E-03	1.00E-02
TOTAL Alt. A - 1 tower, 2 buoys	**2.09E-01**	**2.51E+00**	**9.51E-02**	**1.37E-01**	**1.37E-01**	**2.47E-01**	**1.19E+02**	**3.45E-03**	**1.55E-02**
TOTAL Alt. B - 1 tower, 2 buoys	**2.09E-01**	**2.51E+00**	**9.51E-02**	**1.37E-01**	**1.37E-01**	**2.47E-01**	**1.19E+02**	**3.45E-03**	**1.55E-02**

1.Emissions quantified using the following equation: Emissions (tons) = Engine Power Rating (kW) x Load Factor (%) x Activity (hrs) x Emission Factor (g/kW-hr) x Power Adjustment ÷ 453.59 ÷ 2000. For GHG pollutants CO_2, N_2O, and CH_4, emissions are in metric tons.
2.Power adjustment of 1.1 was assumed for a crew boat to account for auxiliary engines, and 1.5 for a harbor tug, based upon Table 3.5 of the *Current Methodologies* document.

Appendix E

Sightings Information for Marine Mammals and Sea Turtles: Data Handling Procedures and Maps of Raw Sightings Data and Sightings per Unit Effort

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Overview of Sightings and Sightings per Unit Effort

Occurrences of marine mammals and sea turtles in the vicinity of the Wind Energy Area (WEA) were mapped using data from the North Atlantic Right Whale Consortium (NARWC) sightings database and several other sources. Maps were prepared using two data types: 1) raw sightings and 2) Sightings per Unit Effort (SPUE). Raw sightings data were only mapped for three species of endangered whales (fin, humpback, and North Atlantic right whales; Figures E-1 to E-3); SPUE data were mapped for species of marine mammals and turtles with the highest frequency of occurrence within the study area (Figures E-4 to E-15; EA Section 4.4.2.5 Figures 4-9 and 4-10; EA Section 4.4.2.6 Figure 4-11).

Sightings Data Sources for SPUE

A substantial proportion of the existing marine mammal and sea turtle data for the southern New England and New York Bight region have been aggregated and archived by the North Atlantic Right Whale Consortium (NARWC; Right Whale Consortium, 2015). The NARWC database is managed and continually updated at the University of Rhode Island Graduate School of Oceanography (Kenney, 2001), with funding support from the National Marine Fisheries Service (NMFS). The database contains several different types of data, which can differ significantly in their usefulness for description and analysis of the distribution, abundance, seasonality, and habitat use of any particular species.

The most rigorous category of data comes from line-transect aerial surveys. These surveys are designed to estimate density and abundance of encountered populations. Survey methods include measuring the right-angle distance from the survey track to each sighting, and using the distances to construct the probability functions used in the density estimation process. Survey designs are systematic and randomized so that any location should have an equal likelihood of being sampled. Within the WEA study area, the only line-transect aerial survey data in the database are those generated in 1978–1982 by the Cetacean and Turtle Assessment Program (CETAP) (CETAP, 1982).

There is a second, less rigorous category of survey data contained in the NARWC database. The CETAP study included a Platforms of Opportunity Program (POP), which involved placing trained observers on board aerial and vessel platforms conducting other operations in the study area. The platforms included National Oceanic and Atmospheric Administration (NOAA) vessels, foreign research vessels, Coast Guard cutters, Coast Guard patrol aircraft, ferries, commercial fishing vessels, whale-watching vessels, and others. The observer was tasked with keeping a detailed record of the platform's track, environmental conditions, and all sightings. A significant source of POP shipboard data was a program conducted by Manomet Bird Observatory (MBO) personnel aboard NOAA fisheries and oceanographic research cruises (so-called "piggy-back" surveys) during most of the 1980s. The MBO observers maintained watches when the vessel was underway and recorded sightings of mammals, turtles, and birds. The National Marine Fisheries Service's Northeast Fisheries Science Center (NMFS-NEFSC) in Woods Hole, MA has also conducted aerial surveys focused on right whales since the late 1990s, some of which have extended into the study area. These are focused surveys using systematically placed tracks, but the objective was not density estimation, therefore sighting distances were not recorded. Aerial surveys for right whales were also conducted in 2005 and 2006 by the Riverhead Foundation for Marine Research and Preservation in Riverhead, NY. A final source of

POP survey data in the database are aerial and shipboard stock assessment surveys by NMFS, including the recent (2010–2013) AMAPPS surveys (Atlantic Marine Assessment Program for Protected Species). These were conducted as line-transect surveys, however the data are publicly provided without the sighting distances, therefore they are formatted and archived in the NARWC database as POP surveys. By definition, in addition to records of all target species (and sometimes non-target species) encountered, line-transect and POP survey data include detailed information on the track of the survey platform and associated environmental conditions, allowing for subsequent reconstruction of the survey and quantification of effort.

Additional Opportunistic Sightings Data Sources

The NARWC database also includes substantial numbers of opportunistic sighting records that have no associated survey data, which were excluded for SPUE maps (Figures E-4 to E-15; EA Section 4.4.2.5 Figures 4-9 and 4-10; EA Section 4.4.2.6 Figure 4-11), but used for sightings maps (Figures ES-1 to ES-3). Many of these represent records collected during CETAP or older historical sighting records that were aggregated and archived as part of the CETAP study. Other sightings have been contributed on an on-going basis by a variety of individuals, including Navy, Coast Guard, other federal agencies, mariners, commercial fishermen, whale-watch operators, and recreational boaters. An important source of older records for the region was a database provided by Dr. James Mead at the Smithsonian's National Museum of Natural History. This included early historical records extracted from published sources going back as far as the colonial era in some cases; some of these records included strandings or intentional captures by whalers or hunters. Additional sources of data for dead or debilitated marine mammals and sea turtles that occasionally wash up on shore, or strand, are also included in the NARWC database. All records of dead or stranded animals were excluded from the WEA maps.

One other source of opportunistic sighting records is unique to right whales. North Atlantic right whales are individually identifiable from photographs (Hamilton et al., 2007), and now from genetic samples. The “catalog” of identified right whales is maintained by New England Aquarium (NEAq; NEAq, 2015). Anyone who takes a photograph anywhere in the North Atlantic of a right whale which might be identifiable is encouraged to submit it to NEAq. Records in the catalog even include videos posted on YouTube by fishermen if the right whale can be identified. Part of the collaborative NARWC project is to periodically cross-reference right whale sightings in the database with identifications in the catalog. At the end of the process each time, there are some number of catalog records that (1) do not match any sightings already included in the database, (2) are not same-day duplicates of individuals included in sightings already in the database, and (3) are not from surveys likely to be submitted to the database. These records are extracted from the catalog and added to the database as opportunistic sightings. During the most recent round of cross-referencing, a new category of identification record added to the catalog—tagging data. Part of the tagging protocol for right whales is to collect enough photographs to be able to identify the tagged whale. For every right whale that had been tagged with a VHF or satellite tag, a single location per day was added to the catalog. These were then extracted into the database in such a way as to be able to uniquely identify each tag track separately if so desired. For example, if a right whale had been satellite-tagged off Florida and passed through the New York Bight on migration to the Gulf of Maine, one location for each day would show up as opportunistic sightings in a map.

SPUE data handling methods for the WEA

The simplest method for depicting marine mammal distributions is to plot all available records. This makes the maximum use of the available data; however, such a map is very likely to be biased by the distribution of sampling effort. One cannot be sure that a concentration of sightings represents a real concentration of animals or simply a concentration of 10 years. Conversely, a blank space on a sighting map can mean a true absence of that species, or that no one ever looked in that area.

One method to overcome this potential bias is to quantify survey effort, and then to correct sighting frequencies for differences in effort, producing an index termed sighting rate or SPUE. The units are numbers of animals sighted per unit length of survey track. (Note: It is possible to quantify effort in time units rather than length, but that is much less effective when combining aerial and shipboard data together because of the very different speeds.) SPUE values are computed for consistent spatial units and can therefore be quantitatively mapped or be statistically compared across areas, seasons, years, etc. Development of this method was begun during CETAP (1982), and it has been used in a variety of analyses (e.g., Kenney and Vigness-Raposa, 2010; Lagueux et al., 2010). Because the method requires regular location and environmental data to reconstruct the survey tracks and to quantify effort, only a subset of the sighting data can be included. Opportunistic sightings and stranding data are entirely excluded because there is no corresponding effort information. SPUE maps show quantitative relative abundance patterns scaled for uneven sampling, however are based on much smaller numbers of sightings than maps of raw sighting data.

To standardize the SPUE data even further, the data can be limited to only a subset of the survey tracklines and sightings that meet pre-defined criteria for “acceptability.” The effort criteria can vary between studies or between target species. For this analysis, the criteria included having at least one observer formally on watch, visibility of at least 3.7 km (2 nautical miles), and altitude below 366 meters (1,200 feet, applicable only to aerial surveys). Sightings were excluded from the analysis if they were noted as dead (either floating or stranded on a beach) or if the reliability of the species identification had been recorded as “possible” (the lowest level, below “probable” and “definite”). The final criterion for acceptable effort was sea state, which varied by species category. Large whales are easier to spot in higher sea states, therefore effort was included for sea states up to Beaufort class 4. For minke whales and all of the dolphins, the upper sea state limit was set at Beaufort 3. For harbor porpoises and sea turtles, which are all small and tend to be solitary and therefore are the most difficult to see in rough seas, the upper sea state limit was set at Beaufort 2.

The SPUE method involves partitioning the study area into a regular grid based on latitude and longitude. The grid size selected is a compromise between resolution (smaller cells) and sample sizes (larger cells). Previous studies based on the NAWRC data have used cells ranging from 1 min X 1 min (1.9 X 1.4 km in the WEA) to 10 min X 10 min (18.5 X 14.1 km). For this project we used a 5 min X 5 min grid (9.3 X 7.1 km). All acceptable aerial and shipboard survey tracks were parsed into the grid cells and their lengths computed and summed by season. Seasons were defined as: Winter—December, January, February; Spring—March, April, May; Summer—June, July, August; Fall—September, October, November. The survey data are archived as points along the track, and each successive pair of points defines a line segment. The length of a segment where both ends are within the same grid cell is easily assigned to that cell. Segments that cross more than one cell have to be cut into sub-segments, and those lengths assigned to the appropriate cells. The entire process is accomplished using custom-written programs in SAS for Windows version 9.2 (SAS Institute, Inc., Cary, NC). Sightings were similarly filtered and assigned to cells and the numbers of animals sighted were summed by cell and season. Finally, the number of animals in each cell/season was divided by the corresponding effort value, then multiplied by 1,000 to avoid small decimal values, generating a SPUE index in units of animals sighted per 1,000 km of acceptable survey track.

The defined study area (north of 39°00'N, west of 71°45'W) for the WEA was partitioned into a grid of 5-minute X 5-minute blocks. All acceptable survey effort, both aerial and shipboard surveys, across all available years was assigned to the blocks and summed by season and for all seasons combined. All sightings made during that effort were also assigned to the 5x5-minute blocks. For single species, sightings with the lowest level of identification reliability ("possible") were deleted. The numbers of sightings and individuals included in the SPUE analysis are summarized in Table E-1. For the pooled large whale and turtle categories, they were included (e.g., a possible humpback whale sighting is a more reliable ID than an unidentified large whale sighting). For sightings where the number of animals was not recorded (if any), the number was assumed to be 1. SPUE values for the entire area of each 5x5 block where mapped at a point in the center of each block.

Table E-1
Numbers of sightings and individuals included in the SPUE maps

SPECIES CODE	SPECIES NAME	TOTAL INCLUDED SIGHTINGS/ANIMALS
Large Whales[1]:		
FIWH	Fin Whale (*Balaenoptera physalus*)	126/454
HUWH	Humpback Whale (*Megaptera novaeangliae*)	13/17
RIWH	North Atlantic Right Whale (*Eubalaena glacialis*)	3/4
WHAL	All endangered large whales	271/679
	[includes the three preceding species, plus UNBA (Unidentified *Balaenoptera*), UNFS (Unidentified Fin or Sei Whale) UNLW (Unidentified Large Whale), and UNRO (Unidentified Rorqual)	
Medium Whales and Dolphins[2]:		
MIWH	Minke Whale (*Balaenoptera acutorostrata*)	32/78
	[An attempt to combine all beaked whale categories into one pool resulted in a dataset with no sightings. Beaked whale records are either strandings on the beach (excluded) or sightings far offshore (outside of the study area).]	
BODO	Bottlenose Dolphin (*Tursiops truncatus*)	127/2179
GRAM	Risso's Dolphin (*Grampus griseus*)	122/1895
PIWH	Pilot Whale (*Globicephala* sp.)	43/599
	[Sightings, if any, identified as LFPW (Long-finned Pilot Whale, *Globicephala melas*) or SFPW (Short-finned Pilot Whale, *Globicephala macrorhynchus*) were pooled into this category.]	

SADO	Common Dolphin (*Delphinus delphis*)	115/2848
WSDO	Atlantic White-Sided Dolphin (*Lagenorhynchus acutus*)	41/600

Harbor Porpoise and Sea Turtles[3]:

HAPO	Harbor Porpoise (*Phocoena phocoena*)	48/69
LETU	Leatherback Turtle (*Dermochelys coriacea*)	87/97
LOTU	Loggerhead Turtle (*Caretta caretta*)	520/562
RITU	Kemp's Ridley Turtle (*Lepidochelys kempii*)	59/63
TURT	All Sea Turtles Combined	741/800

[This pooled sea turtle category includes the three species above plus GRTU (Green Turtle, *Chelonia mydas*) and UNTU (Unidentified Turtle).]

