OCS EIS/EA
BOEMRE 2011-037

Commercial Wind Lease Issuance and Site Characterization Activities on the Atlantic Outer Continental Shelf Offshore New Jersey, Delaware, Maryland, and Virginia

Draft Environmental Assessment

U.S. Department of the Interior
**Bureau of Ocean Energy Management,
Regulation and Enforcement**
Office of Offshore Alternative Energy Programs

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TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

1 INTRODUCTION

1.1 Background

1.1.1 "Smart from the Start" Atlantic Wind Energy Initiative

On November 23, 2010, Secretary of the Interior Ken Salazar announced the "Smart from the Start" Atlantic wind energy initiative to accelerate the responsible development of wind energy on the Atlantic Outer Continental Shelf (OCS). The initiative calls for the identification of areas on the Atlantic OCS that appear most suitable for commercial wind energy activities, and the opening of these areas for leasing and detailed site assessment activities. On February 9, 2011, the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) launched the first phase of this initiative through the publication of a Notice of Intent (NOI) in the *Federal Register* (76 FR 7226). The NOI identified areas of the OCS offshore the Mid-Atlantic States – New Jersey, Delaware, Maryland, and Virginia – that appeared to provide the most suitable opportunity for wind energy development while presenting the fewest apparent user conflicts. *See* Figure 1.1. These areas, "Wind Energy Areas" (WEAs), were originally delineated in the NOI, and later refined. *See* Figure 1.2. They were developed and refined through extensive consultation with other Federal agencies and BOEMRE's Intergovernmental Renewable Energy Task Forces of each affected state, which had been taking place since October 29, 2011. *See* Section 1.5 for further discussion of BOEMRE's Intergovernmental Renewable Energy Task Forces, and development and refinement of the WEAs. The NOI solicited public input regarding the environmental and socioeconomic issues associated with wind energy leasing in these areas (76 FR 7226).

1.1.2 BOEMRE Authority and Regulatory Process

The Energy Policy Act of 2005, Pub. L. No. 109-58, added Section 8(p)(1)(C) to the OCS Lands Act (OCSLA), which mandated that the Secretary of the Interior issue leases, easements, or rights-of-way on the OCS for the purpose of wind energy development. *See* 43 U.S.C. § 1337(p)(1)(C). The Secretary delegated this authority to the former Minerals Management Service (MMS), now BOEMRE. On April 22, 2009, BOEMRE promulgated final regulations implementing this authority at 30 CFR Part 285.

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. BOEMRE's wind energy program occurs in four distinct phases: (1) planning and analysis; (2) lease issuance; (3) approval of a site assessment plan (SAP); and (4) approval of a construction and operation plan (COP). The first phase is to identify suitable areas for wind energy leasing consideration through collaborative, consultative and analytical processes. The second phase, issuance of a commercial wind energy lease, gives the lessee the exclusive right to subsequently seek BOEMRE approval for the development of the leasehold. The lease does not grant the lessee the right to construct any facilities; rather, the lease grants the right to use the leased area to develop its plans, which must be approved by BOEMRE before the lessee can move on to the next stage of the process. *See* 30 CFR 285.600 and 285.601. The third stage of the process is the submission of a SAP, which contains the lessee's detailed proposal for the construction of a meteorological tower and/or the installation of meteorological buoys on the leasehold. *See* 30 CFR 285.605 - 285.618. The lessee's SAP must be approved by

BOEMRE before it conducts these "site assessment" activities on the leasehold. BOEMRE may approve, approve with modification, or disapprove a lessee's SAP. *See* 30 CFR 285.613. The fourth stage of the process is the submission of a COP, a detailed plan for the construction and operation of a wind energy project on the lease. *See* 30 CFR 285.620-285.638. BOEMRE approval of a COP is a precondition to the construction of any wind energy facility on the OCS. *See* 30 CFR 285.628. As with a SAP, BOEMRE may approve, approve with modification, or disapprove a lessee's COP. *See* 30 CFR 285.628.

The regulations also require that a lessee provide the results of surveys with its COP, including a shallow hazards survey (30 CFR 285.626 (a)(1)), geological survey (30 CFR 285.616(a)(2)), geotechnical survey (30 CFR 285.626(a)(4)), and an archaeological resource survey (30 CFR 285.626(a)(5)). BOEMRE refers to these surveys as "site characterization" activities. Although BOEMRE does not issue permits or approvals for these site characterization activities, it will not consider approving a lessee's COP if the required survey information is not included. *See also* http://www.boemre.gov/offshore/RenewableEnergy/PDFs/GGARCH4-11-2011.pdf.

In addition to commercial leases, BOEMRE has the authority to issue leases to other Federal agencies and to States for the purpose of conducting renewable energy research activities that support the future production, transportation, or transmission of renewable energy. *See* 30 CFR 285.238. The terms of these types of research leases would be negotiated by the Director of BOEMRE and the head of the Federal agency or the Governor of the relevant State, or their authorized representatives, on a case-by-case basis, subject to the provisions of 30 CFR Part 285, including those pertaining to public involvement.

1.2 Purpose and Need

The purpose is to issue leases and approve site assessment plans to provide for the responsible development of wind energy resources in previously identified WEAs offshore New Jersey, Delaware, Maryland and Virginia. The need is to adequately assess wind and environmental resources of the WEAs to determine whether and which areas within the WEAs are suitable for and would support commercial-scale wind energy production.

1.3 Description of the Proposed Action

The proposed action is the issuance of commercial and research wind energy leases within the WEAs offshore New Jersey, Delaware, Maryland and Virginia as shown in Figure 1.2, and approval of site assessment activities on those leases.

1.4 Objective of the Environmental Assessment

Pursuant to the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321-4370f, and the Council on Environmental Quality (CEQ) Regulations at 40 CFR 1501.3, this EA was prepared to assist the agency in determining which OCS areas offshore the Mid-Atlantic States should be the focus of BOEMRE's wind energy leasing efforts. This EA considers a number of reasonable geographic and non-geographic alternatives, and evaluates the environmental and socioeconomic consequences (including potential user conflicts) associated with issuing leases and approving site assessment plans under each alternative.

1.4.1 Information Considered

Information considered in scoping the NEPA document includes:

1. Public response to the February 9, 2011, NOI to prepare this EA;
2. BOEMRE research and review of current relevant scientific and socioeconomic literature;
3. Comments received in response to the Requests for Interest (RFI) and Calls for Information (Calls) associated with wind energy planning offshore each of the Mid-Atlantic States;
4. Ongoing consultation and coordination with the members of BOEMRE's Intergovernmental Renewable Energy Task Forces in each Mid-Atlantic State;
5. Consultation with potentially affected tribes in each Mid-Atlantic State;
6. Ongoing 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); and
7. Relevant material from the *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement* (Programmatic EIS)(USDOI, MMS, 2007a).

1.4.2 Scope of Analysis

BOEMRE intends to use this EA to inform decisions to issue leases in the refined WEAs, and to subsequently approve SAPs on those leases. As discussed above, BOEMRE does not issue permits for shallow hazards, geological, geotechnical, or archaeological resource surveys. However, since BOEMRE regulations require that a lessee include the results of these surveys in its application for COP approval, this EA will treat the environmental consequences of these surveys as reasonably foreseeable consequences of issuing a lease.

Thus, this EA will analyze the reasonably foreseeable consequences associated with two distinct BOEMRE actions in the WEAs identified in the alternatives:

(1) Lease issuance (including reasonably foreseeable consequences associated with shallow hazards, geological, geotechnical, and archaeological resource surveys); and

(2) SAP approval (including reasonably foreseeable consequences associated with the installation of a meteorological tower and/or meteorological buoys).

This EA will not be used to support any future decision regarding construction or operation of any wind energy facility on leases that may be issued within the WEAs. BOEMRE is not currently reviewing any COP, nor has any COP been submitted for the agency's consideration in the WEAs. The purpose of conducting surveys and installing meteorological measurement devices is to assess the wind resources in the lease area and to characterize the conditions of the water column and seabed so that a lessee can determine whether the site is suitable for commercial development and, if so, submit a COP.

BOEMRE's experience with the Cape Wind Project offshore Massachusetts, as well as its understanding of the evolution of the wind industry offshore northern Europe, has demonstrated that rapidly changing technology, different wind resources and wave conditions, various seabed characteristics, different project economics, and the variety of possible project designs can affect whether, to what extent, and how a lease is ultimately developed. Additionally, project design and the resulting environmental impacts are often geographically and design specific, and therefore it would be premature to analyze environmental impacts related to approval of any future COP at this time (Musial and Ram, 2010; Michel et al., 2007). Since no entity is currently in a position to submit a COP (as no entity has yet been awarded a lease or acquired the necessary leasehold information to formulate such a plan), and since the specific information contained in such a plan would be determinative of the reasonably foreseeable environmental consequences associated with the development of any lease, BOEMRE will not speculate in this EA as to what the consequences of the potential future development of any leasehold within in a WEA would be. While analyzing the specific environmental consequences of project construction and operation would be impossibly speculative at this stage in the leasing process, this EA considers obvious navigational issues that could be presented by wind energy development on the OCS when considering what areas should be leased. *See* Chapter 2, Alternatives, of this EA.

This EA considers whether issuing leases and approving site assessment activities in certain areas of the OCS offshore New Jersey, Delaware, Maryland, and Virginia would lead to reasonably foreseeable significant environmental impacts on the environment, and thus, whether an Environmental Impact Statement (EIS) should be prepared before leases are issued. *See* 40 CFR 1508.9. After BOEMRE either issues a Finding of No Significant Impact (FONSI) or completes an EIS process, BOEMRE may issue one or more wind energy leases in the WEAs identified in the preferred alternative. In the event that a particular lease is issued, and the lessee subsequently submits a SAP, BOEMRE would then determine whether this EA adequately considers the environmental consequences of the activities proposed in the lessee's SAP. If the analysis in this EA adequately considers these consequences, then no further NEPA analysis would be required before the SAP is approved. If, on the other hand, BOEMRE determines that the analysis in this EA is inadequate for that purpose, BOEMRE would prepare an additional NEPA analysis before approving the SAP.

If and when a lessee is prepared to propose wind energy generation on its lease, it will submit a COP. If a COP is submitted, BOEMRE would prepare a separate site- and project-specific NEPA analysis. This 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. This EIS process would provide the public and Federal officials with comprehensive site- and project-specific information regarding the potential environmental impacts of the specific project that the lessee is proposing. BOEMRE will use a site- and project-specific NEPA document to evaluate the potential environmental and socioeconomic consequences associated with the proposed project when considering whether to approve, approve with modification, or disapprove a lessee's COP pursuant to 30 CFR 285.628.

1.4.3 Planning Process

In 2010, BOEMRE began publishing in the *Federal Register* RFIs and Calls for the WEAs originally identified in the NOI pursuant to 30 CFR 285.210-285.216. See the section below for further discussion of the RFI/Call processes. The RFI and Call processes are planning notices designed to assist BOEMRE in acquiring environmental and socioeconomic information and determining whether competitive interest exists in acquiring a wind energy lease on the OCS. *See* 43 U.S.C. § 1337(p)(3). Anyone interested in acquiring a lease in the area identified in the RFI or Call must submit a valid expression of interest, which includes the identification of the specific block or blocks the applicant is interested in acquiring, and a general description of the applicant's objectives and the facilities that it contemplates using to achieve them. *See* 30 CFR 285.213. This information has assisted BOEMRE in developing some of the reasonably foreseeable scenarios on which the alternatives in this EA are based:

(1) The reasonably foreseeable leasing scenario, which was used to determine how many leases a particular WEA could reasonably support; and
(2) The reasonably foreseeable site assessment scenario, which was used to determine how many meteorological towers or buoys would likely be installed in a particular WEA.

The RFIs and Calls also solicited public comment and information on all issues associated with wind energy leasing in the areas identified. BOEMRE has received robust public input in response to the RFIs and Calls dealing with a full range of issues including environmental, socioeconomic, user conflict, and refinement of the WEAs, all of which were considered in the preparation of this EA.

1.5 Development and Refinement of Wind Energy Areas

In consultation with other Federal agencies and BOEMRE's Intergovernmental Task Forces, BOEMRE identified WEAs offshore New Jersey, Delaware, Maryland, and Virginia. As a result of comments received on the NOI, RFIs, and Calls, the WEAs were further refined to arrive at the area considered under the Proposed Action.

Coastal and Marine Spatial Planning (CMSP)

On July 19, 2010, the President signed Executive Order 13547: Stewardship of the Ocean, Our Coasts, and the Great Lakes establishing a national ocean policy and the National Ocean Council (75 FR 43023). The Order establishes a comprehensive, integrated national policy for the stewardship of the ocean, our coasts and the Great Lakes. Where BOEMRE actions affect the ocean, the Order requires BOEMRE to take such action as necessary to implement this policy, the stewardship principles and national priority objectives adopted by the Order, and guidance from the National Ocean Council. Following the principles of CMSP, BOEMRE developed and refined the WEAs by coordination with the Intergovernmental Renewable Energy Task Forces.

New Jersey WEA

The Call for Information and Nominations for Commercial Leasing for Wind Power on the OCS Offshore New Jersey, published on April 20, 2011, described how the WEA/Call area was identified through consultation with BOEMRE's New Jersey Intergovernmental Renewable Energy Task Force (76 FR 22130). This is the same area identified as a WEA in the February 9, 2011 NOI to prepared this EA (76 FR 7226).

The New Jersey WEA and Call area was developed using the boundary of New Jersey's Ocean/Wind Power Ecological Baseline Studies (OWPEBS) as a base. The results of the OWPEBS (http://www.nj.gov/dep/dsr/ocean-wind/report.htm) helped to identify areas that may not be suitable for development, based on features ranging from physical obstructions and usages, to the presence and density of biological resources including avian populations and aquatic habitat. Certain areas were removed from consideration prior to the publication of the NOI for the following reasons:

- The northern portion of the OWPEBS area was removed from further consideration due to the presence of a major shipping lane and telecommunications cables, and high bird densities.
- The southernmost section of the OWPEBS area was removed from further consideration, where a large number of shoals and biological resources are concentrated (e.g. birds, marine mammals, sea turtles). The presence of these biological resources increases the area's sensitivity to development and includes Marine Protected Areas (MPAs) and Essential Fish Habitat (EFH).
- The area of the OCS from the state boundary seaward to the 7 nautical mile (nm) line was also removed from further consideration. The 7 nm line is the point at which the OWPEBS identified that avian density steeply declined (moving from inshore to offshore). BOEMRE has excluded the area from the state boundary to the 7 nm limit due to high avian densities, the numerous shipwrecks, reefs, and shoals that occur in this zone, as well as the high level of recreational and commercial vessel activity.

The New Jersey WEA was designed to avoid the following areas:

1. Shipping lanes, traffic separation schemes (TSS), areas in close proximity to pipelines and cables, artificial reefs and shipwrecks.
2. Shoals, since they function as feeding grounds and nurseries for various pelagic and bottom-dwelling species, as well as serve as fishing/feeding hotspots for recreational and commercial fishermen, birds, sea turtles and marine mammals.
3. High Avian Densities—Areas with high avian densities are mostly concentrated in state waters along the coast. However, some hotspots can be found offshore, usually associated with shoals or other unique bottom features and/or oceanographic dynamics.
4. Fishing Hot Spots—Although usually associated with shoals, other natural and artificial bottom features can contribute to fisheries productivity, and should be avoided when possible.
5. Marine Mammals and Sea Turtles— As shown in the OWPEBS, marine mammal and sea turtles densities are roughly evenly distributed throughout the study area, and low in number (with the exception of dolphins). However, marine mammal and sea turtle densities are often found to be higher near underwater features such as shoals and ridges.
6. EFH— EFHs, although not well defined in the study area, are present for numerous fish species, and are known to use the area during all or some life stages.

The area analyzed in the OWPEBS encompassed a portion of the TSS in the approaches to New York and a traditional transit route utilized by tugs and barge operators. Based on recommendations by the USCG, and considering the lack of information currently available to assess vessel traffic types, densities and routing direction of vessels leaving the TSS, BOEMRE determined that OCS blocks within and directly south of the TSS were not included in the WEA. OCS blocks within one nm of an identified traditional tug and barge transit route were also removed from consideration.

DOD conducts offshore testing, training and operations on the OCS offshore New Jersey. Certain areas were excluded from the WEA based on DOD assessments of compatibility between commercial offshore wind development and DOD testing, training and operations.

No refinements have been made to the WEA since its identification in the NOI. The New Jersey WEA, under consideration in this NEPA document, begins 7 nm from the shore and extends roughly 23 nm seaward (or the approximate 100 ft depth contour) and extends 53 nm along the Federal/state boundary form Seaside Park south to Hereford Inlet. The entire area is approximately 418 square nm (354,408 acres; 143,424 hectares) and contains approximately 43 whole OCS blocks and 26 partial blocks. See Figures 1.1 and 1.2.

Delaware WEA

On January 26, 2011, BOEMRE published in the *Federal Register* a Request for Competitive Interest (RFCI) for an area offshore Delaware for the purpose of determining whether competitive interest exists in acquiring a lease there (*see* 76 FR 4719; Figure 1.1). This RFCI discussed how the RFCI area offshore Delaware was delineated through consultation with BOEMRE's Delaware Intergovernmental Renewable Energy Task Force. This RFCI area did not include a nearby explosives dumping ground due to concerns about the safety of development there. The WEA offshore Delaware identified in the February 9, 2011, NOI to prepare this EA (76 FR 7226) is the same area identified in the RFCI. No refinements have made been made since the NOI was published. The Delaware WEA, under consideration in this NEPA document, constitutes the area offshore Delaware resting between the incoming and outgoing shipping routes for Delaware Bay, and is made up of 11 whole OCS blocks and 16 partial blocks. The closest point to shore is approximately 11 miles due east from Rehoboth Beach, Delaware. The entire area is approximately 122 square nm (103,323 acres; 41,813 hectares). *See* Figure 1.2.

Maryland WEA

The Commercial Leasing for Wind Power on the OCS Offshore Maryland—RFI, published in the *Federal Register* on November 9, 2010, discussed how the RFI area was delineated through consultation with BOEMRE's Maryland Intergovernmental Renewable Energy Task Force (75 FR 68824). This is the same area identified as a WEA in the February 9, 2011, NOI to prepare this EA (76 FR 7226).

Since the announcement of the WEA, BOEMRE requested that the USCG identify those blocks that, should wind energy installations be placed on them, would present navigational safety issues. The USCG identified those OCS blocks or portion of the OCS blocks that it believes should not be developed because of existing and possible future increase in vessel traffic density. The USCG also identified blocks or portions of blocks that it believes require further study, including analysis of existing traffic usage and patterns as well as projected future traffic increases. Additionally, the USCG identified blocks or portions of OCS blocks that wherein the installation of wind energy structures would pose minimal or no detrimental impact on navigational safety (USCG, communication, 2011). See Category C on Figure 1.3. In response to the input of the USCG, BOEMRE refined the Maryland WEA since the publication of the NOI to include only the latter two categories of OCS blocks.

The Maryland WEA, under consideration in this NEPA document, is defined as 9 whole OCS blocks and 11 partial blocks. The western edge of the WEA is located approximately 10 nm from the Ocean City, Maryland coast and the eastern edge is approximately 27 nm from the Ocean City, Maryland coast. The entire area is approximately 94 square nm (79,706 acres; 32,256 hectares). See Categories B and C on Figure 1.3.