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[1]The sea state threshold for the large whales was Beaufort 4 (i.e., survey effort and sightings at Beaufort 4 or lower were included, while Beaufort 5 effort and sightings were deleted).

[2]The sea state threshold for medium whales and dolphins was Beaufort 3 (i.e., survey effort and sightings at Beaufort 3 or lower were included, while Beaufort 4 effort and sightings were deleted).

[3]The sea state threshold for harbor porpoise and sea turtles (which are the smallest animals and also all tend to be solitary) was Beaufort 2 (i.e., survey effort and sightings at Beaufort 2 or lower were included, while Beaufort 3 effort and sightings were deleted).

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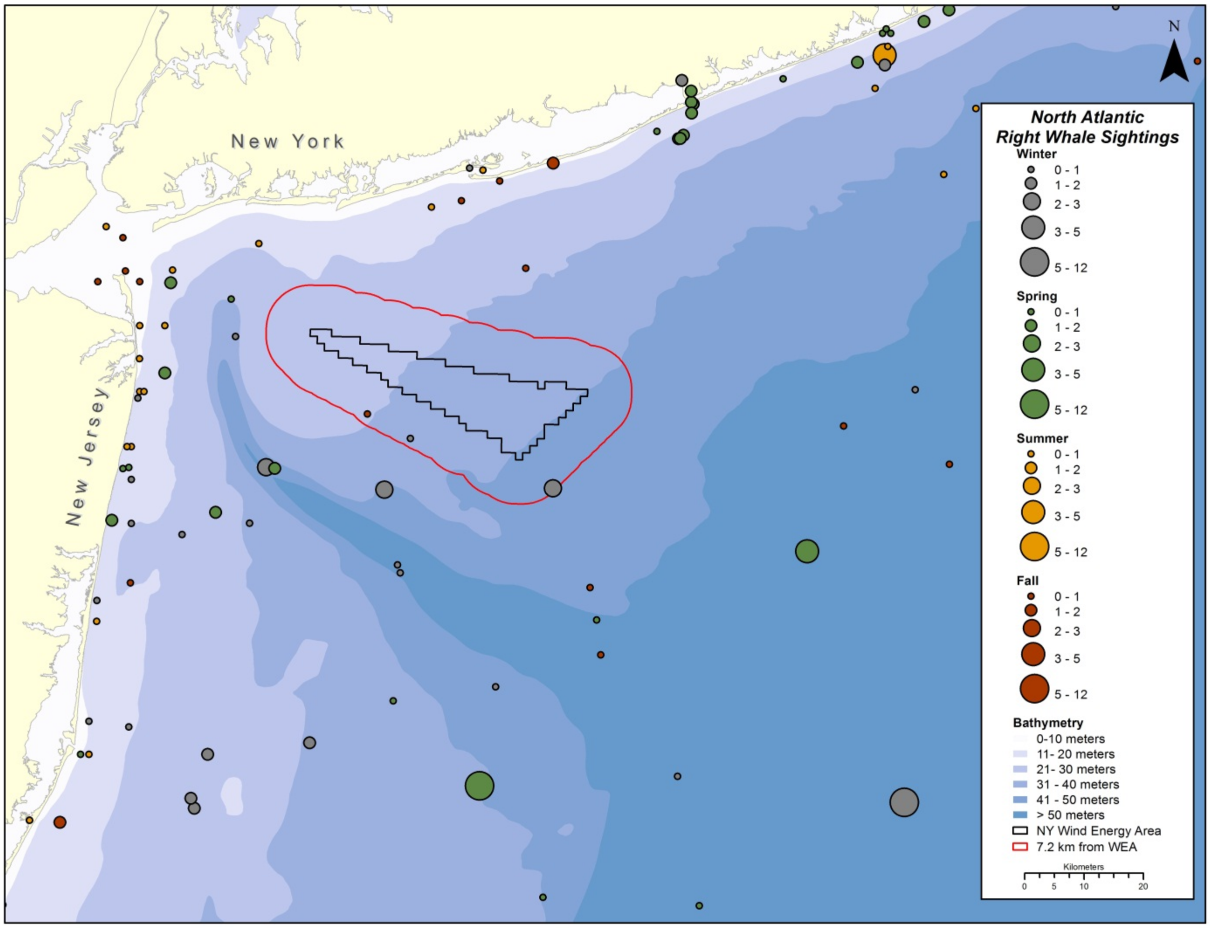

New York
New Jersey
N
North Atlantic Right Whale Sightings
Winter
0 - 1
1 - 2
2 - 3
3 - 5
5 - 12
Spring
0 - 1
1 - 2
2 - 3
3 - 5
5 - 12
Summer
0 - 1
1 - 2
2 - 3
3 - 5
5 - 12
Fall
0 - 1
1 - 2
2 - 3
3 - 5
5 - 12
Bathymetry
0-10 meters
11- 20 meters
21- 30 meters
31 - 40 meters
41 - 50 meters
> 50 meters
NY Wind Energy Area
7.2 km from WEA
Kilometers
0 5 10 20

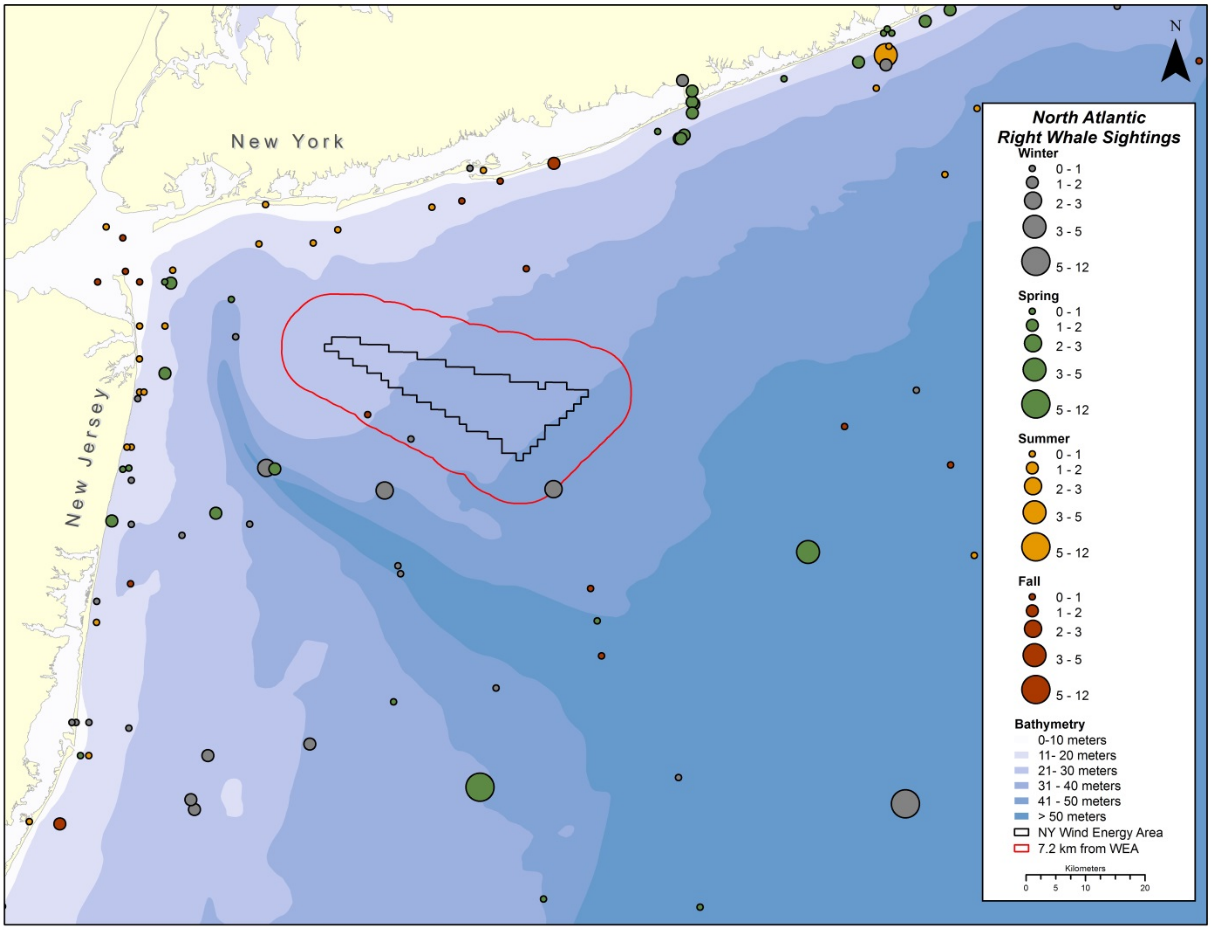

Figure E-1 Sightings for North Atlantic right whales in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

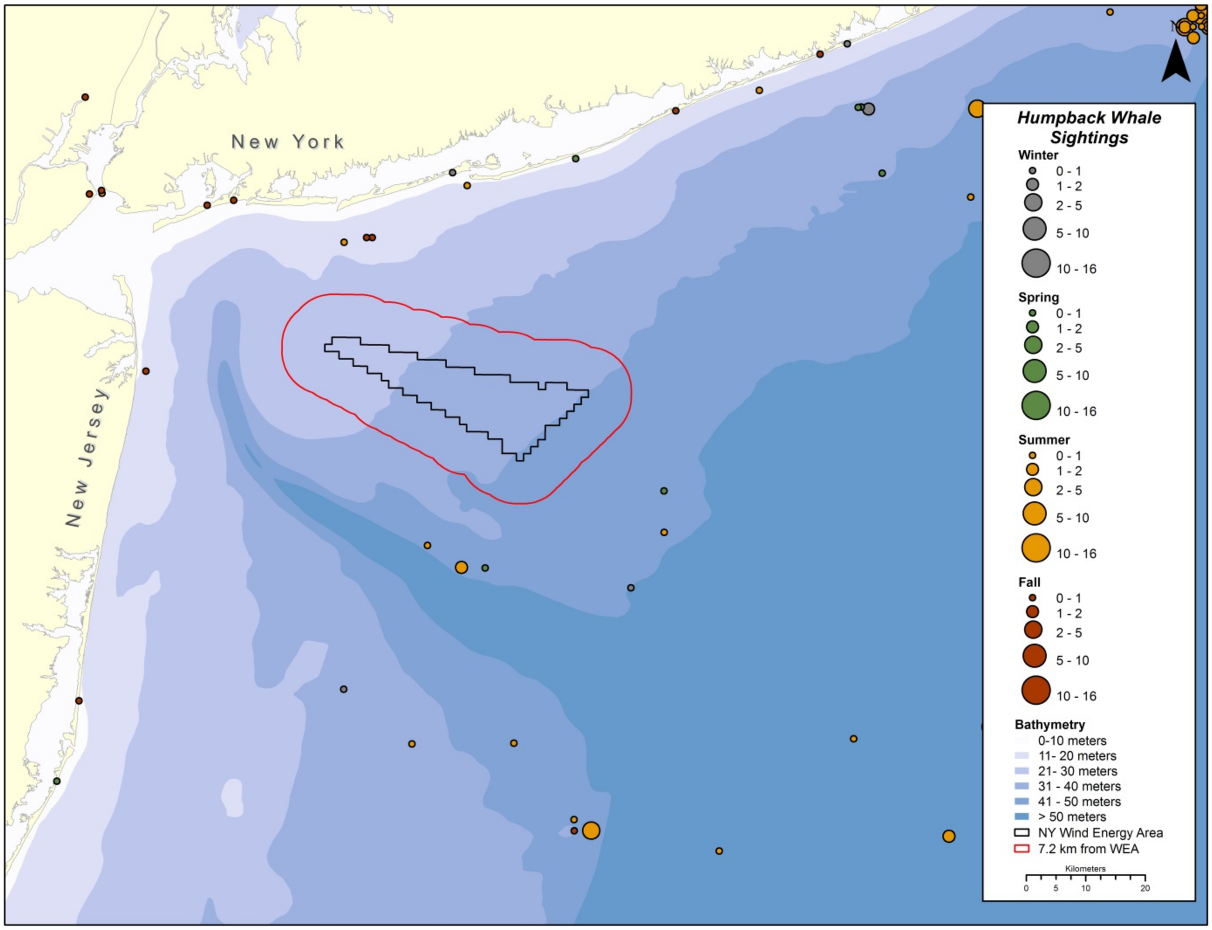

Figure E-2. Sightings for humpback whales in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

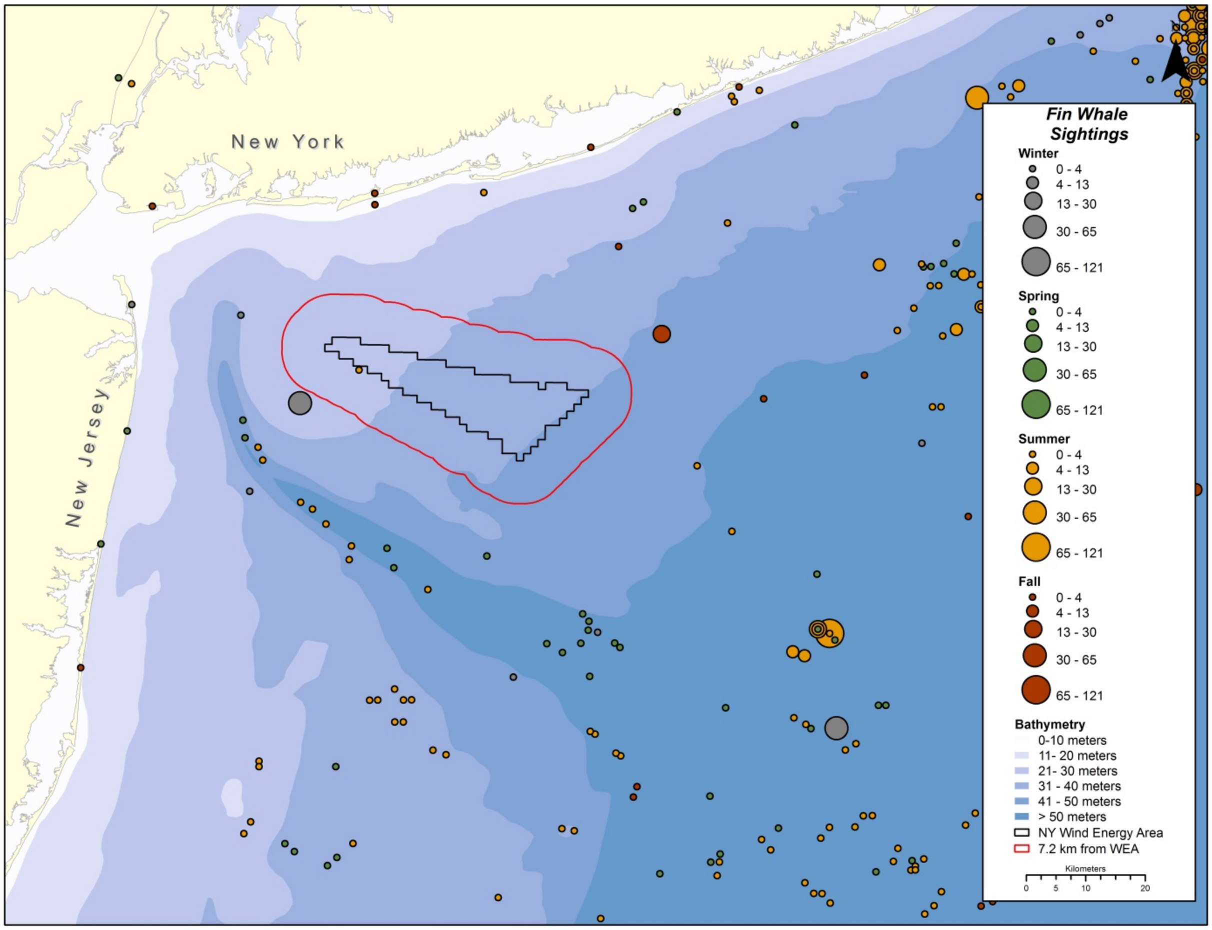

Figure E-3 Sightings for fin whales in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

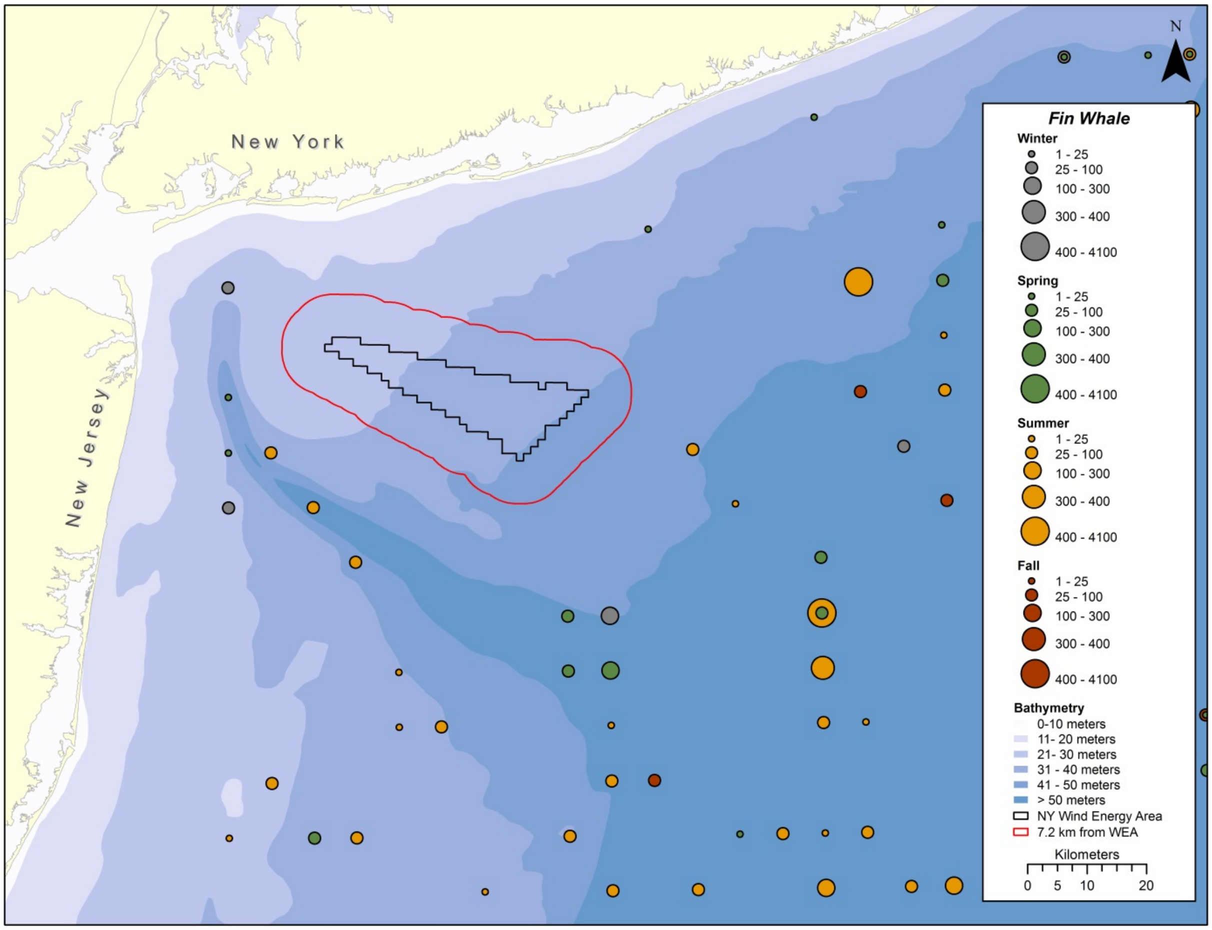

Figure E-4 SPUE for fin whales in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

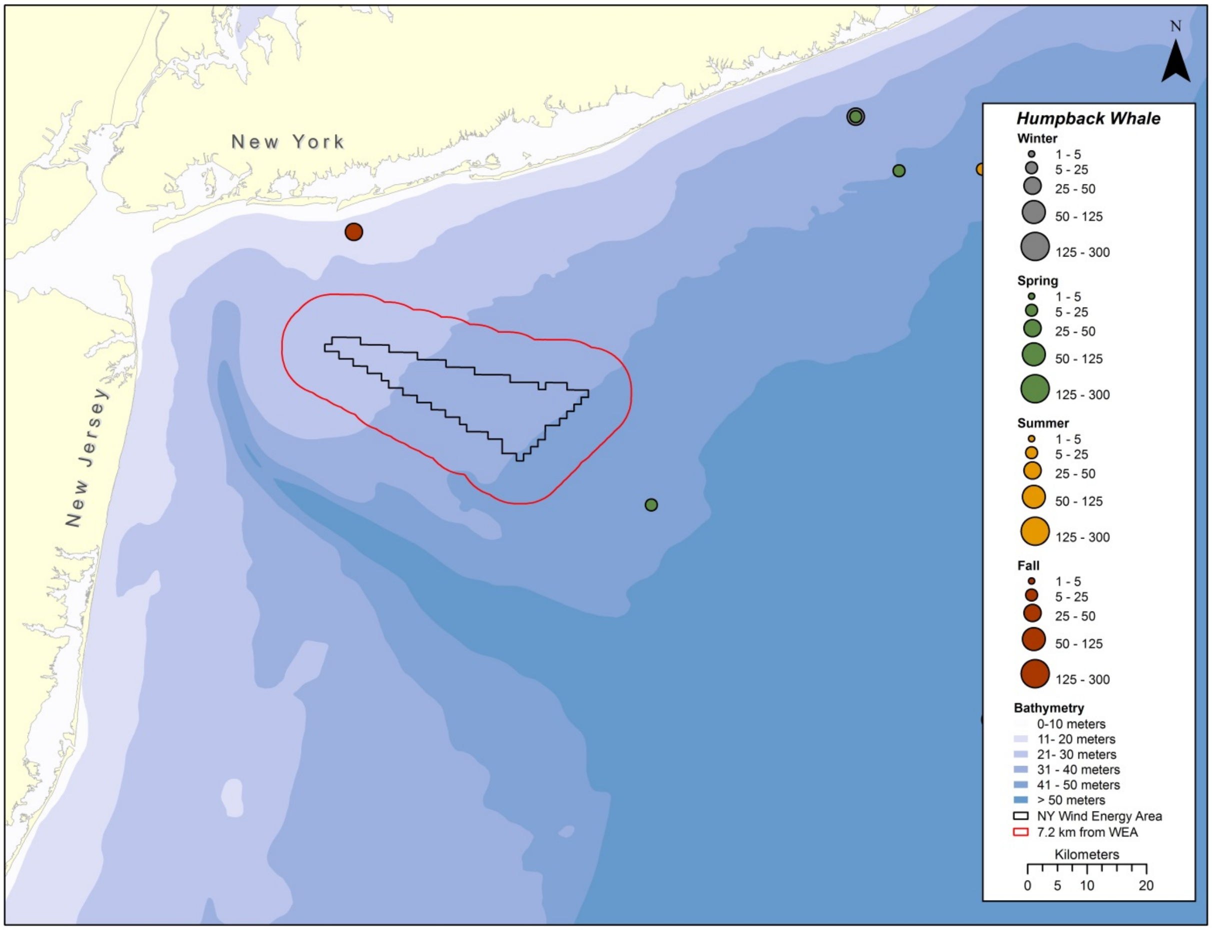

Figure E-5 SPUE for humpback whales in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

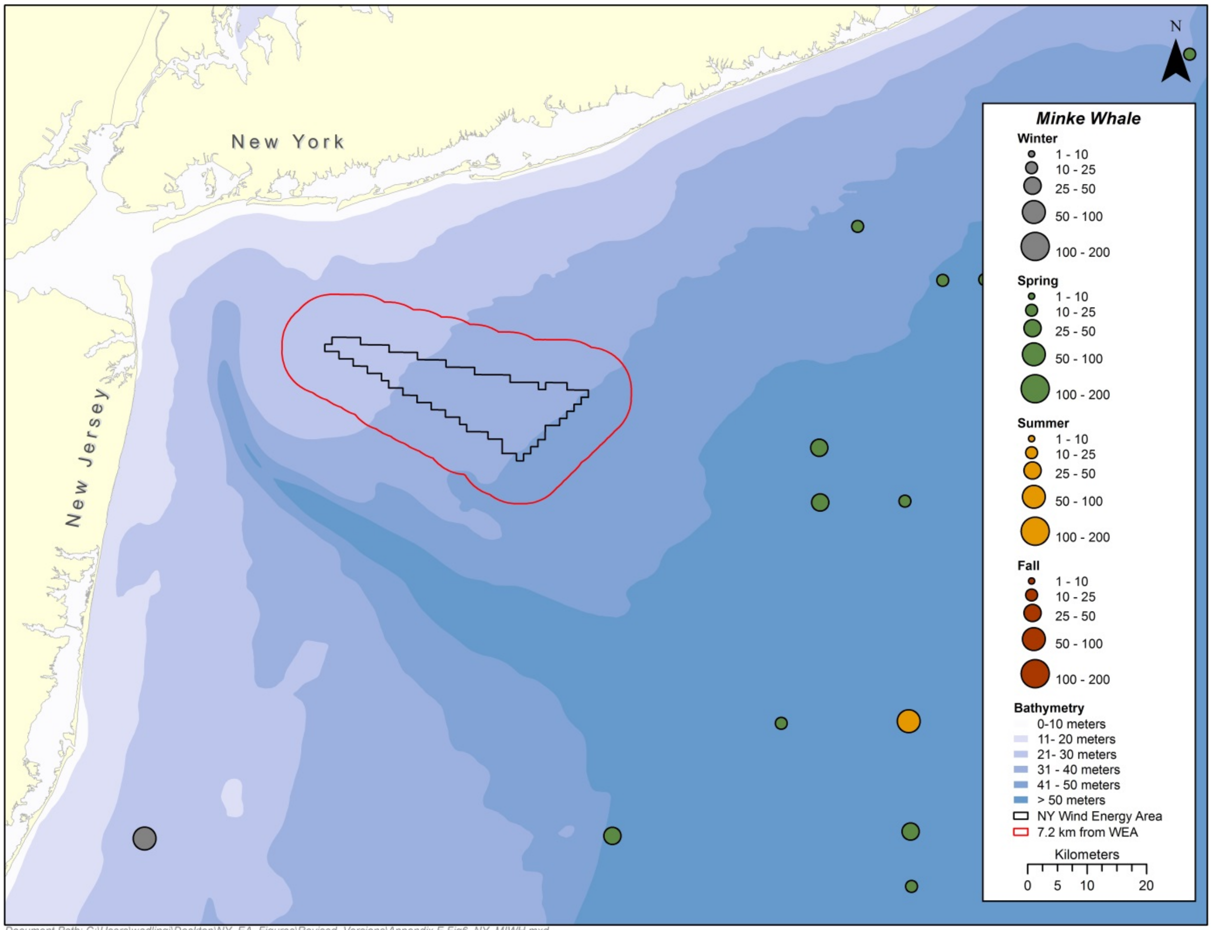

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Figure E-6 SPUE for minke whales in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