Virginia WEA

The WEA identified in the February 9, 2011, NOI was delineated through consultation with BOEMRE's Virginia Intergovernmental Renewable Energy Task Force (76 FR 7226). BOEMRE included portions of OCS Block 6109 for which the Commonwealth of Virginia, January 13, 2010, submitted an unsolicited request for a renewable energy research lease to be held by the Virginia Department of Mines, Minerals and Energy. The request contemplated placement of three wind turbine test platforms on the lease. Subsequent to BOEMRE's receipt of the research lease request, the USCG determined that wind energy structures in OCS Block 6109 would constitute a hazard to navigation. In addition, the Virginia Maritime Association, in their March 3, 2011, response to the NOI, requested that OCS Block 6109 be removed from further leasing consideration, because wind energy structures pose a potentially hazardous impediment to navigation. BOEMRE has determined that activities such as the installation of meteorological towers and buoys on OCS Block 6109 would constitute a hazard to navigation, and therefore removed the block from the WEA after publication of the NOI. See Figure 1.1.

The Virginia WEA, under consideration in this NEPA document, consists of 22 whole OCS blocks and 4 partial blocks. The western edge of the area is approximately 18 nm from Virginia Beach, and the eastern edge is approximately 37 nm from Virginia Beach. The entire area is approximately 164 square nm (138,788 acres; 56,165 hectares). See Figure 1.2.

1.6 Existing Interim Policy Leases

It should be noted that, on November 6, 2007, the MMS issued an Interim Policy for authorizing the issuance of leases for the installation of offshore data collection and technology testing facilities on the OCS (72 FR 62673). In November 2009, MMS issued four Interim Policy leases offshore New Jersey and Delaware for data collection facilities (meteorological tower/buoys) to assess wind resource potential in these areas. Three Interim Policy leases were issued offshore New Jersey in the following lease blocks for wind resource data collection: Wilmington NJ 18-02 Blocks 6931, 6836 and 7033. One Interim Policy lease was issued offshore Delaware in lease block Salisbury NJ 18-05 Block 6325. Site assessment activities authorized under the four Interim Policy leases are not analyzed as part of the proposed action or alternatives in this EA. The environmental consequences of those activities are instead considered in the cumulative impacts section of this NEPA document and in the *Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey Environmental Assessment* (Interim Policy EA) (USDOI, MMS, 2009a).

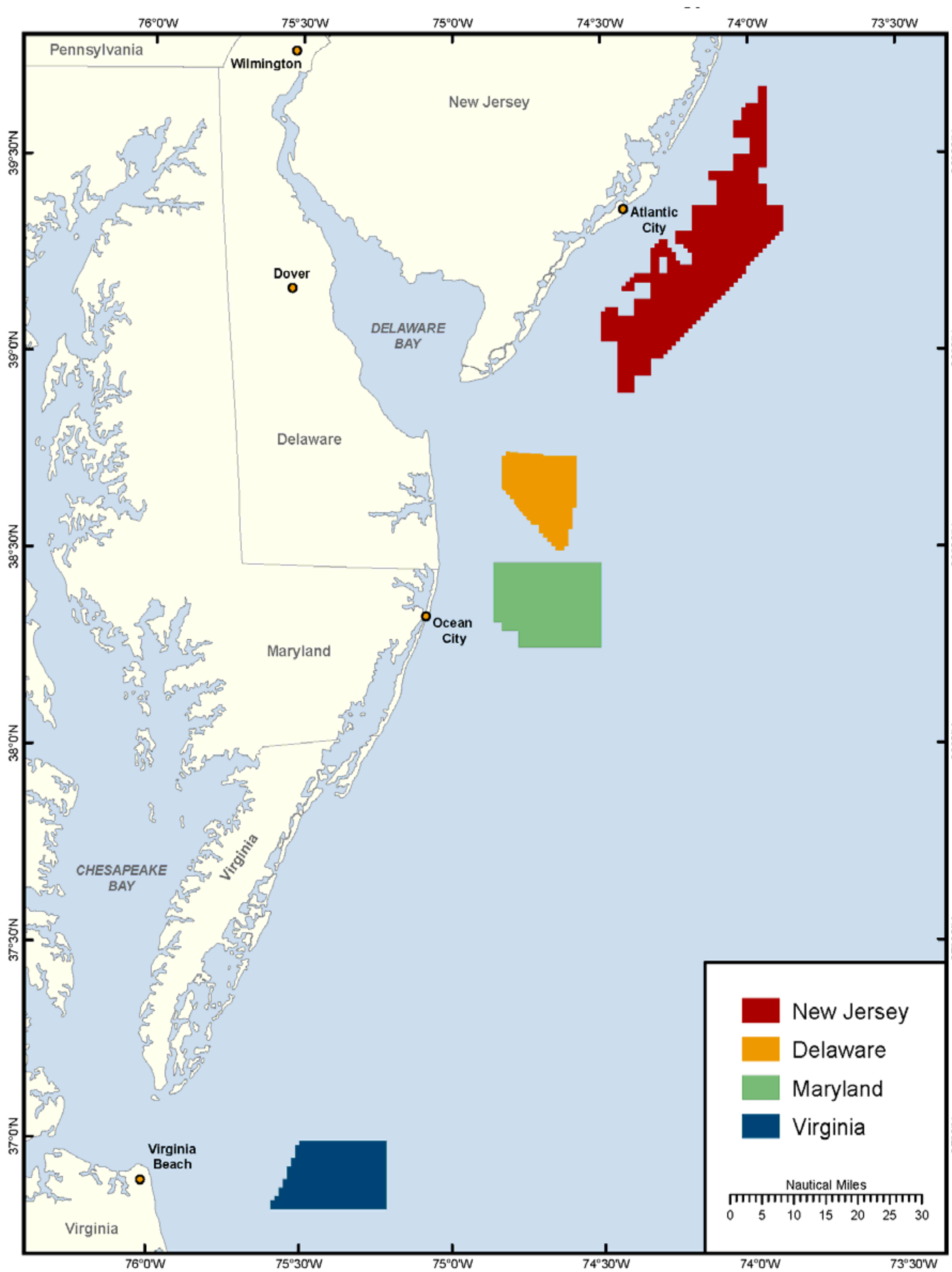

Figure 1.1. Original WEAs offshore New Jersey, Delaware, Maryland and Virginia identified in the Notice of Intent.

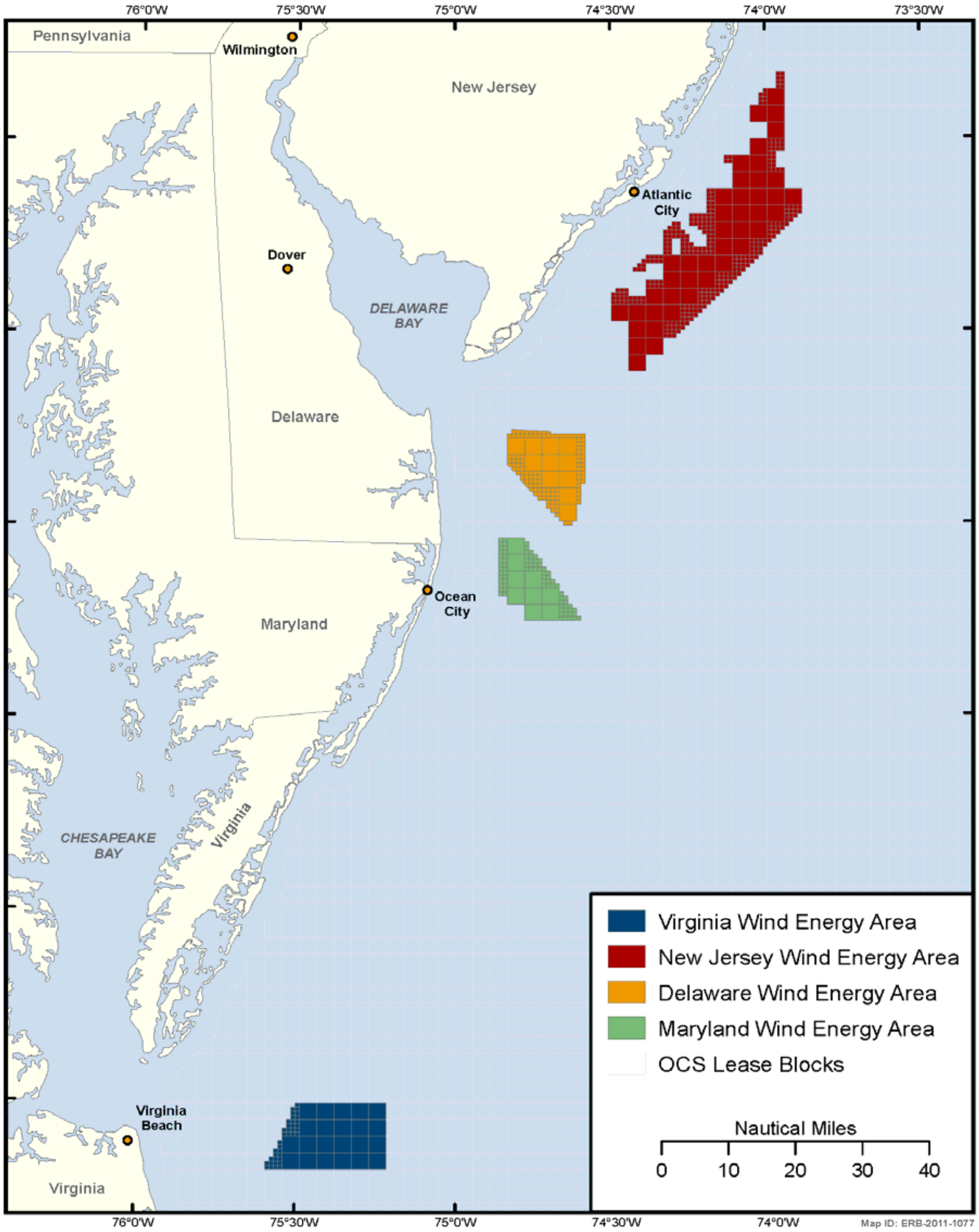

Figure 1.2. Proposed action area offshore New Jersey, Delaware, Maryland and Virginia.

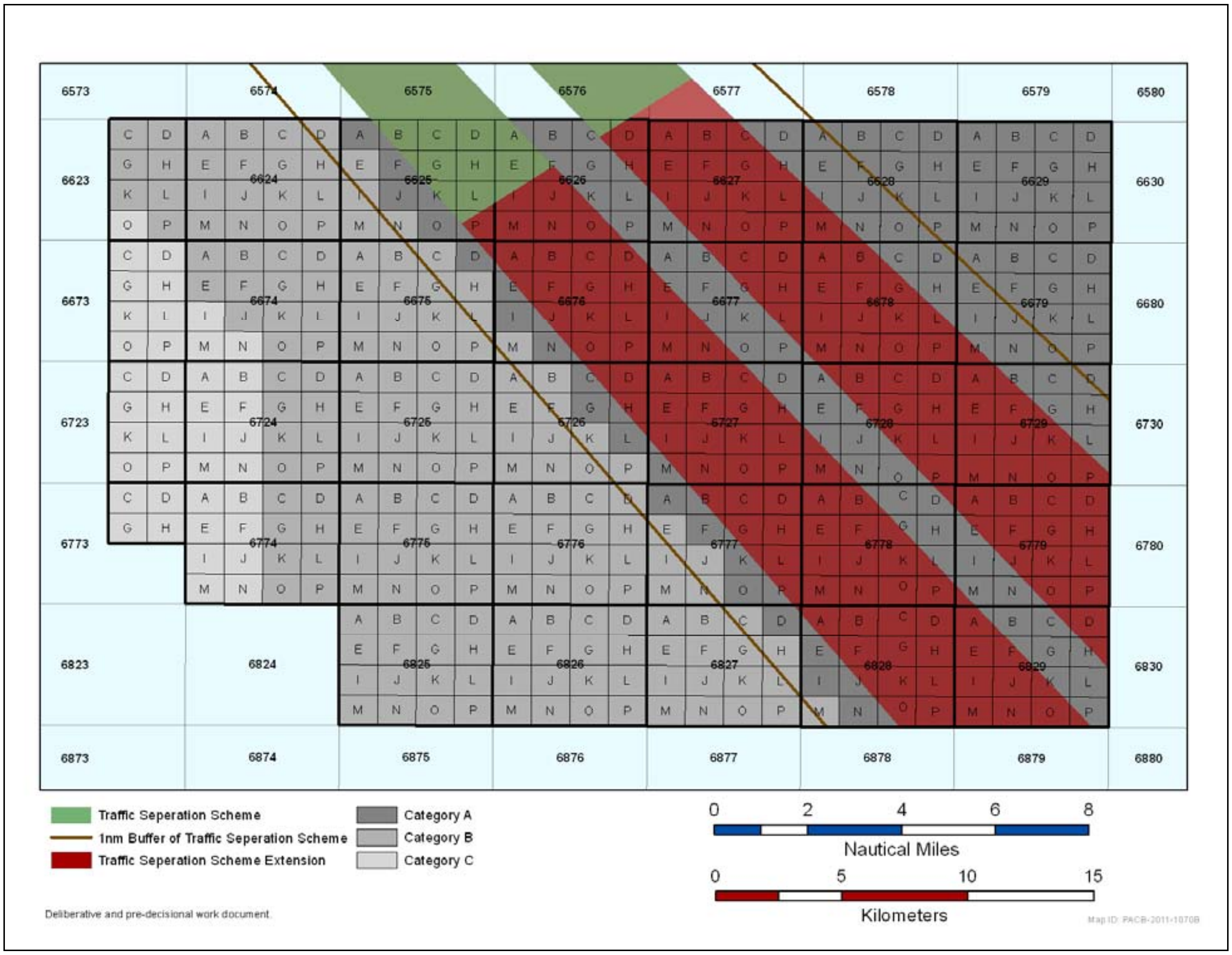

Figure 1.3. USCG-Identified Areas Offshore Maryland.

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes a number of geographic and non-geographic alternatives for lease issuance and the approval of site assessment activities within WEAs offshore New Jersey, Delaware, Maryland and Virginia. See Table 2.1. These alternatives were developed based on input from the following sources:

- Responses to the February 9, 2011 NOI to prepared this EA (76 FR 7226);
- Input from other Federal agencies; and
- Environmental analysis conducted for this EA.

Table 2.1

Alternatives Considered

Alternative	Description
Alternative A (Preferred Alternative) – The Proposed Action	Under Alternative A, lease issuance and approval of site assessment activities could occur in all areas of the WEAs offshore New Jersey, Delaware, Maryland and Virginia as shown in Figure 1.2.
Alternative B – Removal of Anchorage Ground Offshore Delaware	Under Alternative B, lease issuance and approval of site assessment activities could occur in all areas of the WEAs offshore New Jersey, Delaware, Maryland and Virginia, except for an anchorage ground (equivalent to about a half of an OCS block) in the Delaware WEA.
Alternative C – Removal of Category B Areas Offshore Maryland	Under Alternative C, lease issuance and approval of site assessment activities could occur in all areas of the WEAs offshore New Jersey, Delaware, Maryland and Virginia, except for about 80% of the Maryland WEA.
Alternative D – Seasonal Prohibition to Protect the North Atlantic Right Whale	Under Alternative D, lease issuance and approval of site assessment activities could occur in all areas of the WEAs offshore New Jersey, Delaware, Maryland and Virginia, except the surveys, construction and decommissioning of meteorological towers and buoys would not occur during peak migration of right whales and when other marine mammals are most likely to be present.
Alternative E – Removal of Inclement Weather Diversion Areas Offshore Virginia	Under Alternative E, lease issuance and approval of site assessment activities could occur in all areas of the WEAs offshore New Jersey, Delaware, Maryland and Virginia, except for eight OCS blocks in the Virginia WEA.
Alternative F – No Action	Under the No Action Alternative, no wind energy leases would be issued and no site assessment activities would be approved within the WEAs offshore New Jersey, Delaware, Maryland and Virginia at this time. Site assessment activities authorized under the four Interim Policy leases offshore New Jersey and Delaware could still occur.

2.1 Alternative A (Preferred Alternative) – The Proposed Action

In consultation with other Federal agencies and BOEMRE's Intergovernmental Renewable Energy Task Forces, BOEMRE identified WEAs offshore New Jersey, Delaware, Maryland, and Virginia. As a result of comments received on the NOI, RFIs, and Calls, the WEAs have been further refined to arrive at the following areas considered under the Proposed Action (Section 1.4.3 and Figures 1.1 and 1.2):

New Jersey WEA

The proposed area offshore New Jersey begins 7 nm from the shore and extends roughly 23 nm seaward (or the approximate 100 ft depth contour) and extends 53 nm along the Federal/state boundary form Seaside Park south to Hereford Inlet. The entire area is approximately 418 square nm (354,408 acres; 143,424 hectares) and contains approximately 43 whole OCS blocks and 26 partial blocks.

Delaware WEA

The proposed area offshore Delaware rests between the incoming and outgoing shipping routes for Delaware Bay, and is made up of 11 whole OCS blocks and 16 partial blocks. The closest point to shore is approximately 11 miles due east from Rehoboth Beach, Delaware. The entire area is approximately 122 square nm (103,323 acres; 41,813 hectares).

Maryland WEA

The Maryland WEA is now defined as 9 whole OCS blocks and 11 partial blocks. The western edge of the WEA is located approximately 10 nm from the Ocean City, Maryland coast and the eastern edge is approximately 27 nm from the Ocean City, Maryland coast. The entire area is approximately 94 square nm (79,706 acres; 32,256 hectares).

Virginia WEA

The Virginia WEA now consists of 22 whole OCS blocks and 4 partial blocks. The western edge of the area is approximately 18 nm from Virginia Beach, and the eastern edge is approximately 37 nm from Virginia Beach. The entire area is approximately 164 square nm (138,788 acres; 56,165 hectares).

Alternative A (the preferred alternative) is the issuance of commercial and research wind energy leases within the WEAs offshore New Jersey, Delaware, Maryland and Virginia (Figure 1.2), and approval of site assessment activities on those leaseholds. This action presumes reasonably foreseeable scenarios for leasing, site characterization and site assessment. Based on the expressions of commercial wind energy interest received by BOEMRE, it is assumed that the entire area of each WEA would be leased, resulting in 13 total leaseholds. *See* Chapter 3, Reasonably Foreseeable Scenarios, of this EA. This EA also assumes that the maximum amount of site characterization surveys (i.e., shallow hazards, geological, geotechnical, archaeological and biological surveys) would be conducted in the leased areas of the WEAs. A site assessment scenario was also developed to address the range of data collection devices that may be installed under approved SAPs. BOEMRE assumes that, for each lease, 0-1 meteorological towers, 1-2 buoys, or a combination, would be constructed or deployed. Since only one qualified company has expressed interest in the WEA offshore Delaware and interest was for the entire WEA, only one leasehold is anticipated for the WEA offshore Delaware. *See* 76 FR 20367. This company already holds an Interim Policy lease authorizing the construction of a meteorological tower and/or buoy on its Iterim Policy lease, so one additional meteorological buoy and no additional meteorological towers are projected in the Delaware WEA under the proposed action. As a result, up to 12 meteorological towers (should all lessees choose to propose meteorological towers on their leases) or 25 meteorological buoys (should all lessees choose to propose meteorological buoys on their leases) are projected. These site characterization and assessment activities are projected to result in about 12,000 round vessel trips over a five and half year period, which would be divided between 9 major and 28 smaller ports in New Jersey, Delaware, Maryland and Virginia. These leasing, site characterization and site assessment scenarios are described in detail in Chapter 3 of this EA. The impacts of Alternative A (the preferred alternative) on environmental resources and socioeconomic conditions are described in detail in Section 4.1 of this EA.