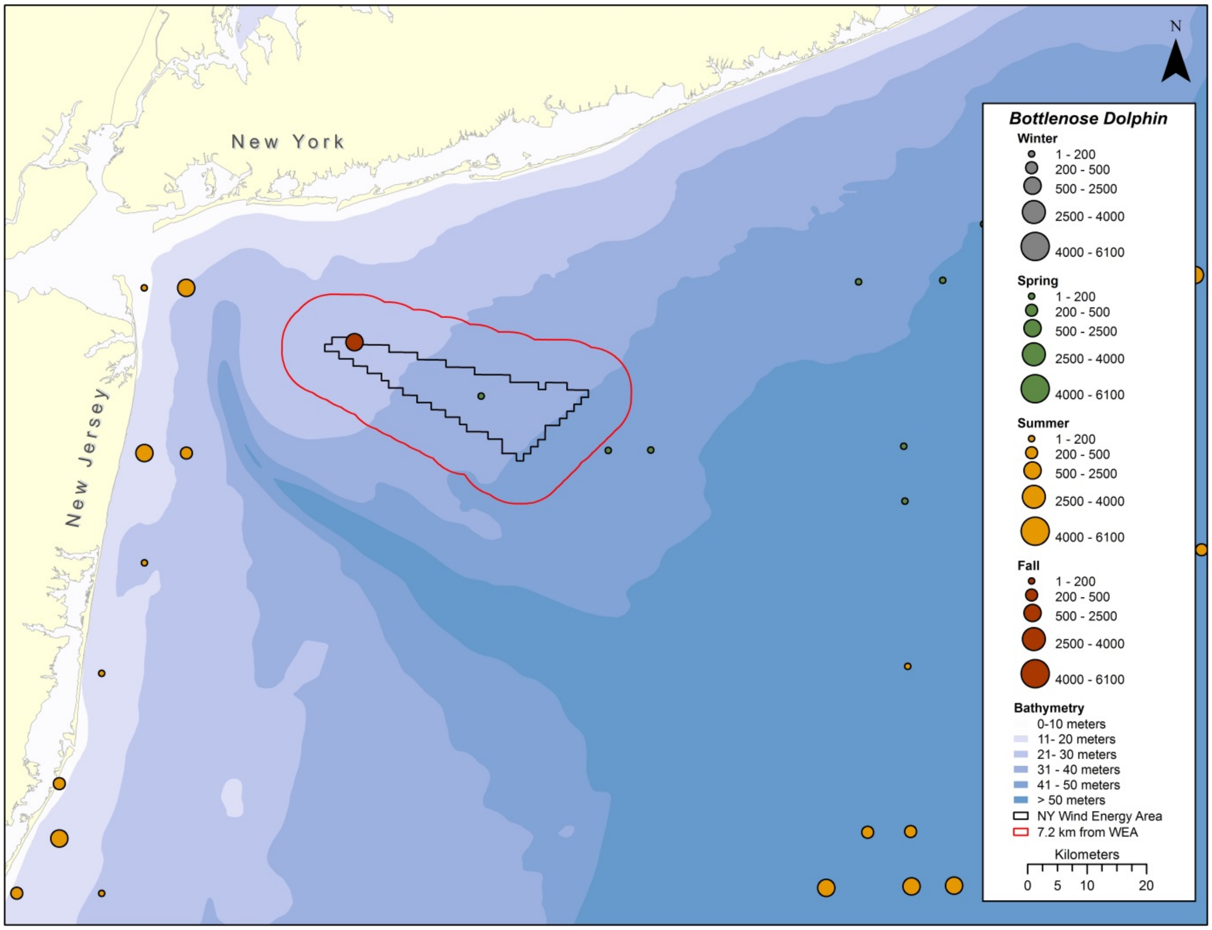

Figure E-7 SPUE for bottlenose dolphins in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

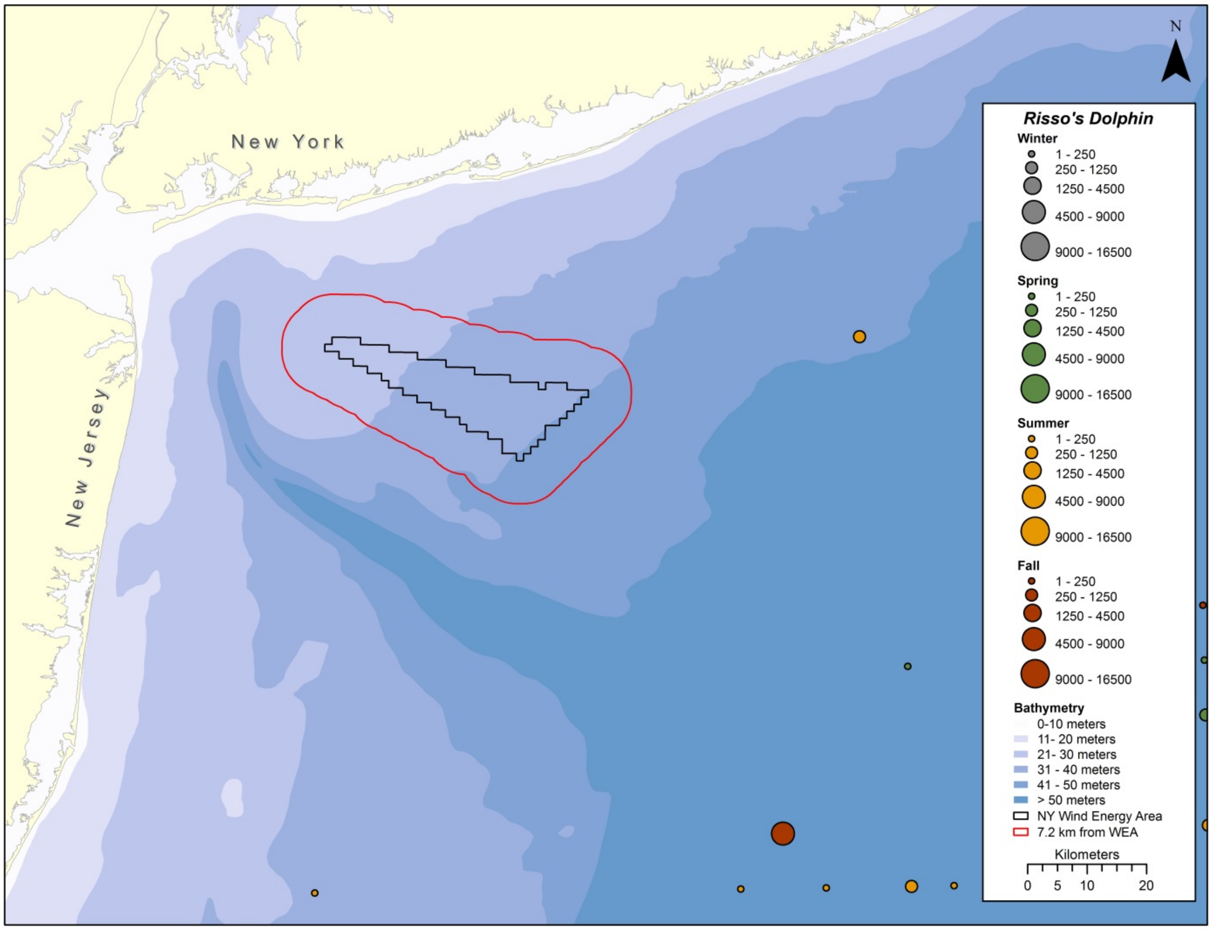

Figure E-8 SPUE for Risso's dolphins in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

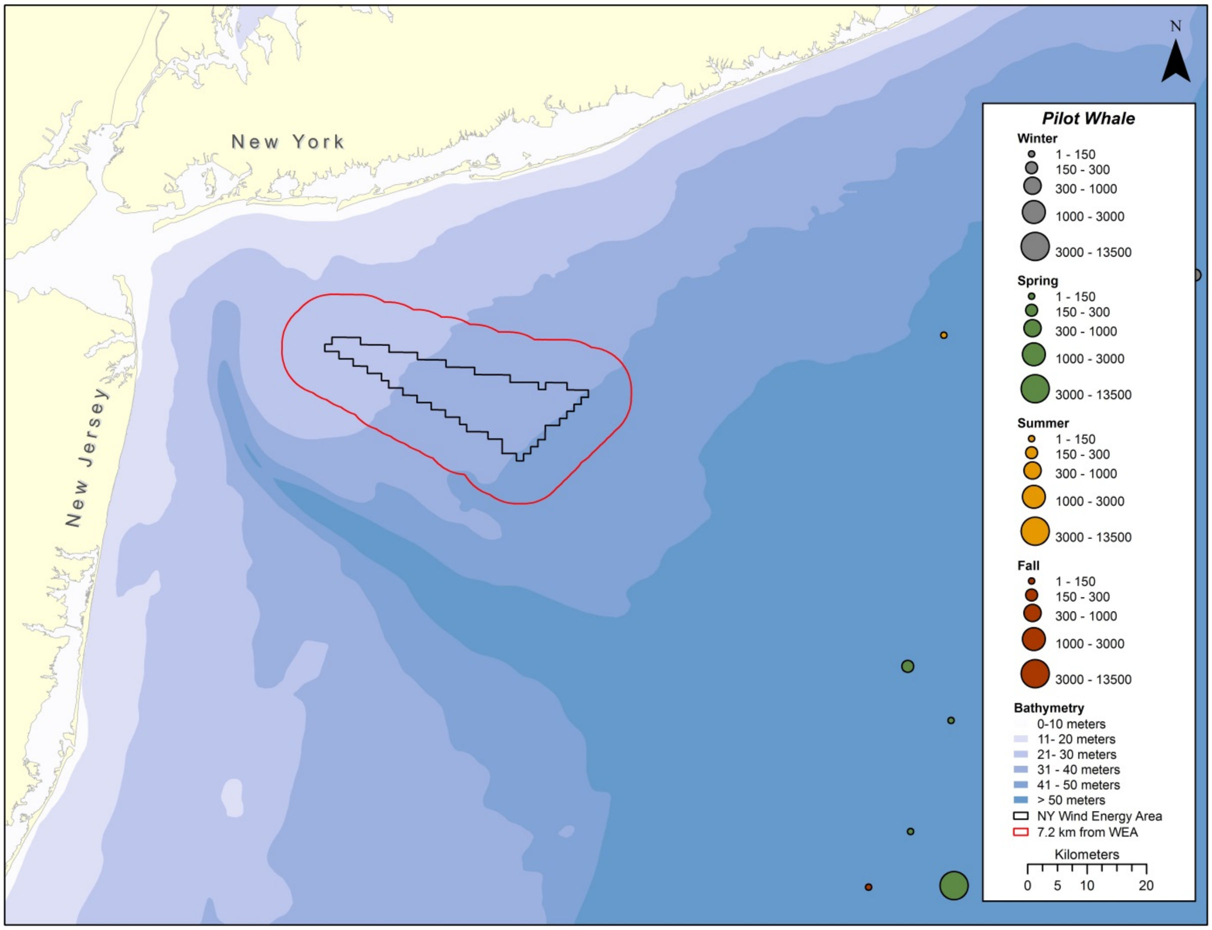

Figure E-9. SPUE for pilot whales in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

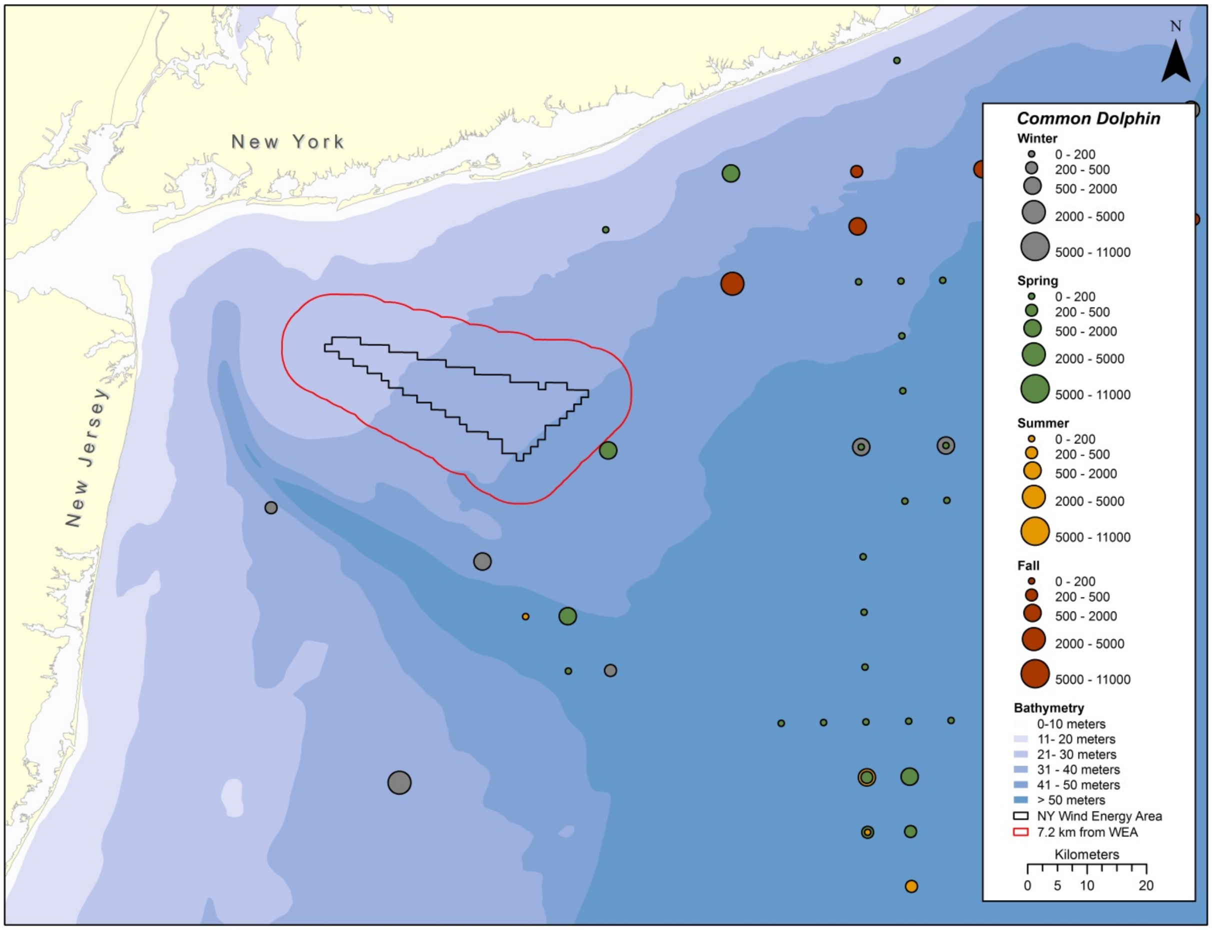

Figure E-10 SPUE for common dolphins in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

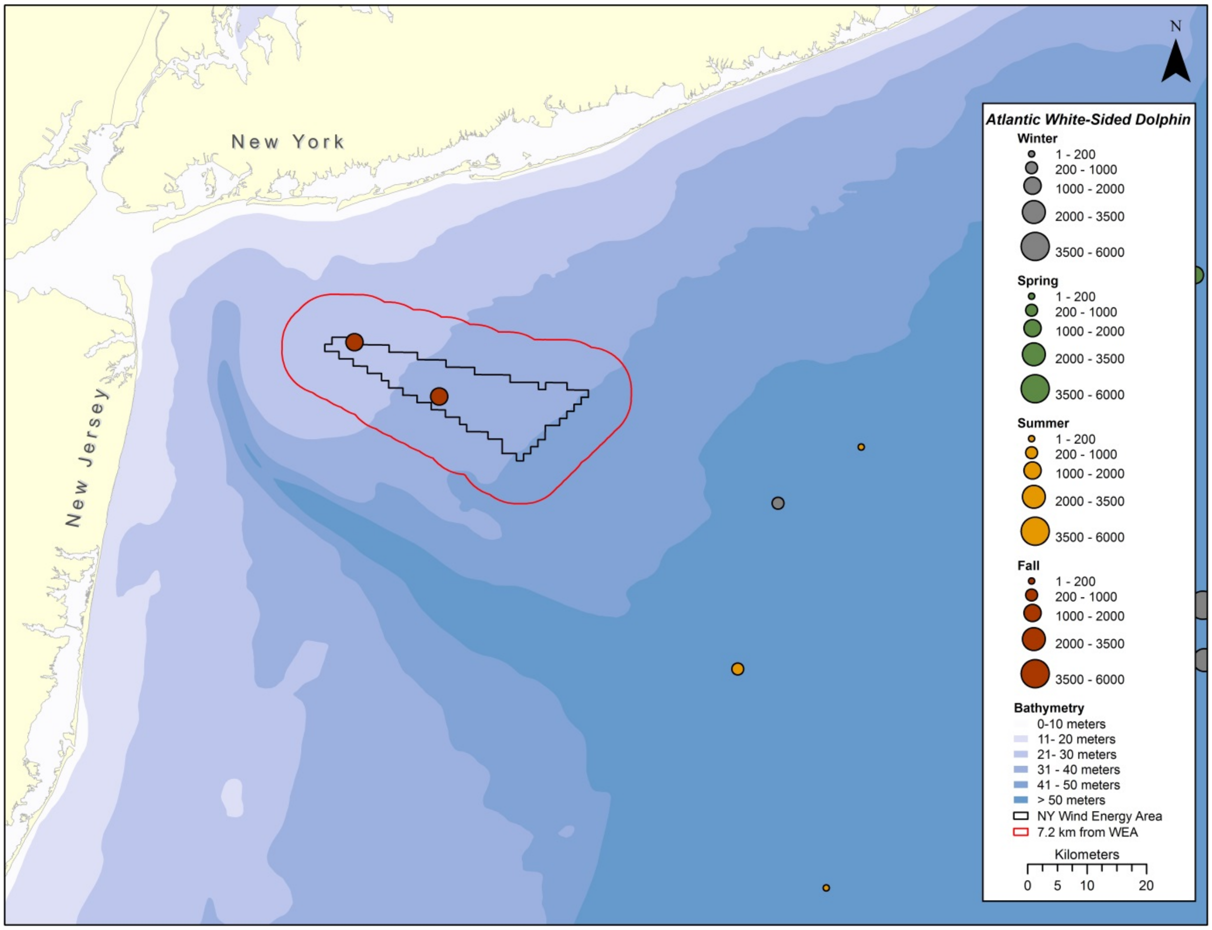

Figure E-11 SPUE for Atlantic white-sided dolphins in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

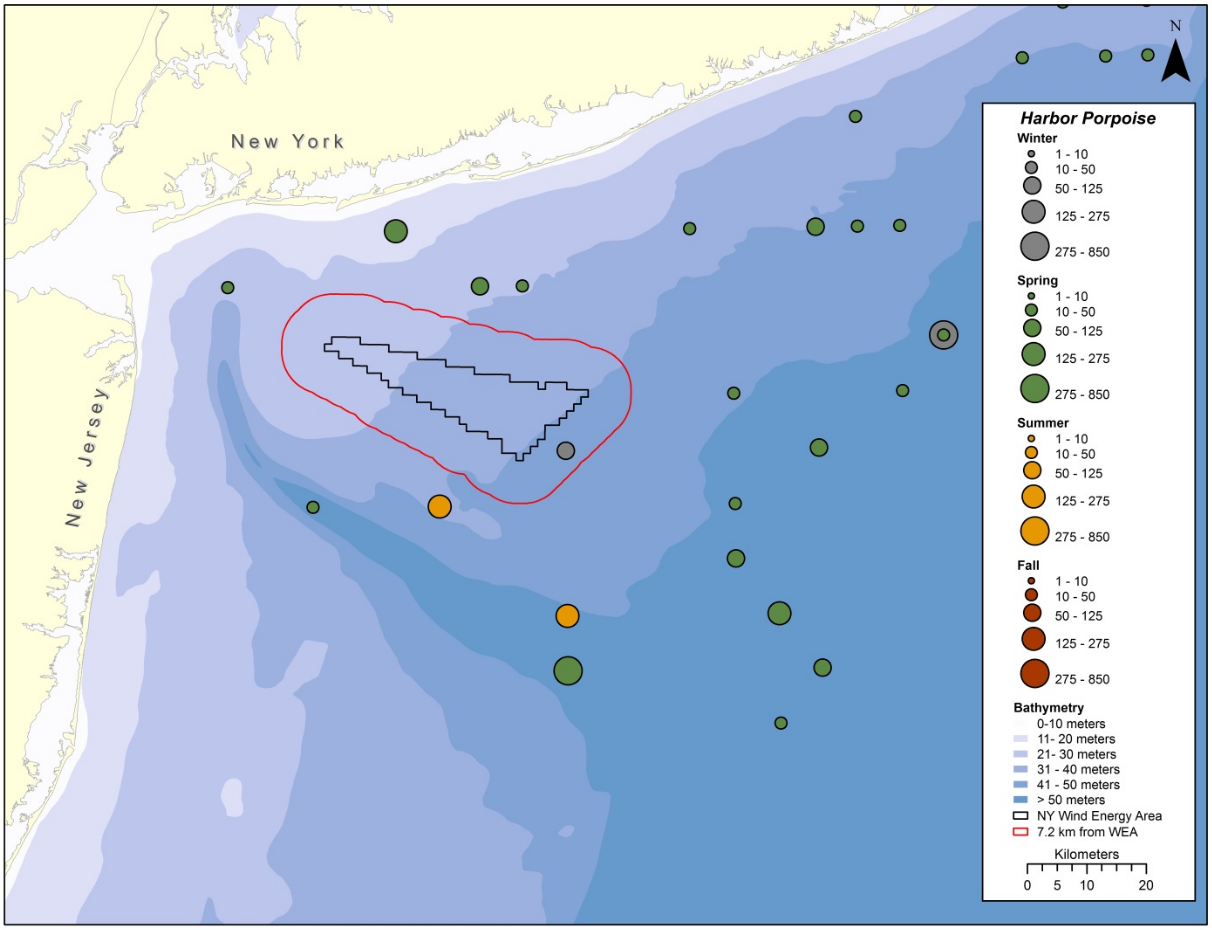

Figure E-12 SPUE for harbor porpoise in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

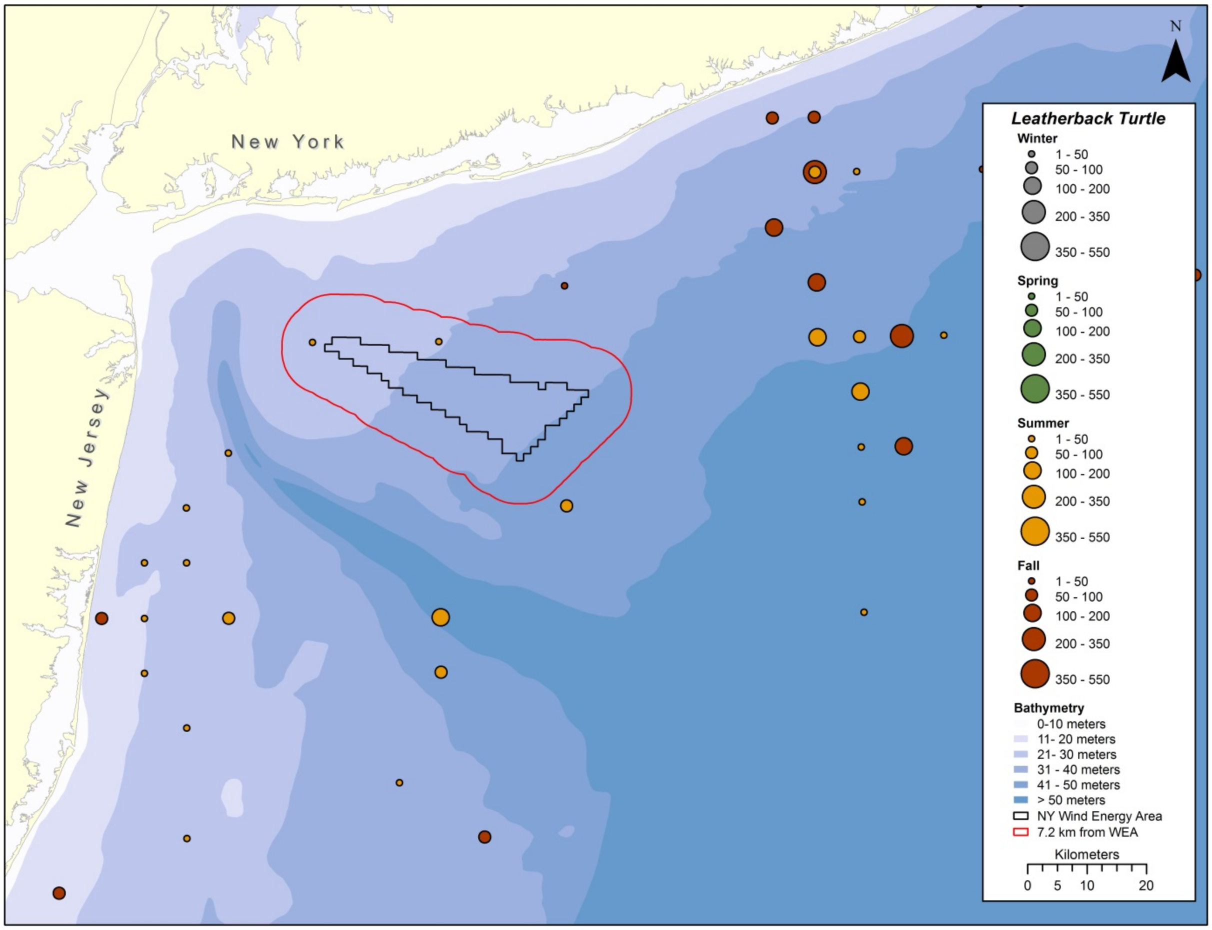

Figure E-13 SPUE for leatherback turtles in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