2.2 Alternative B – Removal of Anchorage Ground Offshore Delaware

Ships frequently anchor in the vicinity of TSSs in unofficial anchorage areas while waiting to go to port. There is such an anchorage area within the Delaware WEA offshore of Delaware Bay. See Figure 2.1. The USCG requested that an unofficial anchorage ground offshore Delaware, which it is considering designating officially, be excluded from consideration for leasing due to navigational safety concerns. The anchorage ground under consideration by the USCG is bounded on its southern border by the southeast approach to Delaware Bay, on its northern border by the charted ordnance dumping ground, and on its eastern border by the 12 nm territorial sea line, and is equivalent to about half of an OCS block in size. The USCG is scheduled to initiate rulemaking for establishing this and other anchorage grounds offshore the Mid-Atlantic States by the end of 2011.

Alternative B differs from Alternative A (proposed action) in that it excludes the proposed anchorage ground (equivalent to about a half of an OCS block) from the Delaware WEA. An area slightly smaller (equivalent to about a half of an OCS block) than the area described under the proposed action would be considered for lease issuance and site assessment activities.

All the environmental consequences associated with selecting Alternative B would be the same as those associated with Alternative A except for the level of impacts associated with site characterization activities. Because the proposed anchorage areas would not be leased, Alternative B would result in a slight reduction (two percent), in site characterization surveys activities compared to the proposed action (reduction of about 220 nm or 50 hours of high resolution geophysical (HRG) surveys and about 6-18 bottom samples). Like the proposed action, up to one meteorological buoy is projected in the Delaware WEA (Section 3.1.3 of this EA). However, under Alternative B that buoy could not be located within the proposed anchorage ground, and therefore would pose no risk of any obstruction to navigation.

The impacts of Alternative B on environmental and socioeconomic resources are described in detail in Section 4.2 of this EA.

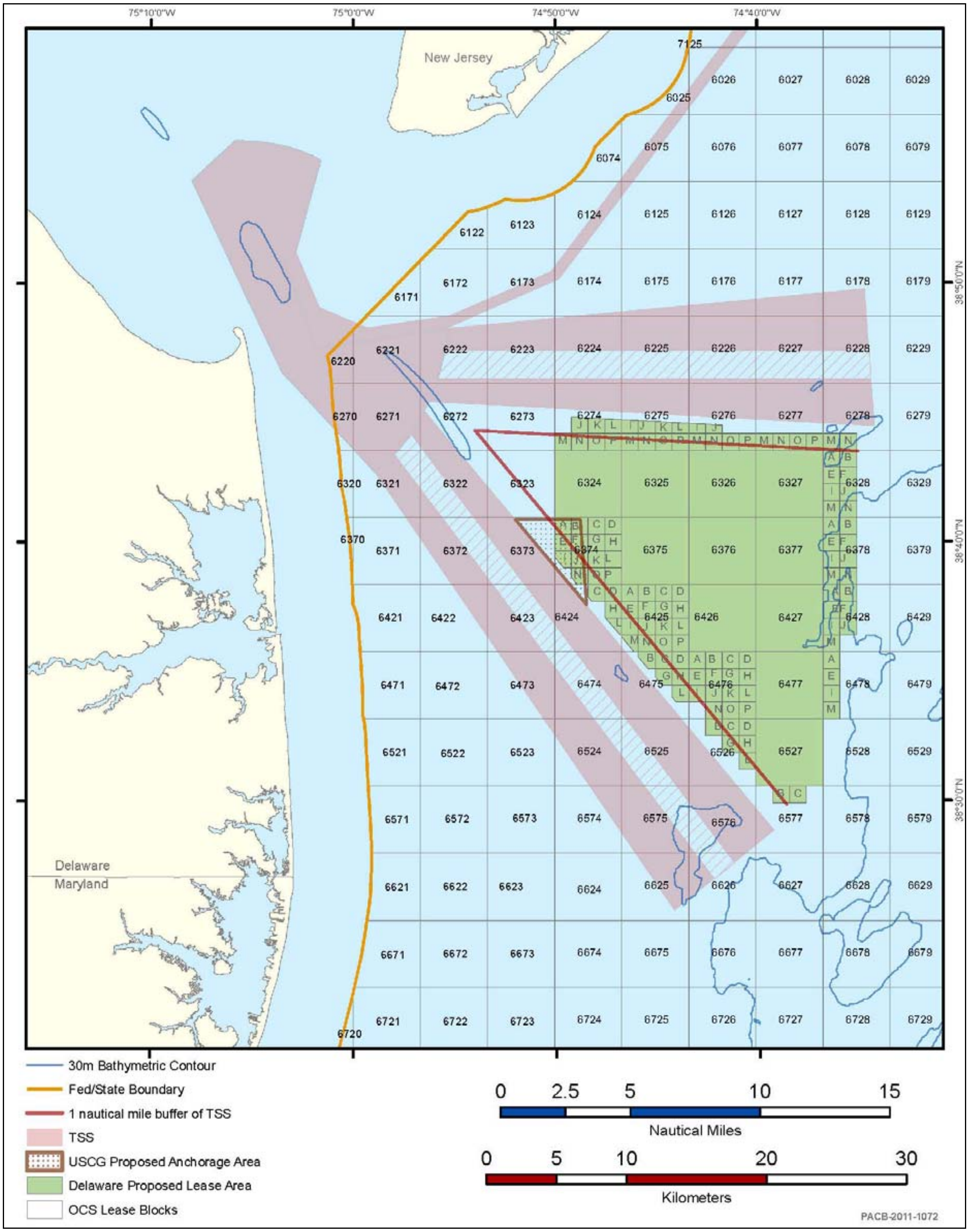

Figure 2.1 U.S. Coast Guard Proposed Anchorage Ground.

2.3 Alternative C – Removal of Category B Areas Offshore Maryland

As described in Section 1.5, since the publication of the NOI, the USCG classified areas in the Maryland WEA into three categories (see Figure 1.3):

- Category A – areas that should not be developed due to existing and anticipated future increase in vessel traffic density (equivalent to about 18.5 OCS blocks);
- Category B – areas that USCG has determined requires further study (equivalent to almost 10 OCS blocks); and
- Category C – areas in which wind energy development would pose minimal or no detrimental impact on navigational safety (equivalent to about 2.5 whole OCS blocks).

Based on the USCG's recommendation and BOEMRE's own preliminary analysis of vessel traffic data, BOEMRE has removed the Category A blocks from the Maryland WEA in all alternatives because of existing, and possible future increase in, vessel traffic density (see Section 1.5). The USCG will provide BOEMRE with additional navigational safety recommendations once it has completed the Atlantic Coast Port Access Route Study (PARS). The goal of the PARS (*see* 76 FR 27788, May, 11, 2011) is to enhance navigational safety by examining existing shipping routes and waterway uses, and, to the extent practicable, reconcile the right of navigation within designated port access routes with other reasonable waterway uses such as the leasing of OCS blocks for construction and operation of offshore wind energy facilities.

Alternative C differs from Alternative A (the proposed action) by excluding Category B Areas. Portions of nine OCS blocks (equivalent to about 2.5 whole OCS blocks) in the Maryland WEA would be considered for leasing and subsequent site assessment activities under Alternative C. Based simply on the reduced area, there would be about an 82 percent reduction in site characterization surveys offshore Maryland, and a 10% reduction to overall site characterization surveys associated with all WEAs contemplated in the proposed action. Due to the reduction in area, one fewer leasehold is anticipated, so it is likely one fewer meteorological tower or two fewer meteorological buoys would be constructed under Alternative C (see Section 3.1.3 for a reasonably foreseeable scenario for meteorological towers and buoys).

The impacts of Alternative C on environmental and socioeconomic resources are described in detail in Section 4.3 of this EA.

2.4 Alternative D – Seasonal Prohibition to Protect the North Atlantic Right Whale

The North Atlantic right whale is among the most endangered whales in the world. Current estimates of the North Atlantic right whale population are between 350-400 individuals. Two primary human-induced threats have been identified – collisions with vessels (ship strikes), and entanglement with fishing gear. To reduce the likelihood of ship strikes from vessels engaged in site characterization and site assessment activities, Alternative D would limit vessel activity by excluding surveys, construction and decommissioning of meteorological towers and buoys during peak migration of right whales to and from the summer feeding grounds in New England and winter calving grounds off of Georgia and Florida. The period of exclusion would be between November and April, when the whales are present, and would apply to all four Mid-Atlantic WEAs. Additionally lease holders would be required to abide by NMFS dynamic area management, and seasonal area management measures to reduce chances of ship strikes. Details of these measures are presented in Appendix C.1.1. Vessel traffic associated with periodic maintenance trips to install meteorological towers and buoys would not be restricted under the prohibition.

The impacts of Alternative D on environmental and socioeconomic resources are described in detail in Section 4.4 of this EA.

2.5 Alternative E – Removal of Inclement Weather Diversion Areas Offshore Virginia

In response to the NOI, the American Waterways Operators (AWO) raised concerns regarding navigational safety in inclement weather and requested that BOEMRE exclude eight OCS lease blocks (6013, 6014, 6063, 6064, 6113, 6114, 6163, and 6164) from leasing consideration in the Virginia WEA (see Figure 2.2).

The AWO states that:

> Under inclement weather conditions, vessel traffic plans require north and south bound tugboats, barge, and ATBs to divert westward approximately 24 nm from Virginia Beach, through the proposed area of interest, between OCS leasing blocks 6013, 6014, 6063, 6064, 6113, 6114, 6163 and 6164. This area provides tugboats and barges with safer operating conditions, enough depth for tow-wires to sag 50 to 75 feet and provides ATBs with enough depth for under-keel clearance. Towing vessels would be forced to divert further west, away from the proposed area, in order to safely navigate around wind turbines. Diverting west, tugboats and barges would have to shorten their tow-wires and decrease speeds, placing crewmembers, vessels and cargo at additional risk, along with decreased maneuverability as they navigate through the shoals south of the Chesapeake Light Tower. To avoid navigating through such hostile environments, vessels would have to be delayed while captains plot alternative bad weather diversion routes.

Under Alternative E, these areas would be excluded from leasing. As a result, an area equivalent to a little over 18 blocks in the Virginia WEA would remain, and would be considered for leasing and subsequent site assessment activities under Alternative E. Based simply on the reduction of the area, there would be a 33 percent reduction in site characterization surveys in Virginia (about an 7% reduction in overall site characterization surveys potentially occurring in all WEAs). Due to the reduction in area, one fewer leasehold is anticipated in the Virginia WEA, therefore, one fewer meteorological tower and/or two fewer meteorological buoys would be constructed (see Section 3.1.3 discussing reasonably foreseeable site assessment scenarios). The scenario and impact analysis would be the same as described under proposed action for the WEAs offshore New Jersey, Delaware, and Maryland.

The impacts of Alternative E on environmental and socioeconomic resources are described in detail in Section 4.5 of this EA.

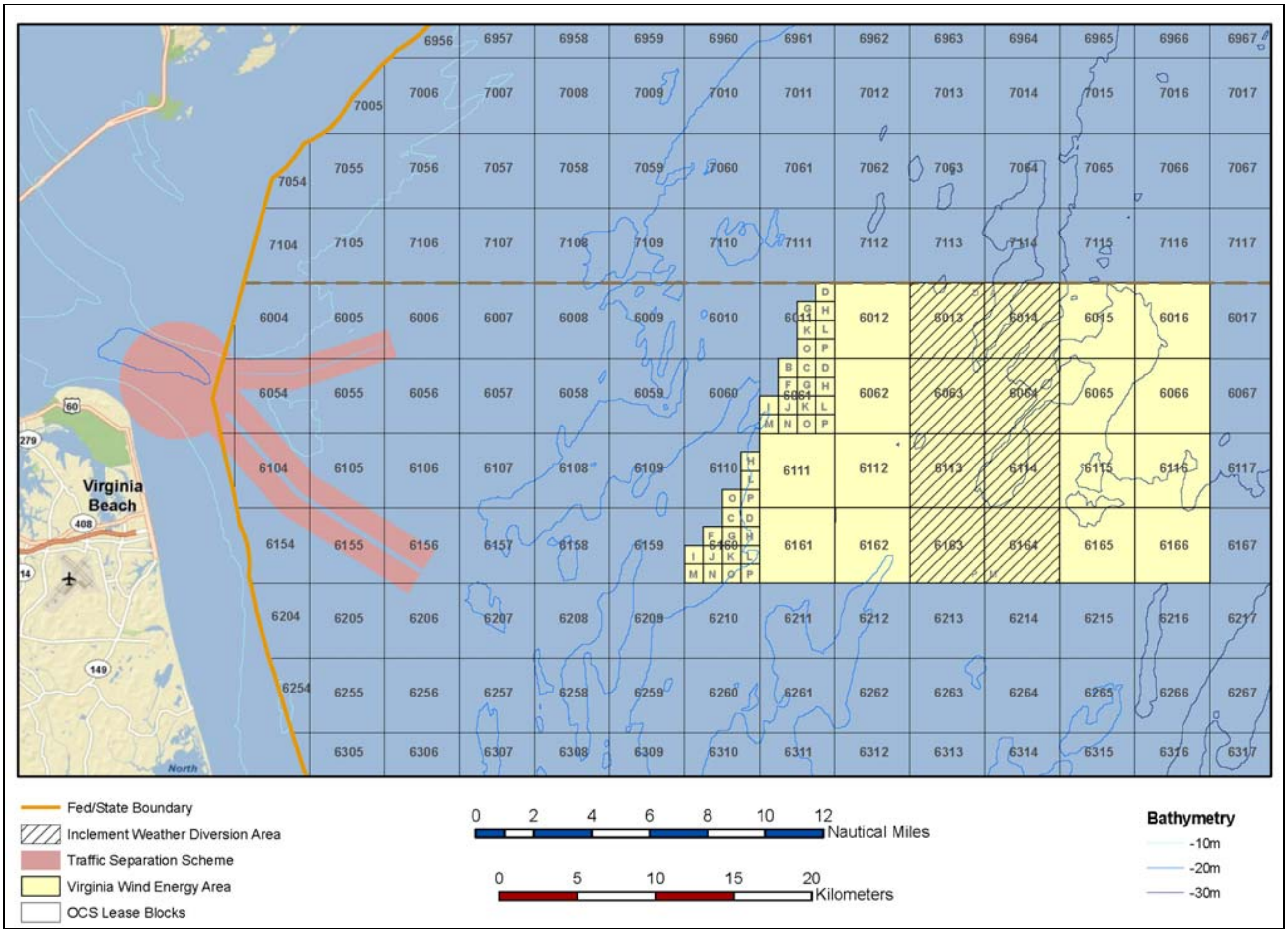

Figure 2.2 Inclement Weather Diversion Areas Offshore Virginia.

2.6 Alternative F – No Action

NEPA requires the analysis of a No Action Alternative. Under the No Action Alternative, no wind energy leases would be issued and no site assessment activities would be approved within the WEAs offshore New Jersey, Delaware, Maryland and Virginia at this time. Site assessment activities authorized under the four Interim Policy leases offshore New Jersey and Delaware could still occur (see Section 1.6). While site characterization surveys are not under BOEMRE's jurisdiction and could still be conducted, it is not likely that these activities would occur without a commercial energy lease. The impacts of Alterative F (No Action) on environmental and socioeconomic resources are described in detail in Section 4.6 of this EA.

2.7 Mitigation Measures

Under the renewable energy regulations, after the lease is issued, the lessee may not commence construction of meteorological or other site assessment facilities until a SAP and the site characterization survey reports are submitted to and reviewed by BOEMRE (see 30 CFR 285.605 – 285.618). The lessee's SAP must contain a description of environmental protection features or measures that the lessee will use. For offshore cultural resources and biologically sensitive habitats, BOEMRE's primary mitigation strategy has and will continue to be avoidance.

For example, the exact location of meteorological and buoys towers would be adjusted to avoid adverse effects to offshore cultural resources or biologically sensitive habitats, if present. Several mitigation measures were developed based on the analysis in this EA to reduce or eliminate the potential environmental risks to or conflicts with individual environmental and socioeconomic resources. These proposed mitigation measures were developed through the analysis presented in Section 4.1, and through consultation with other Federal and State agencies.

BOEMRE may add mitigation measures designed to mitigate the potential impacts of lease-specific site characterization activities and site assessment activities in the form of lease stipulations and/or conditions of approval on a SAP.

3 SCENARIO OF REASONABLY FORESEEABLE ACTIVITY AND IMPACT PRODUCING FACTORS

To describe the level of activity that could reasonably result from the proposed action and alternatives, BOEMRE developed the following scenarios for routine activities (Section 3.1 below) and non-routine events (Section 3.2 of this EA). These scenarios provide the framework for the analyses of potential environmental and socioeconomic impacts of the proposed action (Section 4.1 of this EA) and alternatives (Sections 4.2-4.6 of this EA).

3.1 Routine Activities

This section discusses the reasonably foreseeable leasing scenario, infrastructure that could be built and the activities (impact-producing factors) that could occur on those leases over the site assessment period (up to five years per lease) (see Table 3.1 below) subsequent to lease issuance, including site characterization surveys; and the construction, operation and decommissioning of meteorological and oceanographic data collection facilities. The routine scenario is intended to be broad enough to cover the range of activities and structure types that would be allowed under a commercial or research wind lease, and SAP.

Table 3.1

Projected Site Characterization and Assessment Activities for the Proposed Action

Wind Energy Area (WEA)	**Leaseholds**	**Site Characterization Activities**		**Site Assessment Activities**	
		High Resolution Geophysical (HRG) Surveys (max nm/hours)	**Sub-bottom Sampling (min-max)**	**Meteorological Towers (max)**	**Meteorological Buoys (max)**
New Jersey	**7**	31,100/6,900	900-2,500	7	14
Delaware	1	9,300/2,100	300-700	0[1]	1[1]
Maryland	2	7,100/1,600	200-600	2	4
Virginia	3	12,600/2,800	400-1,000	3	6
Total	13	60,100/13,300	1,800-4,800	12	25

[1] Since only one qualified company has expressed interest in the WEA offshore Delaware and its interest was for the entire WEA, only one leasehold is anticipated for the WEA offshore Delaware. *See* 76 FR 20367. This company already holds an Interim Policy lease authorizing the construction of a meteorological tower and/or buoy on its Interim Policy lease, so one additional meteorological buoy and no additional meteorological towers are projected in the Delaware WEA under the proposed action. The environmental consequences of the meteorological tower on the Delaware Interim Policy lease is analyzed in *Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey Environmental Assessment* (Interim Policy EA) (USDOI, MMS, 2009a), and discussed in the Cumulative Impacts section of this EA.

To describe the activities that could reasonably result from lease issuance, associated site characterization surveys, and the approval of site assessment activities, BOEMRE developed the following scenarios based on previous lease applications submitted to BOEMRE; proposals for data collection activities under the Interim Policy leases received from January 2008 through

February 2011 (USDOI, MMS, 2009a; Fishermen's Energy, 2011; and Tetra Tech EC, Inc., 2010); and expressions of interest received in response to the numerous RFIs and Calls associated with wind renewable energy leasing planning offshore each of the Mid-Atlantic States (Section 1.4.3 of this EA). Unless otherwise noted, assumptions in this section are based on those previous proposals and expressions of interest.

3.1.1 Leasing Scenario

A leasing scenario is necessary to develop a scenario for site characterization and assessment activities. Given its nascency, there is no historical record to use to develop a leasing scenario for OCS wind energy. Instead, BOEMRE based its leasing scenario assumptions on the offshore wind industry's unsolicited applications for commercial leases, and responses to BOEMRE's renewable energy planning notices (e.g., RFIs and Calls).