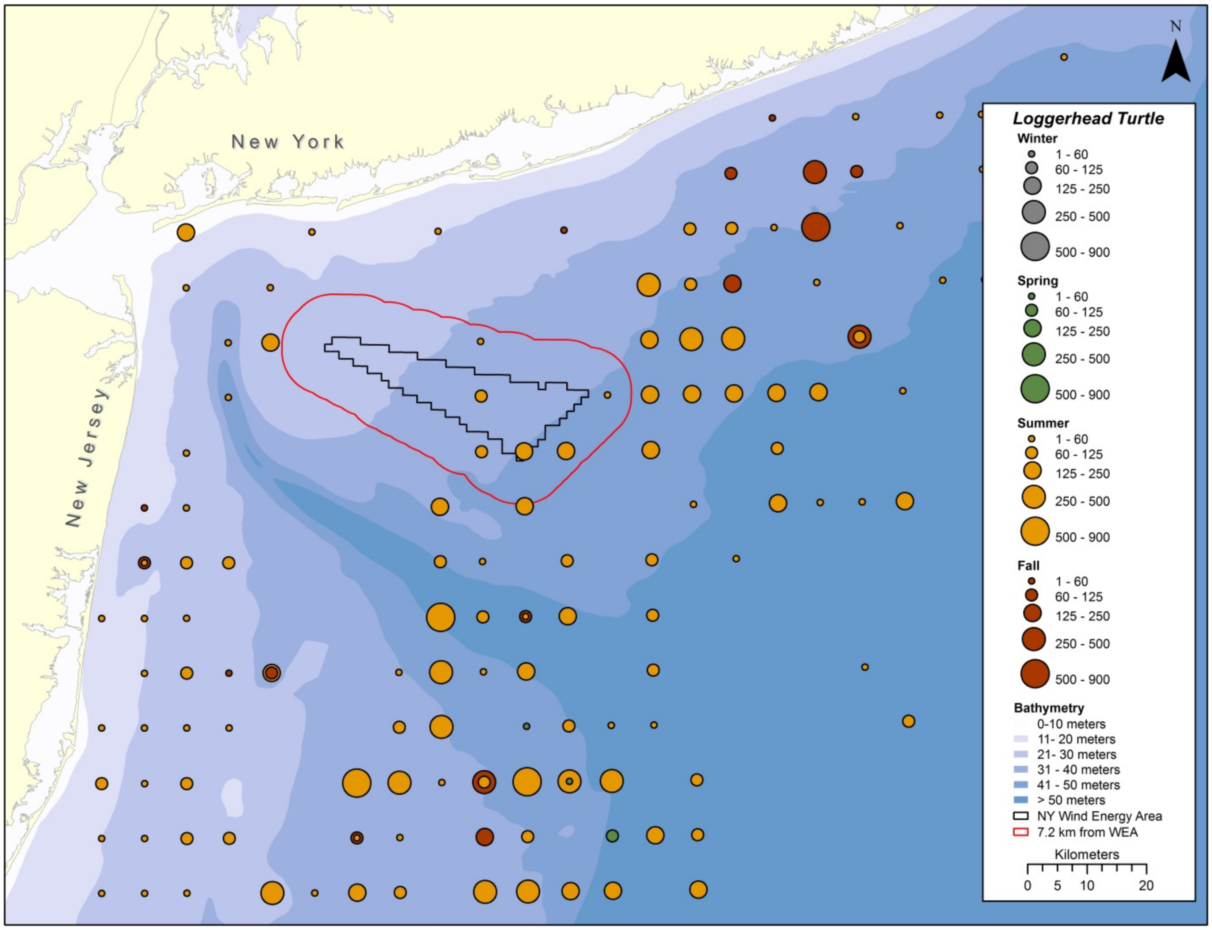

Figure E-14 SPUE for loggerhead turtles in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

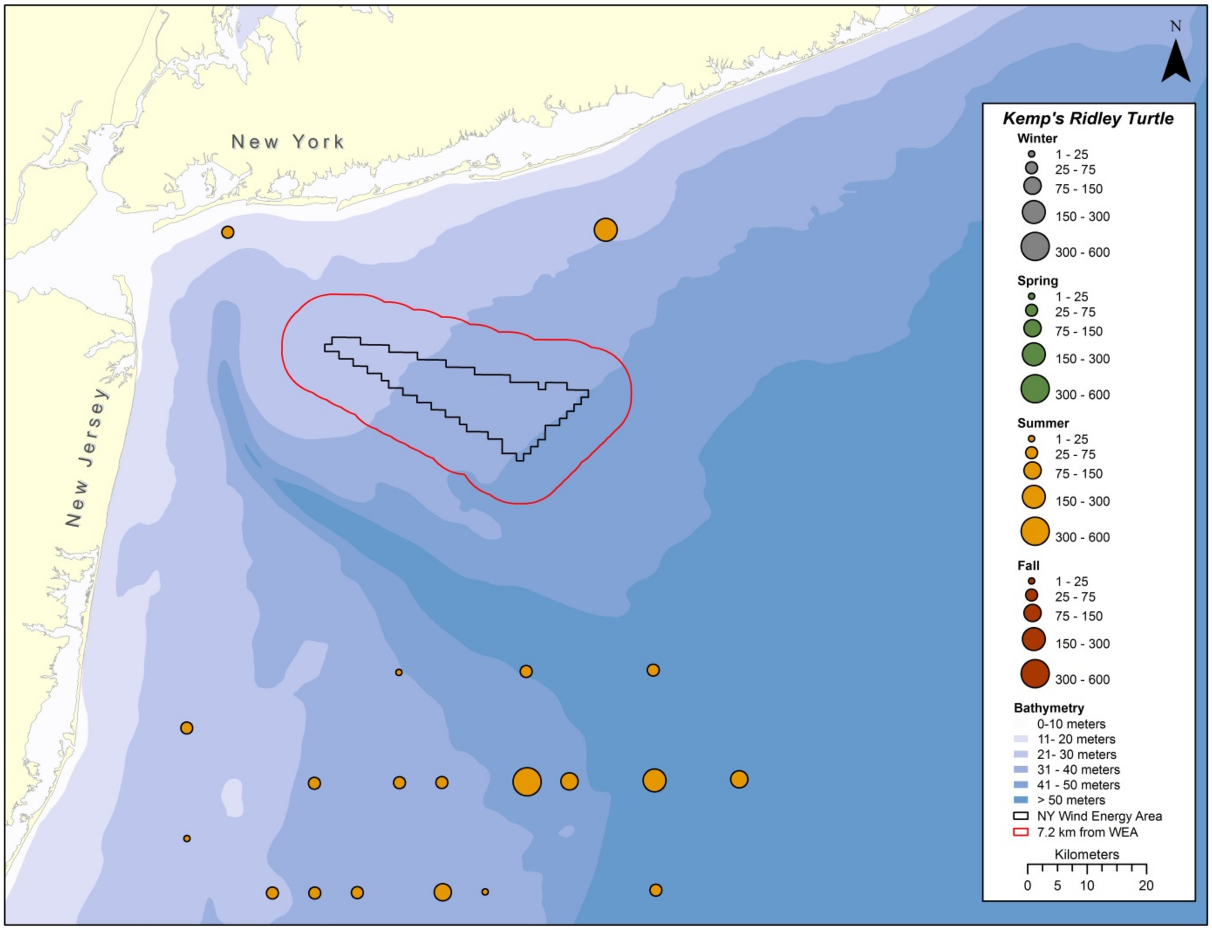

Figure E-15 SPUE for Kemp's ridley turtles in the WEA and surrounding waters (WEA outlined in black and 7.2 km from the WEA outlined in red)

Data Source: Right Whale Consortium, 2015. Map prepared by Normandeau Associates, Inc.

Appendix F

Key Observation Points in the EA Analysis Area and Photosimulations

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KEY OBSERVATION POINTS

Otis Pike Wilderness

Otis Pike Wilderness is located on the Fire Island National Seashore, on public lands administered by the National Park Service (NPS). The Key Observation Point (KOP) was established at the Fire Island Wilderness Visitor Center, at the end of a boardwalk leading to the beach (Figure 4-21). Observer groups represented by this KOP include recreators, tourists, and educational groups. The boardwalk, located adjacent to the Visitor Center, provides viewing opportunities of upland dunes and seascape. The Visitor Center provides access to designated fishing areas, trails, and wilderness campsites.

The seascape appears large in scale, panoramic, and dominated by the broad horizontal plane of the Atlantic Ocean. Dominant colors in the landscape include the varied blue tones of the ocean and sky, the pale tan of the sandy beach, and the greens of upland vegetation. The horizon appears pale tan/white due to atmospheric haze and sea spray.

Observers experience the seascape from both a stationary and mobile position. Observer geometry relative to the WEA is at grade, with a lateral view of the northern edge of the grid. Seascape views from upland ground-level locations are intermittently blocked by dunes and coastal vegetation. Views to the ocean from the beach are unobstructed, limited only by the curvature of the earth and light refraction.

Fire Island Sunken Forest

Fire Island Sunken Forest is located on the Fire Island National Seashore, on public lands administered by the NPS. The KOP was established on the boardwalk, at a location where natural openings in vegetation allow views extending across the dunes to the Atlantic Ocean (Figure 4-21).

The foreground is dominated by the extensive dunes. Topography of the dunes is gentle, characterized by shallow, undulating hills that create enclosure in the foreground. Seascape views from upland ground-level locations are intermitted blocked by low dunes and coastal vegetation. From high-elevation vantage points, views extend outward over the dunes to include the large-scale panorama and dominant horizontal line of the Atlantic Ocean. The existing night sky appears pristine and is not affected by artificial lighting.

Observer groups represented by this KOP include recreators, tourists, and educational groups. Observers experience the seascape in a stationary position at observation decks or interpretive signs and while walking along the boardwalk.

Fire Island Lighthouse

The Fire Island Lighthouse is located on the Fire Island National Seashore, on public lands administered by the NPS. The lighthouse is listed in the National Register of Historic Places. The KOP established outside the door leading from the lens house (Figure 4-21).

Views from the lighthouse deck encompass 360 degrees surrounding the structure. On days of high visibility, observers may view the Manhattan skyline, approximately 50 miles to the northwest. The seascape appears large in scale, panoramic, and dominated by the broad horizontal plane of the beach in the foreground and the Atlantic Ocean beyond. Under nighttime conditions, artificial lighting from residential and commercial centers on the mainland is apparent to the north, east, and west. The night sky above the Atlantic Ocean appears natural, despite the influence of light scatter from the mainland.

Observer groups represented by this KOP include recreators, tourists, and educational groups. An NPS staff member accompanies visitors on the deck to facilitate discussion of views from the lighthouse. Observer geometry relative to the WEA is superior, oriented with a lateral view of the northern edge of the grid. Views to the ocean from the lighthouse deck are unobstructed, limited only by the curvature of the earth and light refraction.

Jones Beach State Park

Jones Beach State Park is located on the south shore of Long Island and includes 6.5 miles of beachfront and 2,400 acres of maritime environment. Approximately 6 to 8 million people visit this park each year (NYPRHP 2015). Jones Beach State Park is listed in the National Register of Historic Places. The KOP established on a boardwalk overlooking the beach (Figure 4-21).

The seascape from Jones Beach appears large in scale, panoramic, and dominated by the broad horizontal plane of the beach in the foreground and the Atlantic Ocean beyond. During the summer months, high visitor use results in a foreground characterized by a high density of recreators and recreation equipment (e.g. beach umbrellas, chairs) that, collectively, dominate foreground views and interrupt views toward the horizon.

Observer groups represented by this KOP primarily include recreators. Observer geometry relative to the WEA is at grade, oriented southeast across the northern edge of the grid. Views to the ocean from the beach are unobstructed.

Jacob Riis Park

Jacob Riis Park is located on the Rockaway Peninsula, a narrow spit separating Jamaica Bay from the Atlantic Ocean. The park is administered by the NPS as part of the Gateway National Recreation Area (NRA). The park is listed in the National Register of Historic Places. The KOP was established in front of the Riis Bathhouse on the Rockaway Gateway Greenway (Figure 4-21).

The seascape from the Riis Bathhouse appears large in scale and panoramic. When standing on the greenway, foreground views are interrupted by the railing and recreational activity on the beach. To the northeast, large-stature buildings can be seen along the shoreline of Rockaway Beach. Artificial lighting illuminates the boardwalk and beach. The night sky is influenced by light from adjacent urban areas and the shoreline of Long Beach.

Observer groups represented by this KOP primarily include recreators and tourists. Views toward the ocean from the beach are unobstructed, limited only by the curvature of the earth and light refraction.

Breezy Point Tip

Breezy Point Tip is located at the tip of the Rockaway Peninsula. Breezy Point Tip is administered by the NPS as part of the Gateway NRA. The KOP was established at a remote access point at the end of a dirt road leading to the beach from Rockaway Point Boulevard (Figure 4-21).

The seascape from Breezy Point Tip appears large in scale and panoramic, with uninterrupted views extending to the horizon. Buildings are visible to the east at Jacob Riis Park and neighboring areas. The night sky is influenced by artificial lighting emanating from nearby urban areas. At the time of the study, offshore cranes and support vessels were stationed near the shore, to the north of the WEA. The vessels were equipped with bright night lighting and appeared dominant on the horizon.

Observers at this location are primarily recreators. Observer geometry relative to the WEA is at grade, oriented southeast toward the tip of the triangular grid.

Fort Wadsworth

Fort Wadsworth is located on Staten Island, NY, on lands administered by the NPS Gateway NRA. Fort Wadsworth is listed in the National Register of Historic Places. The KOP was established at the shoreline, in front of a day-use picnic area (Figure 4-21).

Observers at this location are primarily recreators. Views of the WEA from this location are obstructed by buildings of Seagate and Coney Island, NY.