In developing the leasing scenario, BOEMRE did not use leasing trend data associated with the OCS oil and gas leasing program. While there are decades of statistical data on OCS oil and gas leasing, BOEMRE does not believe that it is relevant to OCS wind energy leasing. The scope of individual OCS oil and gas lease offerings is different. Unlike area-wide OCS oil and gas lease sales, areas that would be offered for OCS wind energy leasing have been honed down to minimize environmental and space use conflicts. BOEMRE believes, and the responses to its planning documents show, such refinement concentrates leasing interest.

In response to BOEMRE's renewable energy planning notices issued for WEAs offshore New Jersey, Delaware, and Maryland, the offshore wind industry submitted expressions of commercial wind energy interest that completely cover each WEA. While a RFI or Call has not been published for the Virginia WEA, BOEMRE believes that this trend is likely to continue in that WEA as well. Based on the expressions of commercial wind energy interest received by BOEMRE it is assumed that the entire area of each WEA would be leased.

Based on expressions of interest received by BOEMRE, proposed leaseholds ranged from just a few OCS blocks to more than 20. The average size of a proposed wind energy lease is approximately 10 blocks. This is also consistent with the lease size requested for the Cape wind energy project, which is approximately 12 OCS blocks. This lease size was used to determine the potential number of leases that may foreseeable be issued in the WEAs offshore New Jersey, Maryland, and Virginia. By dividing the total number of OCS blocks by 10, a total of 13 leases are anticipated under the proposed action. This includes 7 offshore New Jersey, 2 offshore Maryland, and 3 offshore Virginia. Since only one qualified company has expressed interest in the WEA offshore Delaware and its interest was for the entire WEA, only one lease is anticipated for the WEA offshore Delaware. *See* 76 FR 20367.

3.1.2 Site Characterization Surveys

BOEMRE regulations require that the lessee provide the results of a number of surveys with its COP, including a shallow hazards survey (30 CFR 285.626 (a)(1)), geological survey (30 CFR 285.616(a)(2)), geotechnical survey (30 CFR 285.626(a)(4)), archaeological resource survey (30 CFR 285.626(a)(5)), and biological surveys (30 CFR 285.626(a)(3)). BOEMRE refers to these surveys as "site characterization" activities. It is assumed that the site of a meteorological tower or buoy would be surveyed at the same time the lease is surveyed to meet the similar data requirements for a SAP (30 CFR 285.610-285.611). Although BOEMRE does not issue permits or approvals for these site characterization activities, it will not consider approving a lessee's COP if the required survey information is not included. As it is unlikely that any applicant would invest in undertaking these potentially expensive site characterizations prior to acquiring a lease (which would convey the exclusive right to apply for further approvals), and since the survey information must be submitted to BOEMRE before any SAP or COP could be approved, this EA will treat site characterization activities as actions connected to the issuance of a lease.

As described in the Programmatic EIS, to locate shallow hazards, cultural resources, and hard-bottom areas; to evaluate installation feasibility; assist in the selection of appropriate foundation system designs; and determine the variability of subsurface sediments, HRG surveys and sub-bottom sampling would likely be necessary to characterize a site. On April 21, 2011, BOEMRE made publicly available on its website the *"Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 285"* (GGARCH guidelines), which details the information that would be required to satisfy 30 CFR 285.626(a) (*see* http://www.boemre.gov/offshore/RenewableEnergy/RegulatoryInformation.htm). In this guidance, the agency provides descriptions of survey methods that, should lessees follow them, would yield information sufficient to allow the agency to consider approving a COP. For the purposes of this scenario, BOEMRE is assuming that all lessees would employ these methods or methods substantially similar to acquire the information required under 30 CFR 285.626(a).

Lessees would only be required to submit survey information for those areas that would be disturbed or otherwise affected by future actions it proposes in a lease area. *See* GGARCH; *see also* 30 CFR 285.626. As explained in further in this section, different types of site characterization surveys would be necessary to acquire the various types of information required by the regulations. Surveys with wider line spacing would likely be conducted for an entire lease area, while surveys for which narrower line spacing is recommended may be limited to the actual area of disturbance. This area of disturbance may or may not be equal to the entire lease area. However, in the absence of any specific proposal for ground-disturbing activities, this EA assumes that a lessee would survey the entire lease area at the narrower line spacing.

As a practical matter, this assumption is reasonable because acquiring survey information for the entire lease area would give the lessee the maximum flexibility to propose structures in any area of a lease. For example, if the lessee only surveyed a portion of its lease, then, under 30 CFR 285.610(b), 285.611 (SAP) and 285.626(a) (COP), it could only propose building meteorological towers or buoys or future wind energy facilities in those areas. Should those surveys reveal the presence of cultural resources or critical habitat, for example, in those areas that would preclude such development, then the lessee would need to conduct additional surveys on other portions of the lease that were not previously surveyed in order to find a location suitable for construction. Doing so would incur duplicative mobilization costs (both financially and in terms of time) associated with the additional surveys. As a practical matter, comprehensive lease surveys would be far more efficient, and would allow the lessee the greatest flexibility in determining where on the leasehold to propose renewable energy-related structures. Comprehensive surveys would also accelerate the timeline for the lessee's proposed activities by eliminating the delay and cost associated with conducting surveys in stages.

Therefore, this EA assumes that the maximum amount of surveys would be conducted in the leased areas of the WEAs, and analyzes the environmental effects associated with maximum surveying. To the extent that lessees survey less than 100% of their leasehold area is the same extent to which the environmental effects associated with site characterization activities would be less than what is analyzed in this EA. Due to the mobilization costs of site characterization surveys, it is assumed that the site of a meteorological tower or buoy would be surveyed (30 CFR 285.610-285.611) at the same time the lease is surveyed to meet the similar data requirements for a COP (30 CFR 285.626(a)).

As discussed in Section 3.1.2.1 below, in order to meet the information requirements of 30 CFR 285.610(b) and 285.626(a), different surveys would need to be conducted at various line spacings. *See* Section. 3.1.2.1, HRG Surveys, below. Those survey instruments that would need to be flown at the wider line spacing would very likely be attached to the same vessel surveying for a different resource at the narrower line spacing. For example, there would be no need to incur the extra time and expense in sending one vessel out to survey the lease area at 150 m line spacing for one survey, and send out another vessel to conduct a different survey of the lease area at 30m line spacing, when a single vessel could do both simultaneously. *See* GGARCH guidelines, Table 1. As a result, this EA assumes that the lessees would not conduct separate, redundant surveys based on needed line spacing, when the same vessel (or group of vessels) following the smallest line spacing could conduct all of the surveys necessary to acquire all of the relevant data in a single trip.

3.1.2.1 High-resolution Geophysical (HRG) Surveys

The lessee must submit the results of site characterization surveys with their SAP (30 CFR 285.610 and 285.611) and COP (30 CFR 285.626(a) and 285.627). The purpose of the HRG survey would be to acquire geophysical shallow hazards data, information pertaining to the presence or absence of archaeological resources, and to conduct bathymetric charting.

Assuming lessees would follow the GGARCH guidelines to meet the geophysical data requirements 30 CFR 285.626(a), BOEMRE anticipates that the surveys would entail the following:

- For the collection of geophysical data for shallow hazards assessments, side-scan sonar/ sub-bottom profilers would be flown at 150-meter (m) line spacing over the lease area;
- For collecting geophysical data for archaeological resources assessments, magnetometers, side-scan sonar and all sub-bottom profilers would be flown at 30 meter line spacing; and
- For bathymetric charting, lessees would use either using multi-beam technique or side-scan sonar mosaic construction that would adjust for depths encountered and provide both full-coverage of the seabed plus suitable overlap and resolution of small discrete targets of 0.5 - 1.0 m in diameter.

In addition, the geophysical survey grid(s) for proposed transmission cable route(s) to shore would likely include a minimum 300 meter-wide corridor centered on the transmission cable location(s) to allow for all anticipated physical disturbances and movement of the proposed location, if necessary. *See* GGARCH guidelines. The following onshore transmission grid connection points have been identified: Bethany Beach and Indian River, Delaware; Cardiff, Hudson, Larrabee, Piney Grove, and Sewaren, New Jersey; and Fentress and Norfolk, Virginia (CIER, 2010 and Atlantic Grid Operations LLC, 2010). Line spacing for surveys associated with transmission cable route surveys would follow that described above. Since it is not yet possible to predict precisely where a power substation would ultimately be installed on any given lease, or the route that any potential future transmission line would take across the seafloor to shore, this EA uses direct lines between the potential lease areas and potential interconnection points on shore to approximate the reasonably foreseeable level of surveys that may be conducted to characterize undersea transmission cable routes. *See* Figure 4.6. The vessel traffic associated with surveying transmission corridors off-lease has been accounted for in the vessel traffic scenarios associated with the proposed action and alternatives in this EA.

The possible types of equipment to be used during a HRG survey are summarized below and listed in Table 3.2).

Bathymetry/Depth Sounder: A depth sounder is a microprocessor-controlled, high-resolution survey-grade system that measures precise water depths in both digital and graphic formats (PAL, 2006). The system would be used in such a manner as to record with a sweep appropriate to the range of depths expected in the survey area. This EA assumes the use of multi-beam and/or single-beam bathymetry systems. The use of a multi-beam bathymetry system may be more appropriate for characterizing those lease areas containing complex topography or fragile habitats.

Magnetometer: Magnetometer surveys would be used to detect and aid in the identification of ferrous, ferric, or other objects having a distinct magnetic signature. The magnetometer sensor is typically towed as near as possible to the seafloor, which is anticipated to be approximately 6 meters above the seafloor.

Seafloor Imagery/Side-Scan Sonar: This survey technique is used to evaluate surface sediments, seafloor morphology, and potential surface obstructions (USDOI, 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. To meet regulatory requirements as explained in the GGARCH guidelines, BOEMRE is assuming that lessees would use a digital dual-frequency side scan sonar system with frequencies of 445 and 900 kHz and no less than 100 and 500 kHz to record continuous planimetric images of the seafloor.

Shallow & Medium (Seismic) Penetration Sub-bottom Profilers: Typically, a high-resolution Compressed High Intensity Radar Pulse (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. A boomer sub-bottom profiler system is capable of penetrating depth ranges of 10 to 100 m depending on frequency and bottom composition.

Table 3.2 below gives a list of typical equipment used in high-resolution site surveys and their acoustic intensity (Continental Shelf Associates, Inc., 2004). This table is representative the types of equipment that BOEMRE has proposed in draft project plans received under the Interim Policy leases. It should be noted that actual equipment used could have frequencies and/or sound pressure levels somewhat below or above that indicated in Table 3.2. This scenario does not assume the use of any air guns that are used for deeply penetrating 2D and 3D exploratory seismic surveys to determine the location, extent, and properties of oil and gas resources.

Table 3.2

Typical Equipment to be Utilized during an HRG Survey

Survey Task	Example Equipment Model Type	Frequency (kilohertz)	Estimated Sound Pressure Levels at Source (dB re 1µPa RMS at 1m)
Singlebeam Depth Sounder	Innerspace Model 448	200 kHz	202 to 215 dB
Multibeam Depth Sounder	Reson 7101	240 kHz	207 dB
Side-Scan Sonar	Klein Dual 3900	445 and 900 kHz	220 dB
Shallow-Penetration Subbottom Profiler (CHIRP System)	EdgeTech CHIRP System	2-24 kHz	201 dB
Medium-Penetration Subbottom Profiler (boomer)	Applied Acoustics boomer	0.5-8 kHz	205 dB

Proposed Action Scenario for HRG Surveys

This EA assumes that all of the WEAs would be surveyed in their entirety, and geophysical surveys for shallow hazards (150-m line spacing) and archaeological resources (30-m line spacing) would be conducted at the same time on the same vessels conducting sweeps at the finer line spacing. This results in about 500 nm of HRG surveys per OCS block (3 statue miles by 3 statute miles), not including turns. Assuming a vessel speed of 4.5 knots (Continental Shelf Associates, Inc., 2004) and 10-hour days (daylight hours minus transit time to the site), it would take about 11 days to survey one OCS block or about 110 days to survey an average-size lease of 10 OCS blocks.

Since 13 leases are projected, 13 cable routes to shore are also projected to be surveyed. Surveying a 300 m-wide corridor along each potential cable route located outside of a WEA would result in about 5 nm or 1 hour of surveys per mile of cable. To survey all of the WEAs and potential cables, HRG surveys would have to be conducted by multiple vessels and/or over multiple years and potential cable routes. Assuming 100% coverage of the WEAs and potential cable corridors, the proposed action would result in a total of approximately 60,100 nm or 13,300 hours of HRG surveys, divided among the WEAs as follows:

- New Jersey WEA: about 31,100 nm or 6,900 hours of HRG surveys;
- Delaware WEA: about 9,300 nm or 2,100 hours of HRG surveys;
- Maryland WEA: about 7,100 nm or 1,600 hours of HRG surveys; and
- Virginia WEA: about 12,600 nm or 2,800 hours of HRG surveys.

3.1.2.2 Sub-bottom Sampling

Sub-bottom sampling is conducted to assess the suitability of shallow foundation soils to support a structure or transmission cable under any operational and environmental conditions that might be encountered (including extreme events), and to document soil characteristics necessary for the design and installation of all structures and cables. Sub-bottom sampling obtains physical and chemical data on surface sediments to provide BOEMRE with a detailed geotechnical evaluation of the structure's foundation(s) based on analysis of soil borings from the site (e.g., 30 CFR 285.626(4)). The results allow for a thorough investigation of the stratigraphic and geoengineering properties of the sediment that may affect the foundations or anchoring systems of a wind energy project, which would be necessary for BOEMRE to consider a COP. There should also be sufficient geological/geotechnical sampling and testing of foundation soils to thoroughly categorize engineering conditions within a proposed transmission cable corridor. Due to the cost of each sub-bottom sampling, which range from $25,000-35,000 per cone penetration test (CPT) to $500,000 per deep boring, it is assumed the lessee would integrate the results of the shallow hazards survey in planning the geotechnical site survey and in selecting locations/depths of soil samples and in-situ tests.

Proposed Action Scenario for Sub-bottom Sampling

The renewable energy regulations require sediment testing at the proposed site of any proposed bottom-founded structure. *See* 30 CFR 285.610(b) (SAP) and 285.626(a) (COP). This scenario assumes that one sub-bottom sample would be taken at the foundation location for each anticipated meteorological tower and/or buoy. *See* Section 3.1.3 below for a description of the reasonably foreseeable scenario for the installation of meteorological towers/buoys associated with the proposed action. With regard to potential future COPs, the number of sub-bottom samples would depend on the number of turbines a lessee ultimately proposes (see 30 CFR 285.626(a)(4). As discussed in the Programmatic EIS (USDOI, MMS, 2007a), spacing between turbines is typically determined on a case-by-case basis to minimize wake effect and is based on rotor diameter associated with turbine size. In Denmark's offshore applications, for example, a spacing of seven rotor diameters between units has been used (USDOI, MMS, 2007a). Spacing of 6 x 9 rotor diameters, or 6 rotor diameters between turbines in a row and 9 rotor diameters between rows was approved for the Cape Wind project (USDOI, MMS, 2009b). In some land-based settings, turbines are separated by much greater distances, as much as 10 rotor diameters from each other (USDOI, MMS, 2007a). Based on this range in spacing for a 3.6 MW (110 m rotor diameter) turbine and a 5 MW (130 m rotor diameter) turbine, it would be possible to place anywhere from 14 – 40 turbines in one OCS block (3 statute miles by 3 statute miles). Assuming (1) a "maximum" scenario of wind development on every OCS block (which is extremely unlikely, but the lower amount of samples associated with less development would result in lower environmental impacts); (2) that a sub-bottom sample (vibracore, CPT and/or deep boring) would be conducted at every potential wind turbine location throughout the WEAs; (3) that a sub-bottom sample would be conducted every nm along each of the 13 projected transmission corridors to shore (see GGARCH guidelines); and (4) that a sub-bottom sample would be conducted at the foundation of each meteorological tower and/or buoy, a total of 1,800-4,800 ground penetrating surveys could occur as a result of the proposed action:

- New Jersey WEA: about 900-2,500 sub-bottom samples;
- Delaware WEA: about 300-700 sub-bottom samples;
- Maryland WEA: about 200-600 sub-bottom samples; and
- Virginia WEA: about 400-1,000 sub-bottom samples.

3.1.2.3 Biological Surveys

The results of biological surveys are required to be submitted with a COP (30 CFR 285.626(a)(3)). These vessel and/or aerial surveys would need to characterize the biological resources of the lease area, which can be divided into three primary categories: (1) benthic habitats; (2) avian resources; and (3) marine fauna. It is assumed all vessels and aircraft associated with the proposed action would be required to abide by the U.S. Department of Commerce (USDOC), National Oceanic Atmospheric Administration (NOAA) Fisheries Northeast Regional Viewing Guidelines (see http://www.nmfs.noaa.gov/pr/pdfs/education/viewing_northeast.pdf). BOEMRE is also assuming that the mitigation measures discussed in Section 4.1.2.3.2 and Appendix C of this EA, or something substantially similar would be required by NMFS to comply with the Marine Mammal Protection Act (MMPA).

Benthic Habitats

The shallow hazard, and geological and geotechnical surveys described in Section 3.1.2.1 of this EA above would capture all the salient features of the benthic habitat on the leasehold. These surveys would acquire information suggesting the presence or absence of exposed hard bottoms of high, moderate, or low relief; hard bottoms covered by thin, ephemeral sand layers; seagrass patches; and other algal beds, all of which are key characteristics of benthic habitat. *See* Section 4.1.2.2 (defining, describing, and discussing benthic habitat). As a result, BOEMRE does not anticipate that lessees would need to conduct separate surveys to characterize the benthic habitats that could be affected by their potential future leasehold activities.

Avian Resources

Under renewable energy regulations at 30 CFR 285.626(a)(3), lessees are required to describe the state of the avian resources in its lease area in its COP submission. In some areas, such as the WEA offshore New Jersey, abundant information is available regarding the avian resources in the area (NJDEP, 2010a). Due to the abundance of available information, BOEMRE does not anticipate that lessees in the WEA offshore New Jersey would need to conduct additional surveys for avian resources prior to submitting a COP. However, BOEMRE anticipates that lessees in a WEA that has not yet been surveyed for avian resources would conduct their own surveys to meet the COP information requirement.

Avian surveys generally involve simple visual observation, either from a vessel or aircraft. Shipboard observations would generally be sufficient for the purpose of identifying the state of avian resources in the lease area, and it would be most efficient for lessees to survey for avian resources while conducting the other surveys described above. The goal of the surveys is to define the spatial distribution of avian species throughout the year in areas that a lessee ultimately proposes to develop (see 30 CFR 285.626). The environmental analysis in this EA assumes that lessees would conduct by monthly boat and/or aerial surveys for 2 to 3 years, during the site assessment period of a lease, prior to submitting a COP, which would capture the seasonal variation in avian numbers. Similar to guidelines developed in Germany, boat surveys would likely cover 10% of the lease area (BSH, 2007). It is estimated it would take 1 to 2 days to cover 10% of an average-sized leasehold of 10 OCS blocks, which would likely be adequate for determining the presence of avian species. Surveying the same area using aerial surveys would take less than one day. Although these surveys could be conducted from vessels conducting site characterization and assessment activities in the lease area, BOEMRE anticipates that a lease area may be subject to a maximum of 24 to 36 additional boat and/or aerial surveys for the purpose of characterizing avian resources. Should a lessee require less time to adequately characterize the avian resources of its leasehold, should vessels used for site assessment and characterization activities be used for 100 percent of the avian surveys, or should adequate information regarding the state of avian resources already exist (making an independent survey unnecessary), then the environmental impacts associated with conducting avian surveys would be less than that discussed in this EA. Therefore, this EA assumes that all lease areas outside of the New Jersey WEA (2 in Maryland WEA, 3 in VA WEA, and 1 in Delaware WEA) would be surveyed as described above. As a result, BOEMRE presumes that a total of 144 – 216 extra, independent surveys may be conducted to characterize avian resources under the proposed action.

Marine Fauna

Under the renewable energy regulations, a lessee would be required to describe the state of marine mammals, sea turtles, and fish resources in its lease area in its SAP submission (30 CFR 285.610(b)) and COP submission (30 CFR 285.626(a)(3)). Like with avian resources, in some areas such as the WEA offshore New Jersey, sufficient information may already be available regarding marine fauna. However, BOEMRE anticipates that leases in a WEA that has not yet been surveyed for marine resources would need to characterize the state of these resources to meet the COP information requirement.

Multi-year assessment periods may be necessary to capture natural seasonal and inter-annual variability of marine fauna in the area of potential effect (APE). Some data is readily available that can help inform presence or absence, and densities of marine fauna in the APE. However, these data are often incomplete or may not available at a fine enough scale to assess the potential impacts of activities within a certain lease area. It is generally envisioned that fish, marine mammal, sea turtle, and bird aerial and shipboard surveys could be conducted simultaneously. Shipboard observations would generally be sufficient for the purpose of identifying the state of marine mammals in the lease area, and survey vessels and aircraft would likely already have marine mammal observers on board due to standard NMFS requirements and their incidental harassment authorization (IHA) under the MMPA. *See* Informal Consultation for "Non-Competitive Lease for Wind Resource Data Collection on the Northeast Outer Continental Shelf" (USDOC, NOAA, NMFS, 2009; 2010a; and 2010b) and Biological Opinion on the Cape Wind Energy Project of Nantucket Sound (USDOC, NOAA, NMFS, 2010c). Marine fauna information could also be efficiently obtained through instrumentation installed on a meteorological buoy or tower. In addition, marine fauna information from surveys can be supplemented by with publicly available information on geographic web portals that aggregate siting information from several different sources.

However, it is possible that independent marine fauna surveys would be undertaken in special circumstances or to address important data gaps. Shipboard and aerial survey information may be augmented by the deployment of passive acoustic monitors (PAMs) in such cases. As a result of the potential variability in data, the ability or inability to couple different surveys together, and the fact that it is unlikely that there would be any substantial data gaps after vessel surveys and monitoring via meteorological tower/buoy instrumentation, BOEMRE anticipates that very little, if any, additional vessel or aerial traffic would be associated with marine fauna surveys within the WEAs.

3.1.2.4 Timing

The timing of lease issuance, and weather and sea conditions would be the primary factors influencing timing of survey activities. Under the reasonably foreseeable site characterization scenario, BOEMRE would issue leases as early as late 2011 and continue through late 2012. It is assumed lessees would begin survey activities as soon as possible after receiving a lease and sea states and weather conditions permit. The most suitable sea states and weather conditions would occur from April to August (Atlantic Renewable Energy Corporation and AWS Scientific, Inc., 2004). For leases issued in late 2011, the earliest surveys would likely begin would be April 2012. Lessees have up to five years to perform site characterization activities before they must submit a COP (30 CFR 285.235(a)(2)). For leases issued in late 2012, those lessees' surveys would continue through August 2017 prior to submitting their COPs. Under the proposed action, it is projected site characterization would occur over five and one-half years from April 2012 to August 2017.

3.1.2.5 Onshore Activities

In order to conduct surveys of all of the potential leases in the WEAs and potential transmission cable routes, site characterization surveys would involve multiple vessels and would likely take place over several years. Since using vessels that could accommodate all of the necessary survey equipment and conducting as many surveys simultaneously would be most efficient, BOEMRE anticipates that, 65 to 100 ft long vessels would be used (Irion, personal communication, 2011). Vessels must be able to accommodate a crew for several days and be large enough to mount enough cable to tow instruments. As discussed in Section 4.1.3.5, it is assumed existing ports or industrial areas in the adjacent or surrounding states would be used in support of the proposed action.

3.1.2.6 Vessel Traffic Associated with Site Characterization

Vessel traffic associated with all site characterization surveys (HRG surveys, sub-bottom sampling, and biological surveys) is projected to occur over a five and half year-period as a result of the proposed action and be divided among several existing ports in New Jersey, Delaware, Maryland, and Virginia. This section explains how the number of vessel trips was estimated.

Table 3.1 presents the amount of HRG surveys and number of sub-bottom samples that would be associated with the proposed action. For HRG surveys, this scenario assumes a vessel speed of 4.5 knots (Continental Shelf Associates, Inc. 2004) and 10-hour days (daylight hours minus transit time to and from the site). For sub-bottom sampling, this scenario assumes one sub-bottom sample (vibracore, CPT and/or deep boring) would be conducted per work day. Each work day would be associated with one round trip. In addition, BOEMRE presumes that 144–216 extra, independent surveys would be conducted to characterize avian resources under the proposed action. *See* Section 3.1.2.3. Based on these assumptions, approximately 3,300-6,400 vessel trips (round trips) associated with all site characterization surveys are projected to occur as a result of the proposed action over five and one-half years from April 2012 to August 2017 (Section 3.1.2.4 of this EA).

Vessel trips associated with site characterization surveys would be divided among several existing ports in New Jersey, Delaware, Maryland, and Virginia (Section 4.1.3.5 of this EA), adding traffic in already heavily-used waterways (Section 4.1.3.7 of this EA). Due to the distance of ports in New Jersey, Delaware and Maryland to the WEAs offshore those states, the ports in New Jersey, Delaware, and Maryland would support the vessel activity associated with the seven leases projected in the New Jersey WEA, the two leases projected in the Maryland WEA, and the single lease projected in the Delaware WEA. Based simply on the number of ports in New Jersey, Delaware, and Maryland, the estimated 2,500-5,000 vessel trips associated with site characterization of the New Jersey, Delaware and Maryland WEAs would be divided as follows: over half of the traffic would be supported by 3 major and 11 smaller ports in New Jersey; and the remainder of the traffic would be split evenly between 3 major and 8 smaller ports in Delaware and Maryland. Due to the distance from ports in the other states, BOEMRE anticipates that the estimated 800-1,400 vessel trips associated with the three projected Virginia leases would be supported exclusively by the three major and nine smaller ports in Virginia.

More than half of the vessel traffic associated with the proposed action would be related to site characterization activities. Unlike the vessel traffic associated with site assessment activities (see Section 3.1.3.4 below), which would need to utilize the larger ports that would staging areas for meteorological towers and components, the vessels associated with site characterization activities could use any of the ports identified in Section 4.1.3.5 of this EA. This EA assumes that vessels associated with site assessment would strongly trend to larger ports, while vessels associated with site characterization activities would use whatever port is convenient. As a result, this EA assumes generally that the total vessel traffic associated with the proposed action (both site characterization and site assessment) offshore would be more or less evenly distributed among large and small ports in the manner described above.

3.1.2.7 Operational Waste

Operational waste generated from all vessels associated with the proposed action includes bilge and ballast waters, trash and debris, and sanitary and domestic wastes. Bilge water is water that collects in the lower part of a ship. The bilge water is often contaminated by oil that leaks from the machinery within the vessel. The discharge of any oil or oily mixtures of greater than 15 parts per million (ppm) into the territorial sea is prohibited under 33 CFR 151.10. However, discharge is not prohibited in waters farther than 12 nm from shore if the oil concentration is less than 100 ppm. As a result, to the extent that bilge water is expelled at sea, BOEMRE anticipates that the discharge would be more likely to occur beyond 12 nm from shore.

Ballast water is used to maintain the stability of the vessel and may be pumped from coastal or marine waters. Generally, the ballast water is pumped into and out of separate compartments and is not usually contaminated with oil. However, the same discharge criteria apply to ballast water as to bilge water (33 CFR 151.10).

The discharge of trash and debris is prohibited (33 CFR 151.51-77) unless it is passed through a comminutor (a machine that breaks up solids) and can pass through a 25-mm mesh screen. All other trash and debris must be returned to shore for proper disposal with municipal and solid waste. Ballast water may be subject to the USCG Ballast Water Management Program to prevent the spread of aquatic nuisance species (113 FR 32,869 (June 14, 2004)). BOEMRE assumes vessel operators would discharge trash and debris only after it has passed through a comminutor and that all other trash and debris would be returned to shore. Vessel operators are expected to abide by the USCG Ballast Water Management Program.

All vessels with toilet facilities must have a Type II or Type III marine sanitation device (MSD) that complies with 40 CFR 140 and 33 CFR 149. A Type II MSD macerates waste solids so that the discharge contains no suspended particles and has a bacteria count below 200 per 100 milliliters. Type III MSDs are holding tanks and are the most common type of MSD found on boats. These systems are designed to retain or treat the waste until it can be disposed of at the proper shoreside facilities. State and local governments regulate domestic or gray water discharges. However, a State may prohibit the discharge of all sewage within any or all of its waters. New Jersey has no discharge zones in its rivers and the Barnegat Bay, Maryland's zones are in the Herring Bay and Northern Coastal Bays, and Virginia's no discharges zones are in the Lynnhaven River and the Broad Creek, Jackson Creek and Fishing Bay (USEPA, 2010a). Delaware does not have any discharge zones. Domestic waste consists of all types of wastes generated in the living spaces on board a ship including gray water that is generated from dishwasher, shower, laundry, bath and washbasin drains. Gray water from vessels is not regulated outside the State's territory and may be disposed of overboard. Gray water should not be processed through the MSD, which is specifically designed to handle sewage. BOEMRE assumes that vessel operators would discharge gray water overboard outside of state waters or store it onboard ship until they are able to dispose of it at a shoreside facility.

3.1.3 Site Assessment Activities and Data Collection Structures

A SAP describes the activities (e.g., installation of meteorological towers and buoys) a lessee plans to perform for the assessment of the wind resources and ocean conditions of its commercial lease (30 CFR 285.605). No site assessment activities could take place on a lease until BOEMRE has approved a lessee's SAP (30 CFR 285.600(a)). Once approved, site assessment activities would take place during the site assessment term of a commercial lease period, which is up to five years from the date of lease issuance (30 CFR 285.235(a)(2)). It is assumed that each lessee would install some type of data collection device (e.g., meteorological tower, buoy or both) on its lease to assess the wind resources and ocean conditions of the lease area. This information will allow the lessee to determine whether the lease is suitable for wind energy development, where on the lease it will propose development, and what form of development to propose in a COP.

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

BOEMRE assumes that, for each of the 13 leaseholds projected, 0-1 meteorological towers, 1-2 buoys, or a combination, would be constructed or deployed. Since only one qualified company has expressed interest in the WEA offshore Delaware and their interest was for the entire WEA, only one leasehold is anticipated for the WEA offshore Delaware. *See* 76 FR 20367. This company already holds an Interim Policy lease authorizing the construction of a meteorological tower and/or buoy in the Delaware WEA, so one additional meteorological buoy and no additional meteorological towers are projected in the Delaware WEA under the proposed action. As a result, the proposed action is projected to result in up to a total of 12 meteorological towers (should all lessees choose to propose meteorological towers on their leases) or 25 meteorological buoys (should all lessees choose to propose meteorological buoys on their leases) as presented in Table 3.3 below.

Table 3.3

Projected Number of Meteorological Towers and Buoys

Wind Energy Area (WEA)	Meteorological Towers (max)	Meteorological Buoys (max)
Delaware	0[1]	1[1]
Maryland	2	4
New Jersey	7	14
Virginia	3	6

[1] Since only one qualified company has expressed interest in the WEA offshore Delaware and its interest was for the entire WEA, only one lease is anticipated for the WEA offshore Delaware. *See* 76 FR 20367. This company already holds an Interim Policy lease authorizing the construction of a meteorological tower and/or buoy on its Interim Policy lease, so one additional meteorological buoy and no additional meteorological towers are projected in the Delaware WEA under the proposed action. The environmental consequences of the meteorological tower on the Delaware Interim Policy lease is analyzed in *Issuance of Leases for Wind Resource Data Collection on the Outer Continental Shelf Offshore Delaware and New Jersey Environmental Assessment* (Interim Policy EA) (USDOI, MMS, 2009a), and discussed in the Cumulative Impacts section of this EA.

3.1.3.1 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 (see Figure 3.1) or a lattice (similar to a radio tower) type (see Figure 3.2). The mast and data collection devices would be mounted on a fixed or pile-supported platform (monopile, jackets, or gravity bases) or floating platform (spar, semi-submersible or tension-leg). Based on the activities described in the Interim Policy EA offshore Delaware and New Jersey, and other applications received by BOEMRE for potential offshore leases, the following meteorological tower scenario is anticipated.

During Interim Policy stakeholder meetings held in November 2008, BOEMRE, the USCG, the U.S. Army Corps of Engineers (USACE) and the State of Delaware expressed concerns about the stability of jack-up barges as foundations for meteorological towers. Based on these discussions, BOEMRE does not anticipate approving jack-up barges as a foundation for a meteorological tower in the WEAs, and does not include this foundation type for analysis in this EA. As of this date, no proposals have been submitted for meteorological towers with floating semi-submersible or tension-leg platforms. However, since no proposals for these types of floating platforms have been submitted, this EA assumes that lessees would use either fixed platforms on their leases. It is anticipated that compared to semi-submersible or tension-leg floating platforms would result in less impacts from bottom disturbance and noise, due to a smaller footprint and the fact that pile driving would be unnecessary. Should BOEMRE receive an application for a semi-submersible or tension-leg platform, it will consider whether such a platform would lead to environmental consequences not considered in this EA.

Figure 3.1. Cape Wind Meteorological Tower. (Source: Cape Wind Associates, LLC).

In the case of fixed platforms, a deck would be supported by a single 10-ft diameter monopole, tripod, or a steel jacket with three to four 36-inch-diameter piles. The monopole or piles would be driven anywhere from 25 to 100 feet (ft) into the seafloor. Examples of steel jacket and monopile foundations and decks are shown in Figure 3.2, and an example of a tripod foundation is shown in Figure 3.1.

The foundation structure, and a scour control system, if required based on potential seabed scour anticipated at the site, would occupy less than two acres. Once installed, the top of a meteorological tower would be 90-100 m (295-328 ft) above mean sea level. The area of ocean bottom affected by a meteorological tower would range from about two hundred square ft, if supported by a monopole, to two thousand square ft if supported by a jacket foundation. The final foundation selection would be included in a detailed SAP submitted to BOEMRE along with the results of SAP-related site characterization surveys prior to BOEMRE consideration for approval.

The only meteorological tower currently installed on the OCS is located on Horseshoe Shoal, in Nantucket Sound (see Figure 3.1). In 2002, the USACE prepared an EA for this meteorological tower (USACE, 2002). A monopole mast as shown in Figure 3.1 was used for this meteorological tower. The tower was installed in 2003 and consists of three pilings supporting a single steel pile that supports the deck. The overall height of the structure is 60 m (197 ft) above the mean lower low water datum.

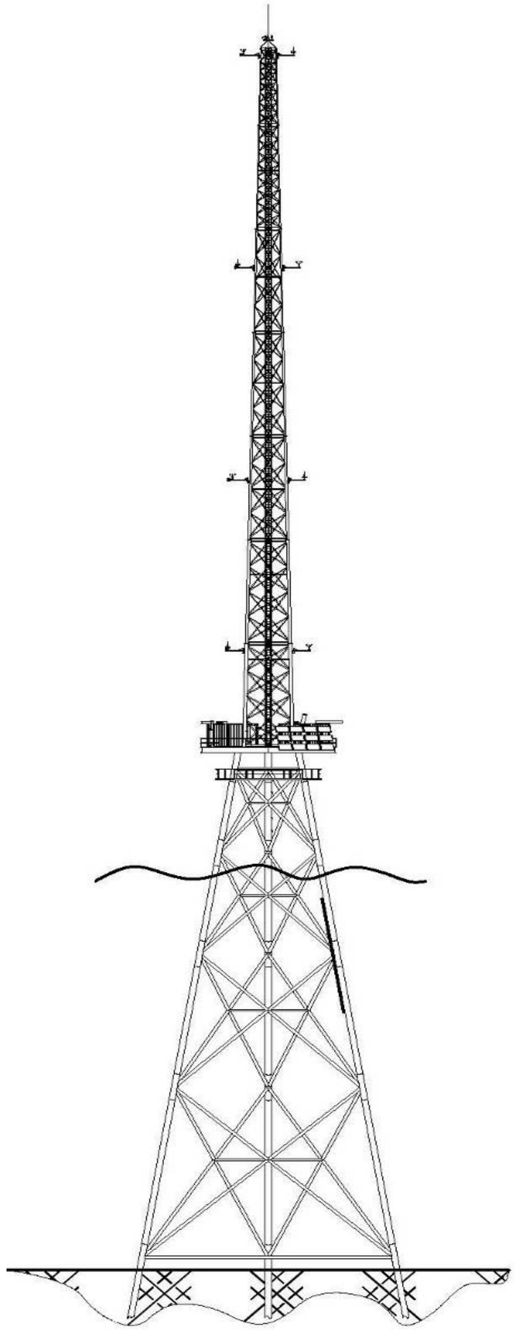

Figure 3.2(a) Example of a Lattice-type Mast Mounted on a Steel Jacket Foundation.
Source: Deepwater Wind, LLC.

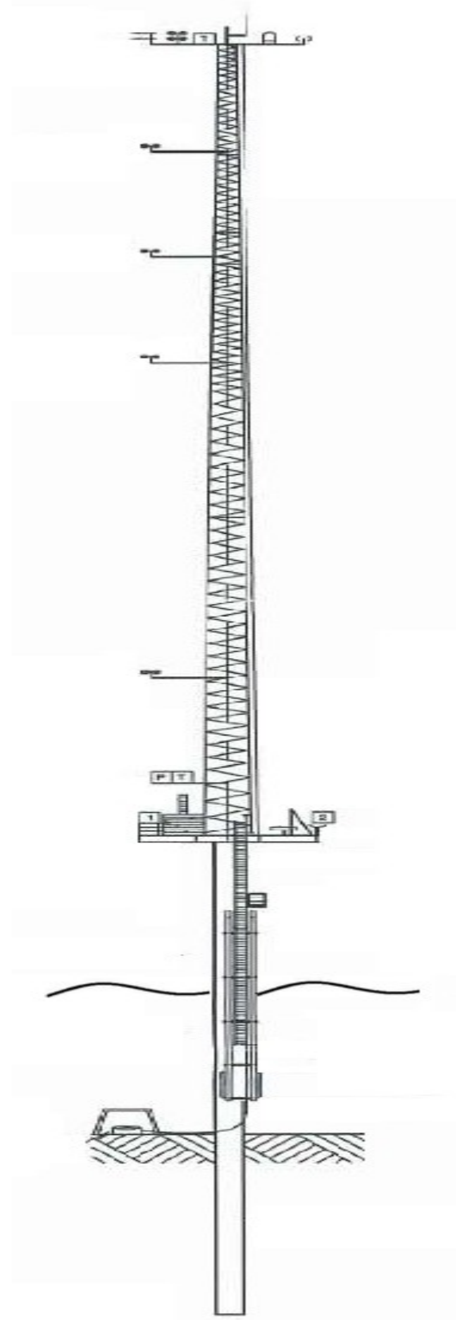

Figure 3.2(b) Example of a Lattice-type Mast Mounted on a Monopile Foundation.
Source: Fishermen's Energy of New Jersey, LLC.

Figure 3.2. Examples of Lattice Mast Meteorological Towers.