Great Kills Park

Great Kills Park is located on Staten Island, NY, on lands administered by the NPS Gateway NRA. The KOP was established in front of the bathhouse, overlooking Lower Bay and the Atlantic Ocean (Figure 4-21). The seascape appears large in scale and panoramic; however, some of the New Jersey coastline to the south and the City of Brooklyn and Brighten Beach to the east encroach the view. Under night conditions, artificial lighting emanates from the City of Brooklyn, Brighten Beach, and New Jersey, dominating the night sky from this location and adding to enclosure of the seascape. Isolated white and red lights occupy the horizon of Lower Bay.

Observers at this location are primarily recreators. Observer geometry relative to the WEA is at grade, oriented southeast toward the tip of the triangular grid.

Sandy Hook Lighthouse

Sandy Hook Lighthouse is located on the northern portion of the Sandy Hook Spit, on public lands administered by the NPS Gateway NRA. The lighthouse is designated as a National Historic Landmark. The KOP for this location was established on the lighthouse deck, with views directed east-southeast (Figure 4-21). Foreground views from the lighthouse are dominated by mature deciduous coastal forest. Historic buildings, local surface streets, and visitor parking are visible.

Observer geometry relative to the WEA is superior, oriented east-southeast toward the tip of the triangular grid. An observer's attention is drawn outward toward the Atlantic Ocean, where a narrow beach separates the upland forest from the water.

Sandy Hook North Beach

Sandy Hook North Beach is located on the eastern shoreline of the Sandy Hook Spit, on public lands administered by the NPS Gateway NRA. The KOP was established on the beach overlooking the Atlantic Ocean, with views generally directed to the southeast (Figure 4-21).

The seascape of Sandy Hook North Beach is dominated by the broad, horizontal lines of the beach and ocean. The landscape is both large in scale and panoramic, with views extending to the horizon. Color is composed primarily of the tan colors of the sand, and—on a clear day—the deep blue of the water and sky. A band of light tan to off-white haze was present on the horizon for many of the days this location was visited. Under night conditions, lighting from the Long

Island shoreline is visible, providing enclosure to the seascape to the north.

Observers at this location are primarily recreators. Observer geometry relative to the WEA is at grade, oriented east-southeast across the tip and the southwestern edge.

Sandy Hook Area D

Sandy Hook Area D is located on the eastern shoreline of the Sandy Hook Spit, on public lands administered by the NPS Gateway NRA. The KOP was established on the beach overlooking the Atlantic Ocean, with views generally directed to the east (Figure 4-21).

The seascape of Sandy Hook Area D is similar to that observed at Sandy Hook North Beach: large in scale and panoramic, with views extending to the horizon and dominated by the broad, horizontal lines of the beach and ocean. Color is composed primarily of the tan colors of the sand, and—on a clear day—the deep blue of the water and sky. Under night conditions, lighting from the Long Island shoreline is visible, providing enclosure to the seascape to the north. Lighting from overflying commercial aircraft is common.

Observers at this location are primarily recreators. Observer geometry relative to the WEA is at grade, oriented east-southeast across the tip and the southwestern edge.

Green-Wood Cemetery

Green-Wood Cemetery is a private cemetery located in Brooklyn, NY. This site is a registered National Historic Landmark. The KOP was established on a prominent hill in the cemetery, overlooking the skyline and Jamaica Bay toward the Atlantic Ocean (Figure 4-21). Observers at this location include individuals attending burial services, tourists, and cemetery managers and maintenance workers.

Twin Lights Lighthouse

Twin Lights Lighthouse is located in Highlands, NJ, in Monmouth County and is registered as a National Historic Landmark. The lighthouse is situated on top of a high bluff overlooking the communities of Highlands, Atlantic Highlands, Navesink, Rumson, Fairhaven, and Seabright, and the open beaches and natural areas of Sandy Hook, the Navesink River, and Sandy Hook Bay. Highway 36 extends across the foreground, crossing the Navesink River and heading south along the New Jersey shoreline. The KOP was placed on the lighthouse deck (Figure 4-21). Views from this location are seen through safety railings on the lighthouse deck. Though visual elements of the foreground are complex, the eye is drawn to the broad, flat panorama of the Atlantic Ocean during daytime conditions.

Under night conditions, foreground views are dominated by artificial lighting illuminating the highway, residential areas, and docks. Light is reflected off the flat water of the Navesink River. To the north, Long Island appears distinct due to contiguous lighting along the shoreline, adding to the enclosure of the seascape. Light sources appear as white to golden tones. Commercial aircraft on approach or ascent from local airports are apparent due to lighting against the night sky.

Observers at this location are primarily recreators and tourists. Observer geometry relative to the WEA is superior, oriented eastward across the tip and the southwestern edge of the WEA.

Town of Rumson, NJ

The Town of Rumson, NJ, is located on the north shoreline, in Monmouth County. The KOP was established on a pathway leading to a public beach (Figure 4-21). Views from this location are oriented eastward. From this location, the seascape of the Atlantic Ocean appears large in scale and panoramic, with views extending to the horizon.

Observer geometry relative to the WEA is at grade, oriented eastward across the tip and southwestern edge.

City of Asbury Park, NJ

The City of Asbury Park, NJ, is located in Monmouth County, along the northern shoreline of New Jersey. The KOP was established on Asbury Park Boardwalk, adjacent to the Convention Hall (Figure 4-21). The view from the KOP is directed northeast and encompasses the boardwalk, beach, and Atlantic Ocean. The seascape appears large in scale and panoramic, with views extending to the horizon.

Observer geometry relative to the WEA is at grade, oriented eastward along the southwestern edge.

Ocean Grove, NJ

The Town of Ocean Grove is located in Neptune Township, Monmouth County, NJ. The town is situated on the New Jersey shoreline and characterized by iconic Victorian architecture, a boardwalk paralleling the beach, and a central beach pavilion. The KOP was established in front of the beach pavilion (Figure 4-21). A narrow corridor of tall shrubs exists between the boardwalk and the beach, blocking views of the shoreline and Atlantic Ocean from much of this walkway. From the beach, views extend to the horizon and appear large in scale and panoramic. The beach is accessible for a fee. Views from the beach pavilion are partially blocked by tall shrubs and dunes. Observers at this location are primarily residents, recreators, and tourists. The pavilion is used for public meetings and religious services.

Observer geometry relative to the WEA is at grade, oriented eastward along the southwestern edge.

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KEY OBSERVATION POINT - JONES BEACH
EXISTING CONDITIONS (SUMMER / AFTERNOON)

Truescape®

Scale bar to be 4 inches wide (102 mm)

For 11 x 17 inch Printed Display:
Viewing distance is 11.2 inches (285 mm)

For On-Screen Display:
Viewing distance is 11.2 inches (285 mm)

KEY OBSERVATION POINT - JONES BEACH

SIMULATION OF PROJECT UNDER MAXIMUM VISIBILITY (FALL / AFTERNOON)

Truescape®

Scale bar to be 4 inches wide (102 mm)

For 11 x 17 inch Printed Display:
Viewing distance is 11.2 inches (285 mm)

For On-Screen Display:
Viewing distance is 11.2 inches (285 mm)

Scale bar to be 4 inches wide (102 mm)

For 11 x 17 inch Printed Display:
Viewing distance is 11.2 inches (285 mm)

For On-Screen Display:
Viewing distance is 11.2 inches (285 mm)

Scale bar to be 4 inches wide (102 mm)

For 11 x 17 inch Printed Display:
Viewing distance is 11.2 inches (285 mm)

For On-Screen Display:
Viewing distance is 11.2 inches (285 mm)

Scale bar to be 4 inches wide (102 mm)

For 11 x 17 inch Printed Display:
Viewing distance is 11.2 inches (285 mm)

For On-Screen Display:
Viewing distance is 11.2 inches (285 mm)

Appendix G
Supplemental Commercial Fisheries Information

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G. SUPPLEMENTAL COMMERCIAL FISHERIES

The National Marine Fisheries Service (NMFS) developed a statistical model to predict the spatial footprint of a fishing trip by merging vessel trip reports with data collected by at-sea fisheries observers. NMFS then linked these locations to seafood dealer reports to create revenue-intensity maps as a visual representation of the fishing harvest (DePiper, 2014).

This appendix provides additional details beyond those provided in Section 4.4.3.5. The appendix is divided into Part 1 (original NY WEA Alternative A): data analysis including the Cholera Bank sensitive habitat and Part 2 (revised NY WEA Alternative A): data analysis after the five aliquots of the Cholera Bank Sensitive Habitat were removed.

G.1 ORIGINAL NY WEA CALCULATIONS

Table G-1
Top 10 landing ports with commercial fishing revenue from the NY WEA, 2007- 2012

Port Group	Avg. Annual Revenue* from NY WEA	Avg. Annual Total Revenue	% Revenue from NY WEA
Freeport, NY	$77,363	$783,641	9.9%
Point Lookout, NY	$166,664	$2,417,162	6.9%
New London, CT	$112,670	$6,101,710	1.8%
Point Pleasant, NJ	$478,290	$30,335,241	1.6%
Newport News, VA	$398,210	$38,319,620	1.0%
Long Beach, NJ	$57,165	$6,226,706	0.9%
Stonington, CT	$61,099	$7,607,928	0.8%
Cape May, NJ	$562,111	$75,665,163	0.7%
Barnegat, NJ	$97,142	$16,706,499	0.6%
New Bedford, MA	$1,264,815	$292,229,242	0.4%

* Based on federally report vessel trip report landings

Table G-2
Revenue by fishery management plans from the NY WEA, 2007-2012

Fisheries Management Plan	Jurisdiction	Avg. Annual Revenue* from NY WEA	Average Annual Total Revenue	% Revenue from NY WEA
Sea Scallop	NEFMC	$3,262,78	$428,413,267	0.8
Squid, Mackerel, Butterfish	MAFMC	$194,	$40,849,295	0.5
Monkfish	NEFMC, MAFMC	$28,340	$19,759,447	0.1
Atlantic Herring	NEFMC	$28,086	$23,241,713	0.1
Summer Flounder, Scup, Black Seabass	MAFMC	$39,452	$33,166,172	0.1
Surf Clam & Ocean Quahog	MAFMC	$22,385	$64,967,095	~0
Skate	NEFMC	$1,395	$7,796,915	~0
Small Mesh Multispecies	NEFMC	$1,572	$10,675,728	~0
Unmanaged		$10,959	$248,316,185	~0
Large Mesh Multispecies	NEFMC	$960	$76,625,579	~0

* Based on federally report vessel trip report landings

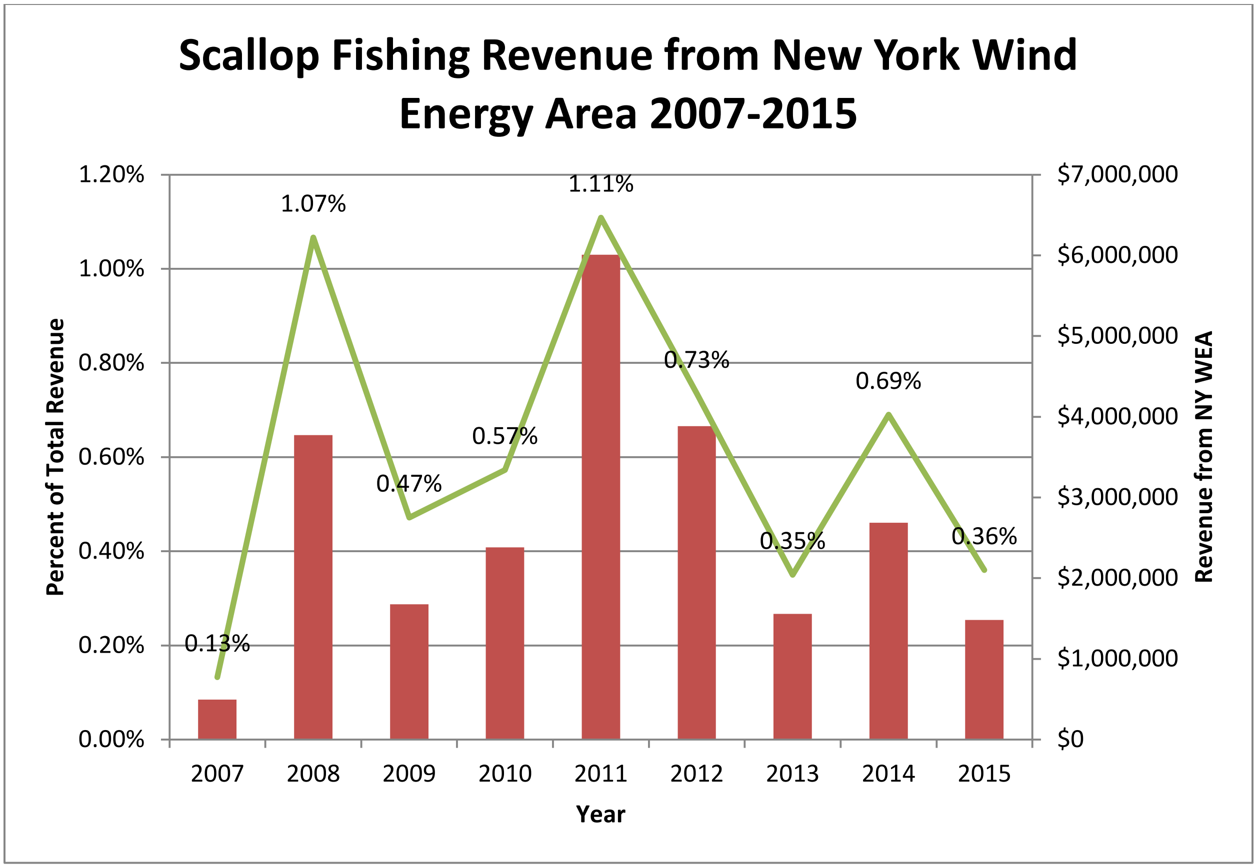

Figure G-1 Yearly variation in scallop FMP revenue from the New York WEA, 2007-2015