Installation

Review of the SAP

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 to, and approved by BOEMRE (30 CFR 285.614(a)). BOEMRE regulations (30 CFR 285.600 - 285.618) require that the SAP include the following information:

- A description of the proposed activities, including the technology intended to be utilized in conducting activities authorized by the lease and all additional surveys lessee intends to conduct;
- The surface location and water depth for all proposed facilities to be constructed in the leased area;
- General structural and project installation information with proposed schedules;
- A description of the safety, prevention and environmental protection features or measures that lessee would use;
- A brief description of how the meteorological tower and other components on the leased area would be removed and the leased area restored as required by the lease;
- Any other information reasonably requested by BOEMRE to ensure lessee's activities on the OCS are conducted in a safe and environmentally sound manner; and
- Results of the geophysical and geological surveys, hazards surveys, archaeological surveys, and baseline collection studies (e.g., biological) with supporting data.

This EA considers environmental impacts of approving site assessment activities in certain areas of the OCS offshore New Jersey, Delaware, Maryland, and Virginia. In the event that a particular lease is issued, and the lessee subsequently submits a SAP, BOEMRE would then determine whether this EA adequately considers the environmental consequences of the activities proposed in the lessee's SAP. If the analysis in this EA adequately considers these consequences, then no further NEPA analysis would be required before the SAP could be approved. If, on the other hand, BOEMRE determines that the analysis in this EA is inadequate for that purpose, BOEMRE would prepare an additional NEPA analysis before approving the SAP.

The siting of meteorological towers would also be authorized by the USACE, likely under a Nationwide Permit 5 for scientific measurement devices. The USACE is a cooperating agency on this EA (see Section 5.2).

Timing

The timing of the issuance of a lease, and weather and sea conditions are the primary factors that would influence the timing of meteorological tower construction activities. Sea states follow annual weather patterns, with the roughest conditions occurring September through March (Atlantic Renewable Energy Corporation and AWS Scientific, Inc., 2004). Meteorological towers and buoys would likely be installed from April to August. Under the proposed action, BOEMRE could issue leases in late 2011. For those lessees, the first available weather season to begin construction activities would be April 2012. Lessees have up to five years to perform site assessment activities before they must submit a COP (30 CFR 285.235(a)(2)). For leases issued in late 2012, those lessees' site assessment activities would continue through August 2017 prior to submitting their COPs. Under the proposed action, it is projected site assessment would occur over five and one-half years from April 2012 to August 2017.

Total installation time for one meteorological tower would take eight days to ten weeks depending on the type of structure installed, and the weather and sea state conditions (USDOI, MMS, 2009a). Due to delays caused by weather and sea conditions, acquiring permits, and availability of vessels, workers, and tower components, it is possible that 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, then it is likely that the foundation would be installed first with limited meteorological equipment mounted on the platform deck, and the mast and remaining equipment would be installed the following year (USDOI, MMS, 2009a).

Onshore Activity

A meteorological tower platform would be constructed or fabricated onshore at an existing fabrication yard. Production operations at fabrication yards would include the cutting, welding, and assembling of steel components. These yards occupy large areas with equipment including lifts and cranes, welding equipment, rolling mills, and sandblasting machinery. The location of these fabrication yards is 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 15-20 ft. Thus, platform fabrication yards must be located at deep-draft seaports or along wider and deeper of the inland channels. Section 4.1.3.5 identifies nine major ports in Delaware, New Jersey, Maryland, and Virginia that would likely support the fabrication of meteorological towers.

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 (USDOI, MMS, 2009a).

Because the proposed action only contemplates the installation of 12 meteorological towers, and since the fabrication facilities in the relevant major port areas are large and have high capacities, BOEMRE does not anticipate that the fabrication of meteorological towers associated with the proposed action would have any substantial effect on the operations of, transportation to or from, or conditions at these facilities.

Offshore Activity

During installation, a radius of approximately 1,500 ft (162 acres) 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 (see Table 3.4).

Table 3.4

Projected Vessel Usage and Specifications for the Construction of a Meteorological Tower

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

Source: USDOI, MMS, 2009a.

Installation of the Foundation Structure and Mast

A jacket or monopole foundation and deck would be fabricated onshore then transferred to barge(s) and carried or towed to the offshore site. This equipment would typically be deployed from two barges, one containing the pile driving equipment and a second containing a small crane, support equipment and the balance of materials needed to erect the platform deck. These barges would be tended by appropriate tugs and workboats as needed.

The foundation pile(s) for a fixed platform could range from either a single 10-ft (3-m) diameter monopile to four 3-ft (0.9-m) diameter piles (jacket). These piles would be driven anywhere from 25 to 100 ft (7.6 to 30.5 m) below the seafloor with a pile driving hammer typically used in marine construction operations. When the pile driving is complete after approximately three days, the pile driver barge would be removed. In its place, a jack-up barge equipped with a crane would be utilized 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 be approximately a few days (monopole in good weather) to six weeks (jacket foundation in bad weather) (USDOI, MMS, 2009a).

The mast sections would be raised using a separate barge-mounted crane; installation would likely be complete within a few weeks.

Scour Control System

Wave action, tidal circulation, and storm waves interact with sediments on the surface of the OCS, inducing sediment reworking and/or transport. Episodic sediment movement caused by ocean currents and waves can cause erosion or scour around the base of the towers. Erosion caused by scour may undermine meteorological tower structural foundations leading to potential failure. It is assumed that scour control systems would be installed, if required based on potential seabed scour anticipated at the site. There are several methods for minimizing scour around piles, such as the placement of rock armoring and mattresses of artificial (polypropylene) seagrass.

A rock armor scour protection system may be used to stabilize a structure's foundation area. Rock armor and filter layer material would be placed on the seabed using a clamshell bucket or a chute. The filter layer helps prevent the loss of underlying sediments and sinking of the rock armor (ESS Group, Inc., 2006). In water depths greater than 15 ft, the median stone size would be about 50 pounds with a stone layer thickness of about 3 ft. It was estimated that the rock armor for a monopole foundation for a wind turbine would occupy 16,000 square ft (0.37 acres) of the seabed (ESS Group, Inc., 2006). While the piles of meteorological tower would be much smaller than those of a wind turbine, a meteorological tower may be supported by up to four piles. Therefore, the maximum area of the seabed impacted by rock armor for a single meteorological tower is also estimated to be 16,000 square ft (0.37 acres).

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 water (ESS Group, Inc., 2003). Monitoring of scouring at the Cape Wind meteorological tower found that, at one pile where two artificial seagrass scour mats were installed, there was a net increase of 12" of sand, and at another pile with artificial seagrass scour mats there was a net scour of 7" pilings; both occurred over a 3-yr time frame (Ocean and Coastal Consultants Inc, 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, about one ft into the sand. It is estimated for a pile-supported platform, four mats each about 5 by 2.5 m (16.4 by 8.2 ft) would be placed around each pile. Including the extending sediment bank, a total area disturbance of about 5,200-5,900 square ft for a three-pile structure and 5,900-7,800 square ft for a four-pile structure is estimated. For a monopole, it is estimated that eight mats about 5 by 5 m (16.4 by 16.4 ft) would be used, and there would be a total area disturbance of about 3,700-4,000 square ft.

Operation and Maintenance

Under the proposed action and alternatives, BOEMRE is considering the operation of a meteorological tower to assess wind resource potential during the site assessment term of a lease. A lessee must submit a COP at least six months before the end of their site assessment term of the lease if it intends to continue its commercial lease with an operations term (30 CFR 285.618(c)). If the COP describes continued use of existing facilities, such as a meteorological tower or buoy approved in the SAP, the lessee may keep such facilities in place on their lease during the time that BOEMRE reviews the COP for approval (30 CFR 285.618(a)), which may take up to two years. If, following the technical and environmental review of the submitted COP, BOEMRE determines that such facilities may not remain in place throughout the operations term, the lessee must initiate the decommissioning process (30 CFR 285.618(c)). Depending on how long it takes to install a meteorological tower, and depending on whether the lessee submits a COP (or the lease expires) and/or how long subsequent COP approval would take, BOEMRE anticipates that a meteorological tower would be present for approximately 5 years before BOEMRE decides whether to allow the tower to remain in place for the commercial term of a lease or whether the tower should be decommissioned immediately.

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 site assessment proposals submitted to BOEMRE, lessees with towers powered by solar panels or small wind turbines would conduct monthly or quarterly vessel trips for operation and maintenance activity over the 5 year life of a meteorological tower (USDOI, MMS, 2009a). However, if a diesel generator is used to power the meteorological tower's lighting and equipment, a maintenance vessel would make a trip at least once every other week, if not weekly, to provide fuel, change oil, and perform maintenance on the generator. Depending on the frequency of the trips, support for all of the meteorological towers in all of the WEAs would result in anywhere from of 240 quarterly to 3,120 weekly round trips. No additional or expansion of onshore facilities would be required to conduct these tasks. It is projected that crew boats 51-57 ft in length with 400-1,000 horsepower (hp) engines and 1,800 gallon fuel capacity would be used for routine maintenance, and generator refueling, if diesel generators are used. The distance 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

All meteorological towers and buoys, regardless of height, would have lighting and marking for navigational purposes. Meteorological towers and buoys would be considered Private Aids to Navigation, which are regulated by the USCG under 33 CFR 66. A Private Aid to Navigation is a buoy, light or day beacon owned and maintained by any individual or organization other than the USCG. These aids are designed to allow individuals or organizations to mark privately owned marine obstructions or other similar hazards to navigation.

If meteorological towers are taller than 199 ft as BOEMRE anticipates, the lessee would also be required to file a "Notice of Proposed Construction or Alteration" with the Federal Aviation Administration (FAA) per federal aviation regulations (14 CFR 77.13). The FAA is in the process of finalizing guidance for the marking and lighting of meteorological towers less than 199 ft. tall (Edgett-Baron, personal communication, 2011). According to the FAA, specific mitigation measures, including lighting requirements, would be applied on a case-by-case basis (Edgett-Baron, personal communication, 2011). Any meteorological tower greater than 199 ft tall would also require an FAA obstruction evaluation analysis with the FAA, to determine if a meteorological tower would pose a hazard to air traffic, and a Determination of Hazard/No Hazard issued by the FAA if within 12 nm of shore. Should BOEMRE receive a SAP for a meteorological tower outside of FAA jurisdiction, BOEMRE would determine if the proposed meteorological tower would pose a threat to air navigation; in either case, additional NEPA analysis and the imposition of additional mitigation measures may be necessary prior to approval.

Visual Aesthetics

As discussed in Chapter 5.2.21.2, p. 5-120 of the Programmatic EIS, a meteorological tower in a typical seascape would introduce a vertical line that would contrast with the horizon line, and introduce a geometrical man-made element into a potentially natural landscape. Some color contrast would also be present. Weather conditions might render the top of the tower invisible or nearly so from shore, particularly for a lattice structure. While lighting on meteorological towers may be viewed from several miles away at night, the tower's lighting would be difficult to distinguish from other lighting present (e.g., vessel traffic).

The main concern related to visual impacts of meteorological towers would be that presented by the widest and most substantial portion of the tower (the deck) rather than the relatively slender (3-5 m) mast. Depending on the distance from shore, earth curvature, waves, and atmosphere could screen some or all of the deck from view. The distance (nm) that the deck of a meteorological tower would be visible by an observer at the shoreline is calculated as 1.17 times the square root of the observer's height (about 6 ft) plus 1.17 times the square root of the height of the deck (about 40 ft). Based on this formula, the decks of meteorological towers located further than 10 miles from shore would not be visible by an observer standing on the shoreline.

The Delaware, Maryland, and Virginia WEAs are all located more than 10 miles from shore. In these areas, the widest portion of meteorological towers (the decks) would be located below the visual horizon and would not be visible from shore. A small percentage of the New Jersey WEA (about 20 partial blocks) is located nearer to shore (between 7-10 miles). Only under unusually ideal conditions (e.g., high visibility and calm seas), would it be possible to see the decks of meteorological towers, should they be located in those areas of the New Jersey WEA closest to shore. While the tallest portions of the masts, up to 300 ft, would be above the visual horizon, they would be too narrow (3-5 m) to be clearly visible from shore.

Other Uses

The meteorological tower and platform could also be used to gather other information in addition to meteorological information, such as information and data regarding avian and marine mammals in the lease area. Information on other equipment that could be installed on meteorological towers is included in Section 3.1.3.3 of this EA.

Decommissioning

At the latest (see "Timing" section above), within a period of 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 part 285, Subpart I).

It is estimated that the entire removal process of a meteorological tower would take one week or less. Decommissioning activities would begin with the removal of all meteorological instrumentation from the tower, typically 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 loading onto the transport barge. The deck would be cut from the foundation structure and loaded on the transport barge. The same number of vessels necessary for installation would likely be required for decommissioning. The sea bottom area 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 BOEMRE, the lessee would sever bottom-founded structures and their related components at least 5 m (15 ft) below the mudline to ensure that nothing would be exposed that could interfere with future lessees and other activities in the area (30 CFR 285.910(a)). Which severing tool the operators use depends on the target size and type, water depth, economics, environmental concerns, tool availability, and weather conditions (USDOI, MMS, 2005). Due to the type and size, piles of meteorological towers in the WEAs would be removed using non-explosive severing methods.

Common non-explosive severing tools that may be used consist of abrasive cutters (e.g., sand cutters and abrasive water jets), mechanical (carbide) cutters, diver cutting (e.g., underwater arc cutters and the 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 which 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 on to 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 monopole 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 (USDOI, MMS, 2009a).

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. It is estimated 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 system would take a total of 0.5 to 2 days to complete (USDOI, MMS, 2009a).

Disposal

Unless portions of the meteorological tower would be approved for use as artificial reefs, 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 law. Additionally, 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 hard bottom. 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). Delaware, New Jersey, Maryland, and Virginia all have artificial reef programs. The State agency responsible for managing marine fisheries resources must accept liability for the structure before BOEMRE would release the Federal lessee from the obligation to decommission and remove all structures from the lease area (USDOI, MMS, 2009a).

3.1.3.2 Meteorological Buoy and Anchor System

While a meteorological tower has been the traditional device for characterizing wind conditions, several companies have expressed their interest in installing 1-2 meteorological buoys per lease instead. Meteorological buoys can be used as an alternative to a meteorological tower in the offshore environment for meteorological resource data collection (i.e., wind, wave, and current). This EA assumes that, should a lessee choose to employ buoys instead of meteorological towers, it would install a maximum of two buoys per lease. These meteorological buoys would be anchored at fixed locations and regularly collect observations from many different atmospheric and oceanographic sensors.

A meteorological buoy can vary in height, hull type, and anchoring method. NOAA has successfully used discus-shaped hull buoys and boat-shaped hull buoys for weather data collection for many years. These are the buoy types that would most likely be adapted for offshore wind data collection. A large discus buoy has a circular hull ranges between 10 – 12 m diameter, and is designed for many years of service (USDOC, NOAA, National Data Buoy

Center, 2011). The boat-shaped hull buoy (known as the 'NOMAD') is an aluminum-hulled, boat-shaped buoy with provides long-term survivability in severe seas (USDOC, NOAA, National Data Buoy Center, 2011). The largest meteorological buoys anticipated in this scenario would be similar to one proposed offshore New Jersey by Garden State Offshore Energy (GSOE) (Tetra Tech EC, Inc., 2010). GSOE proposed a 100' (30 m) long spar-type buoy weighing approximately 15 tons and just over 6 ft (2 m) in diameter.

A buoy's specific mooring design is based on hull type, location, and water depth (USDOC, NOAA, National Data Buoy Center, 2011). Buoys can use a wide range of moorings to attach to the seabed. 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. Some deep ocean moorings have operated without failure for over 10 years (USDOC, NOAA, 2011). The spar-type buoy described by GSOE would be stabilized through an on-board ballasting mechanism approximately 60 ft. below the sea surface. Approximately 30 – 40 ft. of the spar-type buoy would be above the ocean surface where meteorological and other equipment would be located.

There are several meteorological buoy manufacturers located domestically (JCOMMOPS, 2011). International meteorological buoy manufacturers and designers would likely be competitors with domestic firms. Whether the buoys originate domestically or internationally, it is likely that, for future assessment work, buoys will arrive from the manufacturers to lessee's staging areas by truck, rail or sea, then be assembled and fitted with instrumentation and then tested before deployment via a vessel with enough deck space to accommodate a structure potentially up to 12 m as well as a crane to lower the buoy into the sea (USDOC, NOAA, 2005).

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

Installation

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 WEAs 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 (USDOC, NOAA, National Data Buoy Center, 2011). Based on previous proposals, anchors for boat-shaped and discus-shaped buoys would weigh about 6,000-8,000 pounds with a footprint of about 6 square ft and an anchor sweep of about 8.5 acres. After installation, the transport vessel would remain in the area for several hours while technicians configure proper operation of all systems. Buoys would typically take one day to install. Transport and installation vessel anchoring for one day is anticipated for these types of buoys (Fishermen's Energy, 2011).

Based on the proposal offshore New Jersey by GSOE, a spar-type buoy would be towed to the installation location by a transport vessel after assembly at a land-based facility. Deployment would occur in two phases: deployment of a clump anchor to the seabed as a pre-set anchor (Phase 1) and deployment of the spar buoy and connection to the clump anchor (Phase 2). Phase 1 would take approximately one day, and include placement of the clump anchor on a barge and transporting it to the installation site. This example of rectangular clump weight anchor is 22' x

22’ x 3’ (approximately 6.7 m x 6.7 m x 1 m) in size and weighing approximately 100 tons, with a bottom footprint area of 484 square ft (45 m^2). Phase 2 would include towing the spar buoy to the site, deployment and connection to the clump anchor (Tetra Tech EC, Inc., 2010). Once at the final location site, it would be positioned vertically in the water column with a height from mean sea level (MSL) to main deck of 36’ (11 m) and a highest mast point of approximately 52’ (16 m). The monitoring buoy would be anchored to the seafloor using a clump weight anchor and mooring chain. Installation would take approximately two days. The total area of bottom disturbance associated with buoy and vessel anchors is 28’ x 28’ (8.5 m x 8.5 m), with a total area of 784 square ft (73 m^2). The maximum area of disturbance to benthic sediments occurs during anchor deployment and removal (e.g., sediment resettlement, sediment extrusion, etc.) for this type of buoy.

Onshore Activity

Onshore activity (fabrication, staging, and launching of crew/cargo vessels) related to the installation of buoys is expected to utilize existing ports, which are capable of supporting this activity. Refer to Section 4.1.3.5 of this document for information pertaining to existing ports or industrial areas that would be used for meteorological buoys. No expansion of existing facilities would be necessary for the same reasons provided in the onshore activity section for meteorological towers, above.

Operation and Maintenance

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

Since limited space would restrict the equipment that could be placed on a buoy, BOEMRE anticipates that this equipment would be powered by small solar panels or wind turbines instead of diesel generators. Weekly or bi-weekly vessel trips, which would be necessary for refueling generators on meteorological towers, are not projected for any of the anticipated buoys.

Decommissioning

Decommissioning is basically the reverse of the installation process. Equipment recovery would be performed with support of a vessel(s) equivalent in size and capability to those used for installation (see section on installation, 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 towed to shore by the barge.

All buoy decommissioning is expected to be completed within one day. Buoys would be returned to shore and disassembled or reused in other applications. It is anticipated that the mooring devices and hardware would be re-used or disposed of as scrap iron for recycling (Fishermen’s Energy, 2011).

3.1.3.3 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, Light Detection and Ranging (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. SODAR is also a ground-based remote sensing technology; however it operates via the transmission and detection of sound. CODAR utilize high frequency (HF) 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 (ADCP) would likely be installed on each meteorological tower or buoy. The ADCP is a remote sensing technology that transmits sound waves at a constant frequency, and measures the ricochet of the sound wave off fine particles or zooplanktons suspended in the water column. The ADCPs may be mounted independently on the seafloor or to the legs of the platform, or attached to a buoy. A seafloor-mounted ADCP would likely be located near the meteorological tower (within approximately 500 ft) and would be connected by a wire that is hand-buried into the ocean bottom. A typical ADCP has 3 to 4 acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300-600 kHz with a sampling rate of 1 to 60 minutes. A typical ADCP is about one to two ft tall and one to two ft 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 avian monitoring equipment (e.g., radar units, thermal imaging cameras), acoustic monitoring for marine mammals, data logging computers, power supplies, visibility sensors, water measurements (e.g., temperature, salinity), communications equipment, material hoist, and storage containers.

3.1.3.4 Vessel Traffic Associated with Site Assessment

Vessel trips would be associated with all phases of site assessment (installation, decommissioning and routine maintenance). As explained in Section 4.1.3.5, numerous existing ports or industrial areas in the adjacent states are expected to be used in support of the proposed action. These trips would be divided among nine major ports and 28 smaller ports in Delaware, New Jersey, Maryland, and Virginia, adding traffic in already heavily used waterways (see Section 4.1.3.7).

Based on previous site assessment proposals submitted to BOEMRE, up to about 40 round trips by various vessels are expected during construction of each meteorological tower. Should each potential lessee decide to install a meteorological tower on its leasehold, a total of 480 round trips are estimated from construction (40 multiplied by 12). These vessel trips may be spread over multiple construction seasons due to the various times at which lessees acquire their leases, and weather and sea state conditions, assessing suitable site(s), acquiring the necessary permits, and availability of vessels, workers, and tower components. Since decommissioning process would basically be the reverse of construction, vessel usage during decommissioning would be similar to vessel usage during construction, so another 480 round trips are estimated.

Meteorological buoys would typically take one day to install by one vessel. One round trip is assumed for the installation of each buoy and again for its decommissioning. Should each potential lessee decide to install meteorological buoys on its leasehold, a total of 50 round trips are estimated for the installation and decommissioning of the 25 anticipated meteorological buoys.

Assuming a single maintenance trip to each meteorological tower weekly to quarterly and monthly to quarterly to each buoy, the proposed action would result in an additional 148-924 vessel trips per year, or 740-4,620 vessel trips over a five and one-half year period.

The total vessel traffic estimated as a result of the installation, decommissioning, and routine maintenance of the meteorological towers/buoys that could be reasonably anticipated in connection with the proposed action is anywhere from 1,750-5,630 round trips over a five and one-half year period (Section 3.1.3.1, Operation and Maintenance).

3.2 Non-Routine Events

Chapter 5.2.24 of the Programmatic EIS discusses in detail potential non-routine events and hazards that could occur during data collection activities. The primary events and hazards are: (1) severe storms such as hurricanes and extratropical cyclones; (2) collisions between the structure or associated vessels with other marine vessels or marine life; and (3) spills from collisions or during generator refueling. These events and hazards are summarized below.

3.2.1 Storms

Severe weather events have the potential to cause structural damage and injury to personnel. Data collected from National Data Buoy Center buoys located offshore of Delaware Bay (Buoys 44009 and 44012), Raritan Bay (Buoy 44025), and offshore of Virginia Beach (Buoy 44014) show wind speeds are typically lowest in June and July at 10 knots (12 mph) to 12 knots (14 mph), and highest in January ranging from 15 knots (17 mph) in the Delaware Bay area to 21 knots (24 mph) off the coast of Virginia Beach. Peak winds of up to 58 knots (67 mph) have been recorded at Buoy 44014 over the period of record (2002 – 2008) during the month of September. The highest winds are associated with tropical cyclones, but more often, high wind events are associated with extratropical cyclones in the winter season. The Atlantic Ocean hurricane season is June 1 – November 30 with a peak in September when it is most likely that hurricanes will impact the WEAs at sometime during the proposed action (see Figure 3.3). The Atlantic basin averages about 10 storms of tropical storm strength or greater per year; about half reach hurricane level (USDOC, NOAA, 2005) and 2.5 become major hurricanes (Category 3 or higher).

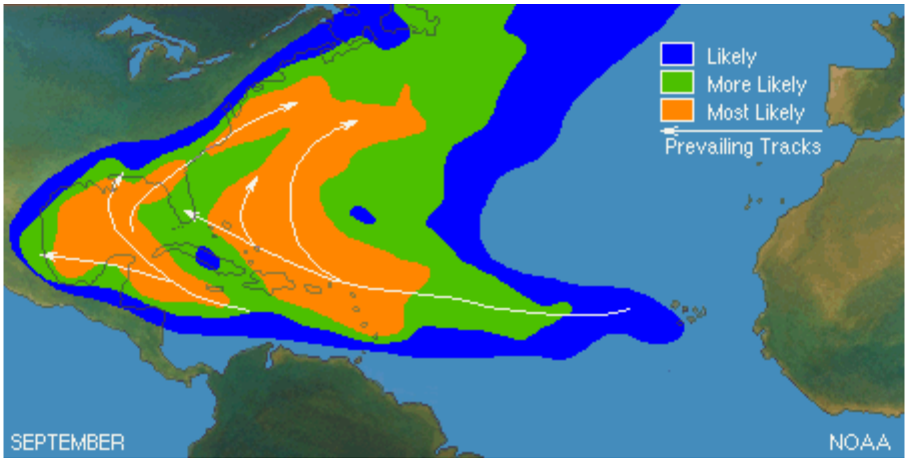

Figure 3.3. The zones of origin and tracks for the month of September during the hurricane season.
(Note: this figure only depicts average conditions. Hurricanes can originate in different locations and travel much different paths from the average; Source USDOC, NOAA, 2010)

3.2.2 Allisions and Collisions

A meteorological tower or buoy located in the WEAs could pose a risk to navigation. An allision between a ship and a meteorological structure could result in the loss of the entire facility and/or the vessel, as well as loss of life and spill of diesel fuel. When a vessel hits a buoy system, it could damage the buoy hull so the buoy loses its buoyancy and sinks, or damages the equipment or its supporting structure. Vessels associated with site characterization and assessment activities could collide with other vessels and experience accidental capsizing or result in a diesel spill.

Collisions and allisions are considered unlikely since vessel traffic is controlled by multiple routing measures, such as safety fairways, TSSs, and anchorages. These higher traffic areas were excluded from the WEAs, as described in Chapter 1 of this EA. Risk of allisions with meteorological towers and buoys would be further reduced by USCG-required marking and lighting.

Historical data supports that allisions and collisions resulting in major damage to property and equipment would be unlikely. Allision and collision incident data were reviewed for the years 1996 through 2010 (USDOI, BOEMRE, 2011a), for the Gulf of Mexico and Pacific regions, which contain many fixed structures on the OCS like the meteorological facilities that would be installed. These facilities would need operations and maintenance over the five and a half year period of site assessment just as the fixed structures in the Gulf of Mexico and Pacific regions do. Over a 15-year period with over 4,000 structures present at any one time, 236 allisions with platforms or associated OCS structures and collisions between vessels were reported in the Gulf of Mexico or Pacific regions. While only allisions and collisions that result in property or equipment damage greater than $25,000 must be reported, this number includes reports of minor damage (< $25,000). The most commonly reported causes of the allisions and collisions included human error, weather-related causes, equipment failure on the vessels, and navigational aids not working on the structures. In many cases, the allisions resulted in major damage (> $25,000) to the platforms and/or impacting vessels.

3.2.3 Spills

A diesel spill could occur as a result of collisions, accidents, or natural events. If a vessel collision occurs and if the collision leads to major hull damage a diesel spill could occur. The amount of diesel fuel that could be released by a marine vessel involved in a collision would depend on the type of vessel and severity of the collision. From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88.36 gallons (U.S. Department of Homeland Security, USCG, 2011), and, should the proposed action result in a spill in any given area, BOEMRE anticipates that the average volume would be the same.

Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. Most equipment on the meteorological towers and buoys would be powered by batteries charged by small wind turbines, solar panels. However, diesel generators may be used on some of the anticipated meteorological towers. Minor diesel fuel spills may also occur during refueling of generators.

Impacts would depend greatly on the material spilled (diesel fuel in the related vessel and infrastructure types); the size and location of a spill, the meteorological conditions at the time, and the speed with which cleanup plans and equipment could be employed. Diesel fuel is a refined petroleum product that is lighter than water. It may float on the water's surface or be dispersed into the water column by waves. Diesel is a distillate of crude oil and does not contain the heavier components that contribute to crude oil's longer persistence in the environment. If a diesel spill were to occur, it would be expected to dissipate very rapidly and would then evaporate and biodegrade within a few days (USDOI, MMS, 2007b).

4 ENVIRONMENTAL AND SOCIOECONOMIC CONSEQUENCES

4.1 Alternative A – The Proposed Action

4.1.1 Physical Resources

4.1.1.1 Air Quality

The proposed action could affect the air quality in and offshore New Jersey, Delaware, Maryland and Virginia. Survey and construction vessels would use harbors in all of these states and travel through state waters to and from the WEAs. Vessels would emit pollutants in these areas and, due to the nature of the pollutants associated with these vessels, the volume of existing vessel traffic, the heavily developed nature of many of the port and coastal areas that could be affected, and prevailing westerly winds, the potential impacts if the proposed action on existing air quality would very likely be minor, if detectible.

Chapter 4.2.2.2 of the Programmatic EIS describes air quality in the Atlantic Region, while Chapter 4.2.2.3 describes regulatory controls on OCS activities that would affect air quality. The following is a summary of that information, and incorporates new and site-specific information.

4.1.1.1.1 Description of the Affected Environment

Over 12,000 vessel round trips are anticipated in connection with site characterization and assessment activities associated with the proposed action over a five and half year period. These trips would be divided among nine major and 28 smaller existing ports in Delaware, New Jersey, Maryland, and Virginia. Due to the proximity of the ports to the WEAs, it is assumed the majority of traffic associated with site characterization and assessment of the Virginia WEA (about 2,800 round trips) would be supported by the 3 major and 9 smaller ports in Virginia. If all ports are used equally, this would average about 43 round trips per year to each of the Virginia ports. Based simply on the number of ports in each state, traffic associated with site characterization and assessment of the WEAs offshore New Jersey (about 6,400 round trips), Delaware (about 1,100 round trips) and Maryland (about 1,700 round trips) would be divided as follows: over half of the traffic supported by 3 major and 11 smaller ports in New Jersey; and the remainder of the traffic split between 3 major and 8 smaller ports in Delaware and Maryland. If all ports are used equally, this would average about 67 round trips per year to each of the ports in New Jersey, Delaware and Maryland.

Most of the harbors and associated coastal areas in New Jersey, Delaware and Maryland are heavily developed metropolitan and industrial areas and are regularly subject to historic and current heavy rail, road and vessel traffic. Virginia's harbors and coastal areas are slightly less developed. Vessels associated with the proposed action would travel through these areas and emit sulfur dioxide, nitrous oxides, carbon monoxide, particulate matter, volatile organic compounds, and other chemicals categorized as air pollutants there. However, due to the low level of pollutants emitted at any one time in any single area over the course of five and one-half years of site assessment and characterization activities, and due to the amount of human activity that emits air pollutants in the areas potentially affected by the proposed action, any impacts to air quality would be minor and localized, if detectible.

The Clean Air Act (CAA) of 1970 directed the U.S. Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for air pollutants that are 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 of 10 µm and 2.5 µm), and lead (Pb) (40 CFR Part 50). The primary NAAQS are set at levels to protect public health with an adequate margin of safety. The USEPA has designated secondary NAAQS to protect public welfare. All of the standards are expressed as concentration in air and duration of exposure. Many standards address both short- and long-term exposures. Any individual State may adopt a more stringent set of standards.

When the monitored pollutant levels in an area of a state exceed the NAAQS for any pollutant, the area is classified as “nonattainment” for that pollutant. All of the counties that may be affected by emissions associated with the proposed action are exempt from the 1-hour ozone standard, and all counties meet the NAAQS for NO_2, and Pb (USEPA, 2008a). Warren County, New Jersey is classified as nonattainment for SO_2. New Castle County, Delaware; six coastal New Jersey counties (Bergen, Burlington, Essex, Hudson, Monmouth, and Union Counties); three coastal Maryland counties (Anne Arundel, Baltimore City, Baltimore County); and Alexandria, Virginia are classified nonattainment for $PM_{2.5}$. All three Delaware counties (New Castle, Kent and Sussex), all New Jersey counties, four Maryland counties (Anne Arundel, Baltimore City, Baltimore, Calvert) and Alexandria, Virginia are classified as nonattainment for 8-hour ozone (see Table 4.1). The USEPA air quality standards for ozone are 0.12 ppm (1-hour average) and 0.075 ppm (8-hour average). Ozone is a regional air pollutant issue. Prevailing southwest to west winds carry air pollution from the Ohio River Valley, where major nitrogen oxides (NOx) emission sources (e.g., power plants) are located, and from Mid-Atlantic metropolitan areas, to the northeast, contributing to high ozone episodes.

Table 4.1

Total Number of Coastal Counties in Nonattainment of Each Criteria Pollutant per State

Criteria Pollutant	Delaware	New Jersey	Maryland	Virginia
8-hour O_3	3	6	4	1
SO_2	-	-	-	1
$PM_{2.5}$	1	6	3	1

Source: USEPA, 2008a.

The USEPA General Conformity Rule (42 U.S.C. 7506(c)) implements section 176(c) of the Clean Air Act and requires that Federal actions resulting in emissions in non-attainment areas and maintenance areas in a state conform to the federally approved State Implementation Plan (SIP). Because vessels supporting site characterization and assessment activities travel through state waters a conformity determination would be required if emissions exceed 100 tons per year in the non-attainment areas.

Delaware’s 2009 annual air quality report (DNREC, 2009a), which documents the changes and overall improvement in ambient air quality, states, “in 2009 only two pollutants, ozone and

$PM_{2.5}$, exceed the national ambient air quality standards." Other pollutants monitored are well below the national standards.

In New Jersey, ozone is a significant problem in the summer months according to the 2008 annual air quality report (NJDEP, 2008a). Fine particles are also a problem for the state, specifically $PM_{2.5}$. During 2008 there were 30 days in which the new 0.075 ppm 8-hour standard [for ozone] was exceeded. The mean annual average of Fine Particulate Speciation for the four fine particle monitoring sites in New Jersey was 12.6527 micrograms per cubic meter.

During the 2009 ozone season in Maryland eleven "exceedance days were observed[,] with only one reaching the Unhealthy AQI range." From 2004 to 2008 the average number of exceedance days was 39 (MDE, 2009). Also during 2009, $PM_{2.5}$ caused air quality to exceed an Air Quality Index of 100 on a scale of 0 – 500, which means that the air was "Unhealthy for Sensitive Groups" (MDE, 2009).

Virginia's 2009 ambient air monitoring report (VADEQ, 2010a) stated that Northern Virginia had four days that 8-hour ozone exceedance occurred. The remainder of the state had no exceedances recorded at the monitoring stations.

Class I Areas

Class I Areas are defined in Sections 101(b)(1), 169A(a)(2), and 301(a) of the CAA, as amended (42 USC 7401(b), 7410, 7491(a)(2), and 7601(a)). Class I areas are federally owned lands where very little air quality degradation is allowed. In these areas, air quality-related values including visibility are protected. There is one Class I area in New Jersey that could be affected by the proposed action, the Brigantine Wilderness Area located in southern New Jersey approximately 11 miles north of Atlantic City. Class I Areas have stringent incremental limits for NO_2, SO_2 and PM_{10}. The Prevention of Significant Deterioration (PSD) regulations (40 CFR 52.21 *et seq.*), which are designed to protect ambient air quality, apply to major new sources and major modifications to existing sources located in an attainment or unclassified area. The Brigantine Wilderness Area is in a non-attainment area and is therefore not subject to PSD.

Regulatory Controls on OCS Activities That Affect Air Quality

Section 328 of the Clean Air Act Amendments of 1990 (CAAA 1990) directs the USEPA to promulgate regulations for OCS sources that may affect the air quality of any state (42 U.S.C. 7627). The regulations are found in 40 CFR Part 55. Under 40 CFR Part 55, USEPA has authority to regulate the air emissions associated with "OCS sources," which would include meteorological towers, any vessels for the purposes of constructing, servicing, or decommissioning them, and seafloor boring. *See* 40 CFR 55.2. Under the USEPA rules, for all OCS sources located within 25 nm of States' seaward boundaries the requirements are the same as the requirements that would be applicable if the source were located in the corresponding onshore area. In the States potentially affected by the proposed action, State boundaries extend three nm from the coastline.

Section 328 of the CAAA 1990 also establishes a unique treatment for vessels associated with OCS facilities. With respect to calculations of the facility's Potential to Emit (PTE), emissions from vessels that are servicing or associated with the operations of OCS facilities must be counted as direct emissions from the OCS source when those vessels are at the source or en route to or from the source when within 25 nm of the source. The USEPA rules set forth in 40 CFR Part 55 replicate this treatment of vessels with respect to PTE calculations.

Any permit that may be needed by the regulations would be issued by the appropriate USEPA Region (Region 2 for New Jersey and Region 3 for Delaware, Maryland and Virginia) or the state agency authorized to do so by the USEPA.

Some emissions associated with OCS sources may require compliance with the General Conformity Rule 40 CFR Part 93, Subpart B. These regulations implemented Section 176 of the CAAA 1990 which requires that Federal actions conform to applicable SIPs developed by States and approved by USEPA for the purpose of attaining or maintaining compliance with NAAQS. To determine whether a conformity determination is required, BOEMRE would conduct an applicability analysis to identify, analyze, and quantify emissions resulting from an action. A conformity determination is required when the total direct and indirect emissions for criteria pollutants in a nonattainment or maintenance area exceed rates (known as *de minimus* rates), specified in 40 CFR 93.153(b)(1) and (2). The emissions estimates must include emissions from transportation of materials, equipment, and personnel, and must extend to construction and decommissioning phases, as well as the operational phase of the action. Conformity only applies to emissions within State boundaries (onshore and in state waters) and only to emissions that are not subject to an air permit (emissions located within 25 nm of the state's seaward boundary).

4.1.1.1.2 Impact Analysis of the Proposed Action

Impacts of Routine Activities

Routine activities (see Section 3.1 of this EA), which include site characterization activities and the construction, servicing, maintenance, and decommissioning of meteorological towers and buoys have the potential to impact air quality locally. Potential emission sources include support vessels, survey vessels and equipment, and the possible use of diesel generators to power equipment on meteorological towers.

Chapter 5.2.2.2 of the Programmatic EIS concluded that primary emission sources associated with site assessment activities would be from engine exhaust of vessel traffic (e.g., boat or barge) and heavy equipment (e.g., pile drivers). In general, most criteria pollutant emissions would be from internal combustion engines burning diesel fuel during the installation, construction or decommissioning of a meteorological buoy or tower and would include primarily nitrogen oxides NO_x and carbon monoxide (CO), lesser amounts of volatile organic compounds (VOCs) and PM_{10} (mostly in the form of $PM_{2.5}$), and negligible amounts of sulfur oxides (SO_x).

Site Characterization Surveys

Survey vessels would emit pollutants both in state waters and in waters over the OCS while traveling to and from the WEAs and while conducting site characterization surveys within the WEAs. Impacts from pollutant emissions associated with these vessels would very likely be localized, and would not travel in between WEAs or, for example, from NJ waters to VA waters. Prevailing westerly (west to east flow) winds would prevent any substantial amount of pollutant emissions from traveling from offshore areas to onshore non-attainment areas.