* Based on federally report vessel trip report landings

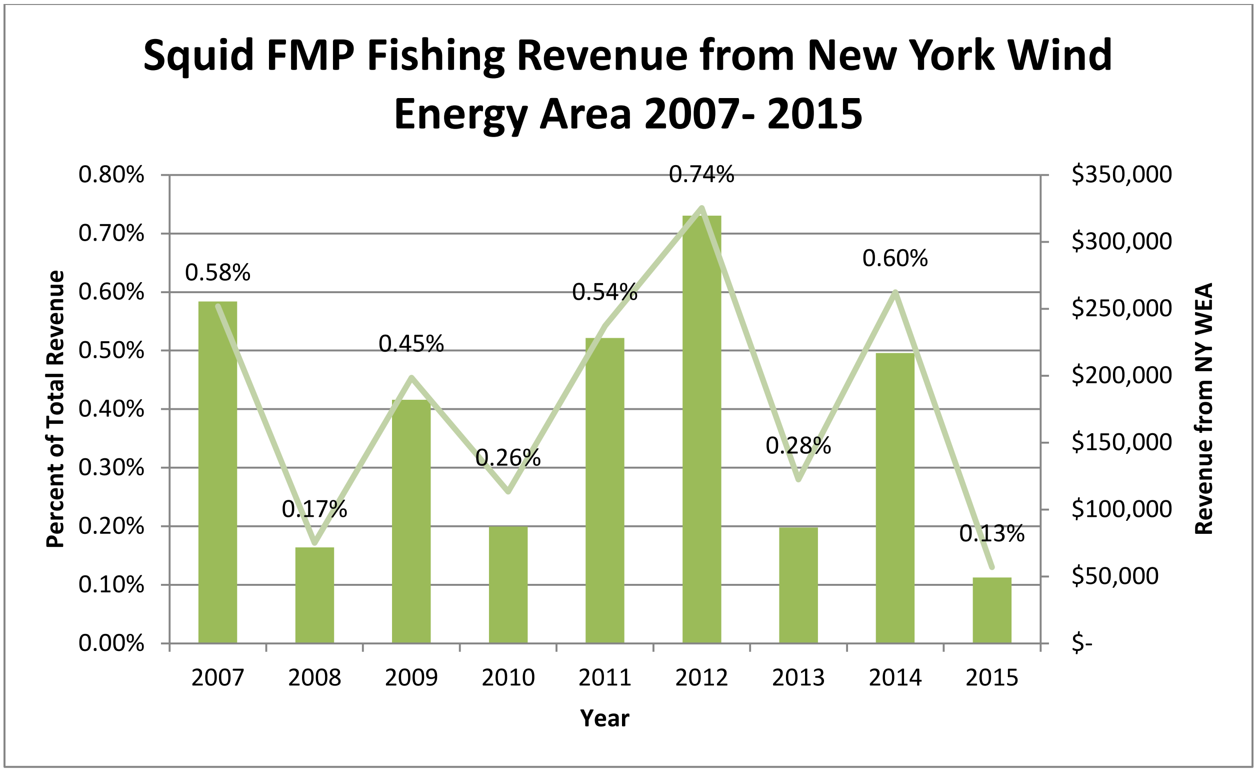

Figure G-2 **Yearly variation in Squid, Mackerel, Butterfish FMP (Squid FMP) revenue from the NY WEA, 2007-2015**

* Based on federally report vessel trip report landings

Table G-3
Number of permits, by gear, fishing in the NY WEA, 2007-2012

Gear	Permits	Average Annual Revenue *	Average Annual NY WEA-sourced Revenue	Percent Revenue from NY WEA	Top 4 FMPs	Top 5 Port Groups
Dredge	373	$486,160,813	$2,914,060	0.6	Sea scallop[1]; Surf Clam Ocean Quahog[2]; Monkfish[3]; Unmanaged[4]	New Bedford, MA; Cape May, NJ; Newport News, VA; Point Pleasant, NJ; New London, CT
Gillnet	55	$34,164,385	$13,254	0.04	Monkfish[3]; Skate[1]; Unmanaged[4]; Bluefish[2]	Barnegat, NJ; Long Beach, NJ; Point Pleasant, NJ; Belford, NJ; Portsmouth, NH
Hand	31	$8,339,830	$178	~0	Summer Flounder, Scup, Black Seabass[2]; Unmanaged[4]; Bluefish[2]; Small Mesh Multispecies[1]	Freeport, NY; Suffolk County, NY; Brooklyn, NY; Point Lookout, NY; Island Park, NY
Longline	1	$7,399,976	$106	~0	Golden Tilefish	Long Beach, NJ
Pot	13	$11,071,430	$146	~0	Unmanaged[4]; Summer Flounder, Scup, Black Seabass[2]; Small Mesh Multispecies[1]; Large Mesh Multispecies[1]	Islip, NY; Freeport, NY; Neptune, NJ; Brooklyn, NY; Other NY, NY
Lobster Pot	33	$213,321,675	$4,724	~0	Unmanaged[4]; Summer Flounder, Scup, Black Seabass[2]; Small Mesh Multispecies[1]; Large Mesh Multispecies[1]	Point Pleasant, NJ; Freeport, NY; Belmar, NJ; Neptune, NJ; Belford, NJ

Gear	Permits	Average Annual Revenue *	Average Annual NY WEA-sourced Revenue	Percent Revenue from NY WEA	Top 4 FMPs	Top 5 Port Groups
Seine	5	$10,258,052	$478	~0	Unmanaged[4]; Monkfish[3]; Small Mesh Multispecies[1]; Summer Flounder, Scup, Black Seabass[2]	Gloucester, MA; Fall River, MA; Belford, NJ
Bottom Trawl	212	$174,094,198	$569,332	0.3	Sea scallop[1]; Squid, Mackerel, Butterfish[2]; Summer Flounder, Scup, Black Seabass[2]; Monkfish[3]	Point Lookout, NY; Point Pleasant, NJ; Freeport, NY; Belford, NJ; Narragansett, RI
Midwater Trawl	18	$21,384,152	$89,500	0.4	Squid, Mackerel, Butterfish[2]; Atlantic Herring[1]; Unmanaged[4]; Spiny Dogfish[3]	Gloucester, MA; New Bedford, MA; Cape May, NJ; Fall River, MA; North Kingstown, RI

[1]NEFMC management

[2]MAFMC management

[3]Joint NEFMC and MAFMC management

[4]Unmanaged species

* Based on federally report vessel trip report landings

Table G-4
Top 10 commercial fish species with revenue from the NY WEA, 2007-2012

Species	Average Annual Revenue* from NY WEA	Average Annual Revenue	Percent Average Annual Revenue From NY WEA
Mackerel, chub	Not Disclosed*	Not Disclosed	-
Mackerel, Atlantic	$70,862	$5,201,950	1.4%
Scallop, sea	$3,262,785	$428,413,267	0.8%
Squid (Loligo)	$123,703	$24,867,195	0.5%
Flounder, summer	$37,654	$22,019,367	0.2%
Monkfish	$28,340	$19,759,447	0.1%
Herring, Atlantic	$28,086	$23,241,713	0.1%
Ocean quahog	$19,013	$27,233,867	0.1%
Surfclam	$3,373	$35,291,040	0.0%
Lobster	$4,413	$212,474,994	0.0%

* Based on federally report vessel trip report landings

******Less than 3 permits reporting

G.2 NEW PROPOSED LEASE AREA CALCULATIONS

Table G-5
NY Proposed Lease Area Revenue for Squid compared to NMFS Statistical Area 612

Year	Proposed Lease Area Revenue*	Statistical Area 612 Revenue	Percent of Statistical Area 612 Revenue from NY WEA**	Area 612 Percent of Coastwide Landings (pounds)
2000	NA	$2,288,971	NA	5%
2001	NA	$669,322	NA	2%
2002	NA	$2,121,981	NA	5%
2003	NA	$115,432	NA	0%
2004	NA	$402,998	NA	3%
2005	NA	$240,198	NA	1%
2006	NA	$1,868,754	NA	5%
2007	$246,579	$1,273,722	19%	4%
2008	$69,278	$210,780	33%	1%
2009	$173,336	$1,213,578	14%	5%
2010	$85,503	$953,152	9%	5%
2011	$205,852	$3,983,318	5%	16%
2012	$297,946	$4,709,339	6%	14%
2013	$83,802	$611,506	14%	2%
2014	$212,638	$2,410,921	9%	8%
NA – not available * Based on federally report vessel trip report landings **This comparison is only available for the years 2007-2014				

Table G-6
NY Proposed Lease Area and NY WEA Revenue Prior to the Removal of Cholera Bank Sensitive Habitat Comparison for Select Groupings

Fishing Group	Average Annual Revenue* 2007-2012 Proposed Lease Area	Average Annual Revenue 2007-2012 from Original NY WEA	Percent Change from NY WEA to Proposed Lease Area
All Trawl Gear	$414,941	$437,636	-5.19%
Mackerel, Squid, Butterfish FMP	$179,749	$194,935	-7.79%
Atlantic Sea Scallop FMP	$2,977,044	$3,035,808	-1.94%
All Fishing Combined	$3,336,111	$3,590,000	-7.61%

* Based on federally report vessel trip report landings

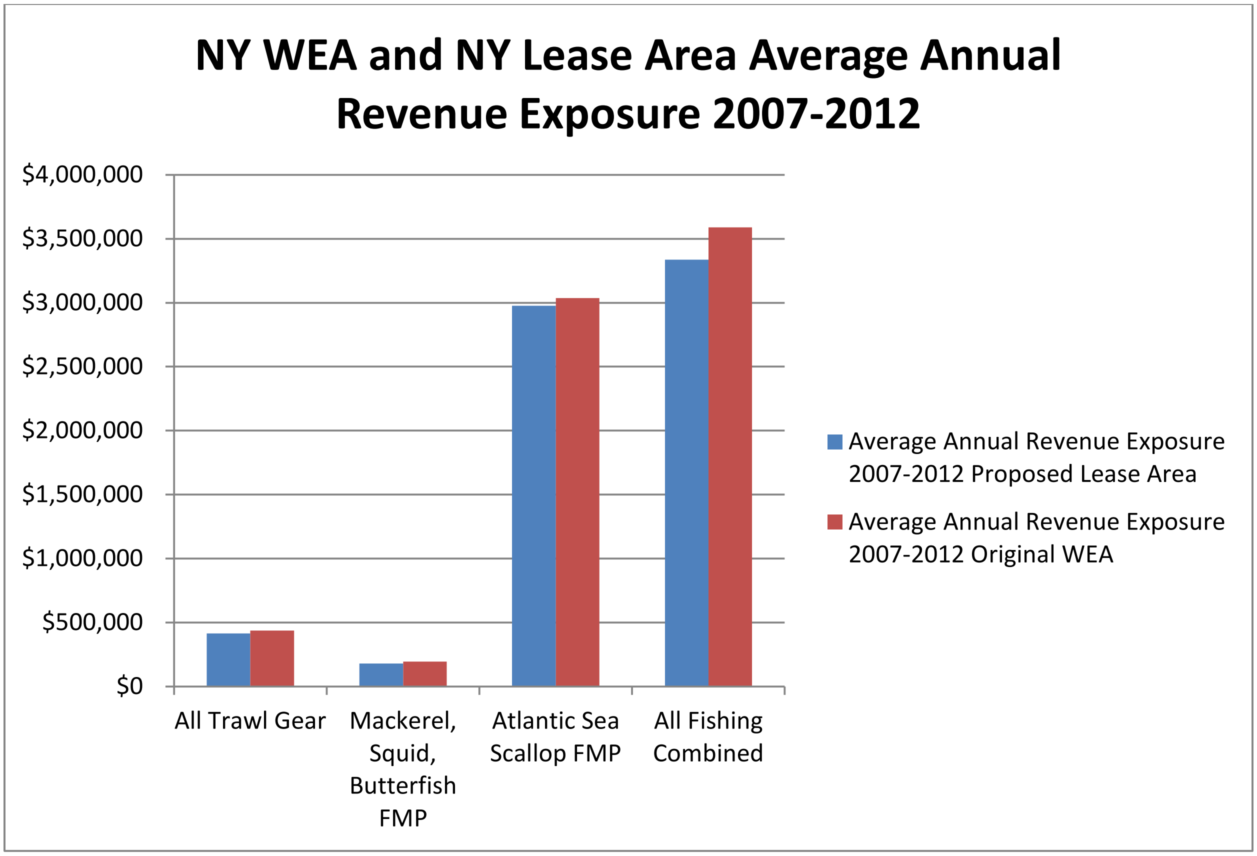

Figure G-3 Comparison of fishing revenue between the NY WEA and the NY Proposed Lease Area

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the sound use of our land and water resources, protecting our fish, wildlife and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island communities.

The Bureau of Ocean Energy Management

The Bureau of Ocean Energy Management (BOEM) works to manage the exploration and development of the nation's offshore resources in a way that appropriately balances economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development and environmental reviews and studies.