In state waters, vessel traffic associated with survey vessels moving in and out of each port would potentially average 43 trips per year per port in Virginia and 67 trips per year per port in New Jersey, Delaware and Maryland (see Section 4.1.1.1.1 of this EA). These 43-67 trips per year is a very small contribution to the annual average of each port, coastal, and harbor area's activity. The additional pollutant emissions would be negligible, if detectible, in these areas.

On the OCS, vessel traffic to conduct surveys within the WEAs would cover a maximum of 60,100 nm and 13,300 hours total. Pollutant emissions from surveying one state's WEA are unlikely to impact air quality in another state with the exception of survey work in the southern parts of the Delaware WEA and the northern Maryland WEA. Again, it is unlikely that these activities would impact onshore air quality in any way due to prevailing westerly winds.

Construction and Decommissioning

The proposed action is projected to result in up to 12 meteorological towers or 25 meteorological buoys within the WEAs (see Section 3.1.3 of this EA). Potential impacts on ambient air quality during construction and decommissioning would be minor due to the short duration of these activities and the location of these activities offshore. Estimated emissions of criteria air pollutants from construction and decommissioning of each anticipated meteorological tower is approximately 13.5 tons (Bluewater Wind New Jersey Energy LLC, 2009). As a result, should all of the lessees within the New Jersey WEA choose to erect meteorological towers, the total amount of emissions associated with constructing and decommissioning all of the towers offshore New Jersey would be 94.5 tons. Similarly, emissions associated with meteorological tower construction offshore Maryland would be 27 tons, and offshore Virginia would be 40.5 tons. For Delaware, no meteorological towers are projected in connection with the proposed action (See Section 4.8, Cumulative Environmental and Socioeconomic Impacts, of this EA).

Emissions associated with a buoy would be much less because buoys are towed or carried aboard a vessel and then an anchor is used for installation. No drilling equipment would be required for meteorological buoys. The installation and decommissioning of a buoy can be completed in one day.

Whether towers or buoys, emissions associated with the construction and decommissioning of the anticipated meteorological data collection facilities would be minor (less than 100 tons per leasehold). The majority of these emissions would occur within the WEAs, and would not affect onshore air quality.

Operations

Under the proposed action, meteorological towers and buoys would be operating concurrently or staggered over a five and one half year period. Equipment on the meteorological data collection facilities would be powered by batteries charged by small wind turbines, solar panels, and/or diesel generators. Diesel generators, if used, would only be employed on meteorological towers because buoys are not large enough to hold them. While turbines and solar panels would produce no emissions, diesel generators would emit NO_x, CO, PM_{10} and SO_2. All criteria pollutant emissions are estimated to total approximately one ton (1.08 tons (Bluewater Wind New Jersey Energy LLC, 2009)) per year for each facility. Total operational emissions for all anticipated meteorological towers for the New Jersey WEA is seven tons per year; for Delaware no meteorological towers are projected in connection with the proposed action; for Maryland it is estimated to be two tons per year; and for Virginia three tons per year.

Due to the distance to shore and prevailing winds, the use of diesel generators in the WEAs would not impact onshore air quality.

Support vessels traveling to and from shore and in harbor or port areas making approximately 12,000 trips over 5.5 years have the potential to affect onshore air quality. Several major ports are suitable for supporting the fabrication and staging of meteorological towers and buoys. Support vessels traveling from these ports and offshore sites would contribute slightly to emission totals in these areas. Therefore, impacts from additional pollutant emissions associated with the proposed action in the already busy ports and harbors would be negligible.

Impacts of Non-Routine Activities

A spill of diesel fuel could occur from vessel collisions in and outside the WEAs, or during generator refueling at the 12 anticipated meteorological towers within the WEAs (see Section 3.2.3). In these events, the estimated spill size is 88.36 gallons (U.S. Department of Homeland Security, USCG, 2011). If such a spill were to occur, it is expected to dissipate very rapidly and then evaporate and biodegrade within a few days (USDOI, MMS, 2007b). Air emissions from a diesel spill would be minor and temporary. If a storm were to occur, rain would wash lingering pollutants out of the air and winds would cause dispersal of the pollutants.

A diesel spill occurring in the WEAs is not projected to have any impacts on onshore air quality, because of the estimated size of a spill, prevailing atmospheric conditions over the WEAs, and distance from shore. The impacts of emissions to air quality in the vicinity of the spill within the WEAs would be minor and temporary.

In the unlikely event of vessel collision, a spill could occur while enroute to and from the WEAs or while survey potential cable routes to shore. Spills occurring in these areas, outside of the WEA, are not projected to have significant impacts on onshore air quality due to the estimated size and duration of a diesel spill. Impacts of emissions to onshore air quality would be minor and temporary.

Conclusion

Due to the short duration and low level of emissions associated with routine activities, potential impacts to onshore ambient air quality from the proposed action would be minor (less than 100 tons per year), if detectable in the relevant affected environment. Prevailing westerly (west to east flow) winds would prevent significant amounts of pollutant emissions from making it to onshore non-attainment areas from offshore areas and the WEAs. Emissions associated with the proposed action in ports and harbors would be negligible, if detectable, due to the low volume of vessel activity in comparison to the volume of current human activity in and around these areas which emit pollution. A non-routine event such as a diesel spill may have short-term impacts on ambient air quality in a localized area. A storm would also have short-term beneficial impacts to air quality by removing and dispersing air pollutant emissions associated with routine activities. Neither routine activities nor non-routine events in coastal waters or in the WEAs would significantly impact onshore air quality, including the Brigantine Wilderness Area Class I Area.

4.1.1.2 Water Quality

For the purposes of this EA, water quality is a measure of the ability of a waterbody to maintain the ecosystems it supports or influences. In the case of coastal and marine environments, the quality of the water is influenced by the bays and rivers that drain into the area, the quantity and composition of wet and dry atmospheric deposition, and the influx of constituents from sediments. Besides the natural inputs, human activity can contribute to water quality through discharges, run-off, dumping, burning, spills, the pollutants released into the water from vessel traffic, and anti-fouling paints containing tributyltin (the usage of anti-fouling paints containing tributyltin is not anticipated in this scenario because it is banned by the International Maritime Organization). Also, mixing or circulation of the water can either improve the water through flushing or be the source of factors contributing to the decline of water quality.

Evaluation of water quality is done by measurement of factors that are considered important to the health of an ecosystem. The factors influencing coastal and marine environments are temperature, salinity, dissolved oxygen, nutrients, the presence of chlorophyll, potential of hydrogen (pH), oxidation reduction potential (Eh), pathogens, and turbidity or suspended load. Trace constituents such as metals and organic compounds can affect water quality. Contaminants, which are associated with the suspended load, may ultimately reside in the sediments rather than the water column.

The affected environment is divided into coastal and marine waters for the purposes of the following discussion. Coastal waters includes all the rivers, bays and estuaries that could be affected by the proposed action. Marine waters, include both waters offshore that are state territory (within three nm of shore) as well as those above the OCS.

4.1.1.2.1 Description of the Affected Environment

Chapter 4.2.4 of the Programmatic EIS describes coastal and marine water quality in the Atlantic Region, including the regions in which the WEAs are located. The following is a summary of that information, and incorporates new and site-specific information.

Mid-Atlantic Coastal Waters and Water Quality

The nation's coastal waters were rated on a scale of poor, fair, and good using an index based on dissolved oxygen, chlorophyll *a*, nitrogen, phosphorus, and water clarity. According to the National Coastal Condition Report III by the USEPA, the water quality index for the relevant portions of the Mid-Atlantic, which includes much of the New Jersey Coastline, the Delaware Coastline, Delaware Bay, the Chesapeake Bay, and coastal and harbor areas south of the Chesapeake were rated by USEPA as "poor" for water quality (see Figure 4.1).

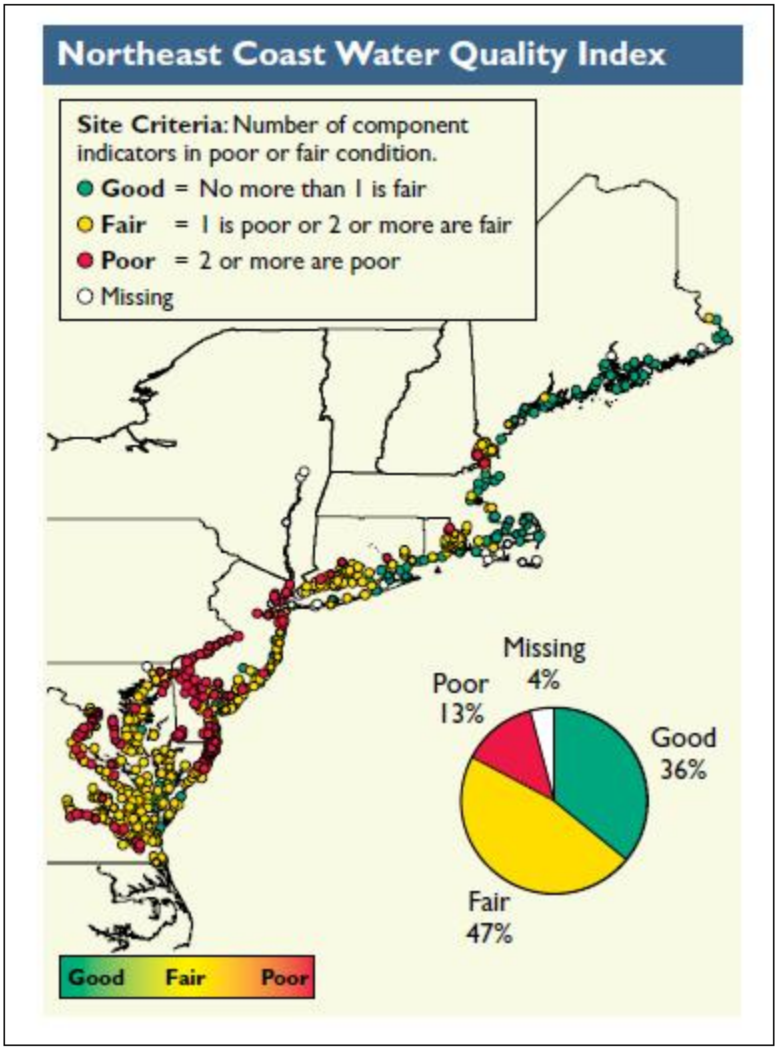

Figure 4.1. Water Quality Index for the Northeast Coast (USEPA, 2008b).

Delaware Coastal Waters

Beach front communities dot the 25 mile coast of Delaware. In the 2006 *Delaware Water Quality Assessment Report* (DNREC, 2011), Delaware's entire coastal shoreline was rated "good" for fish, aquatic life and wildlife, water supply and recreation. However, 29.5 miles of Delaware bays and estuaries were reported as impaired due to municipal point source discharges, septic systems, industry, agriculture, development, runoff, vessel traffic, and natural sources such as wildlife. In the lower Delaware Bay, the dissolved oxygen levels continue to fall below levels adequate to provide for aerobic life forms (5.0 mg/l). Levels of the contaminants mercury, chlorinated pesticides and PCBs are high enough in fish to require fish consumption advisories throughout the Bay. Nutrient levels have begun to improve in the estuary.

New Jersey Coastal Waters

New Jersey actively monitors coastal water quality and monitors shellfish and chlorophyll at a greater frequency and at more stations than the national survey. Dissolved oxygen is consistently rated good in New Jersey's coastal waters. Water clarity is also good in New Jersey with the exception of some excessively turbid bays and estuaries. Since the major economic drivers of NJ's Coastal communities are the beaches and tourism, New Jersey consistently tracks beach water quality for elevated bacteria levels related to sewage or runoff from heavy rainfall.

In the shallow estuaries of central New Jersey (Great Bay and Great Egg Harbor River) the annual dissolved oxygen concentration in annual summer monitoring has been in decline (Zimmer and Groppenbacher, 1999). New Jersey's estuarine dissolved oxygen standard is 4 mg/L. The occurrence of these low dissolved oxygen concentrations coincided with phytoplankton blooms. Dissolved oxygen is inversely related to temperature and, so, is generally highest in the winter and lowest in the summer. New Jersey has been intermittently sampling state oceanic waters. While surface waters consistently have sufficient dissolved oxygen levels for water quality health, the samples taken one foot off the bottom exhibited low dissolved oxygen during the summer months, especially in the more southern waters of the State.

The Raritan Bay and/or Arthur Kill location in northern New Jersey are home to potential fabrication sites. The Arthur Kill links Raritan Bay to Newark Bay and is heavily and historically industrialized. These waters are impacted by industrial and municipal discharges, occasional spills from the many tank farms along Arthur Kill, and stormwater run-off. These waterways have been extensively used by industry and transportation for many years and the sediments reflect the impact of historical discharges. Although individual sampling locations may differ, in general the water quality in this region has been rated fair to poor due to elevated nitrogen and phosphorus and excessive turbidity (USEPA, 2008b).

Maryland Coastal Waters

Maryland's coastal zone includes about two-thirds of the State's land, and coastal areas house 67.83% of Maryland's population. Maryland has 4,360 miles of coastline that includes the Chesapeake Bay, Coastal bays, and the Atlantic Ocean. Almost 95% of the land in Maryland drains to the Chesapeake Bay, which then leads to the Atlantic Ocean. "The Chesapeake Bay is North America's largest and most biologically diverse estuary." (Chesapeake & Coastal Program). The Port of Baltimore, located in the upper Chesapeake Bay is a major urban, industrial, and transportation center with heavy vessel traffic and port activity.

In the National Coastal Condition Report III, nitrogen and phosphorous nutrient levels were rated good for the main stem of the Chesapeake Bay. Water clarity was poor for the estuarine system and dissolved oxygen was rated poor for the deep channels of the bay with fair conditions reported elsewhere. Poor sediment quality was found in the upper portions of the Chesapeake Bay and test stations that rated poor for sediment contaminants were also in areas such as the upper Chesapeake Bay that are near major urban and industrial centers.

The state of Maryland has established the Maryland Chesapeake Bay Water Quality Monitoring Program. The goal of this program is to reduce impacts of excess nutrients on the Bay by reducing nitrogen, phosphorus and sediment pollution. In Maryland's coastal zone (within 3 nm of shore), non-point source pollution from marinas, agriculture, and sewage outfall is a primary cause of water quality impairment (Maryland DNR, 2000).

Virginia Coastal Waters

Virginia's coastal zone includes its entire Atlantic coast, parts of the Chesapeake Bay, and the Albermale/Pamlico estuary watersheds. There is a total of 120 linear shore miles along the coast of Virginia. This area includes 29 counties, 15 cities and 42 towns (VADEQ, 2010b).

Virginia's Department of Environmental Quality prepared a Final Water Quality Assessment and Impaired Waters Integrated Report summary presentation for 2010. Water Quality Trends from 1985 to 2010 show that bacteria, phosphorous and nitrogen saw significant improvement in most coastal areas. However, in 2010, the southern beaches of Newport News, Norfolk, Hampton, and Virginia Beach exceeded the maximum daily bacterial standards for the state (Natural Resources Defense Council, 2011).

Marine Waters

Though no data specific to the water quality of each WEA is available at this time, as the distance from shore increases, oceanic circulation and the volume of water increasingly serves to disperse, dilute, and biodegrade anthropogenic contaminants and determine water quality. Since the vast majority of pollutants and threats to marine waters originate on land, there are far fewer identified major threats to marine water quality that are identified as actually originating from activities in the marine environment.

Discharges from ships and onshore wastewater treatment facilities are the most likely sources of water-borne contaminants in the WEAs themselves. Ocean-going vessels sometimes discharge bilge and ballast water, and sanitary waste prior to entering state waters due to state restrictions. Presently, sewage outfalls from both the New Jersey and Delaware coasts discharge treated municipal wastewater to the Atlantic Ocean in such concentrations and volume, that water quality in the WEAs could be affected. A dredge spoil location in Virginia at the mouth of the Potomac River could affect the water quality within the WEA offshore Virginia, as the project "generated in excess of 450,000 m^3 of silt loam, high pH, low salt dredge spoils" (Daniels, 2011).

Mid-Atlantic ocean waters beyond three miles offshore typically have very low concentrations of suspended particles, generally less than 1 milligram per liter (Louis Berger Group, 1999). Levels may be higher in bottom waters because bottom currents may resuspend sand. Storms may cause suspended sediment loads to increase by one to two orders of magnitude, but this effect dissipates soon (within days) after the storm passes.

Sand, the predominant sediment type in the area, does not retain contaminants, thus resuspension of sediments is not a potential source of pollution. The distance of the WEAs from the shoreline bays and rivers limits the potential influence of land-based contaminants.

4.1.1.2.2 Impact Analysis of the Proposed Action

Routine Activities

The routine activities associated with the proposed action that would impact coastal and marine water quality include vessel discharges (including bilge and ballast water and sanitary waste), and structure installation and removal. A general description of these impacts to coastal and marine water quality is presented in Chapter 5.2.4 of the Programmatic EIS. The following is a summary of that information, and incorporates new and site-specific information.

Onshore Discharges

All point-source discharges are regulated by the USEPA, the agency responsible for coastal water quality, or the USEPA-authorized state agency. The USEPA National Pollutant Discharge Elimination System (NPDES) storm-water effluent limitation guidelines control storm-water discharges from support facilities such as ports and harbors. Activities associated with staging and fabrication of the meteorological towers and buoys would account for a very small amount of activity at existing ports facilities during the short duration of staging and would therefore be negligible.

Vessel Discharges

Vessel discharges associated with the proposed action may affect water quality when vessels are traveling to and from the WEAs, and during site characterization surveys and site assessment activities in the WEAs. Vessel discharges include bilge and ballast water, and sanitary waste. Bilge water is often contaminated with oil. Regulations that set limits for oil in bilge water would minimize the impact to water quality. Bilge water is water that collects in the lower part of a ship. The bilge water is often contaminated by oil that leaks from the machinery within the vessel. The discharge of any oil or oily mixtures is prohibited under 33 CFR 151.10; however, discharges may occur in waters greater than 12 nm from shore if the oil concentration is less than 100 ppm. Ballast water is less likely to contain oil but is subject to the same limits. Ballast water is used to maintain stability of the vessel and may be pumped from coastal or marine waters. Generally, the ballast water is pumped into and out of separate compartments and is not usually contaminated with oil; however, the same discharge criteria apply as for bilge water (33 CFR 151.10). Ballast water may be subject to the USCG Ballast Water Management Program to prevent the spread of aquatic nuisance species. In coastal waters, bilge and ballast water may be discharged with an oil content of 15 ppm or less. The discharges may affect the water quality locally and temporarily, but the potential impacts would be minor.

The marine sanitation device (MSD) is required under 33 CFR 159 to treat sanitary waste generated on service vessels so that surrounding waters are not impacted by possible bacteria or viruses in the waste. All vessels with toilet facilities must have a MSD that complies with 40 CFR 140 and 149. Vessels complying with 33 CFR 159 are not subject to State and local MSD requirements. There are three types of MSDs. The MSD Type I macerates the sewage to no visible solids and then reduces the bacteria count to less than 1,000 per 100 millimeters using chemicals before discharge at sea. The MSD Type II device requires that solids be ground up even finer and the bacteria count must be below 200 per 100 milliliters. The discharge of treated sanitary waste would still contribute small amounts of nutrients to the water. The MSD Type III device, where waste water is tanked aboard ship until pumped out onshore, is the most common type of sewerage treatment system aboard vessels. These systems are designed to retain or treat the waste until it can be disposed of at the proper shoreside facilities.

State and local governments regulate domestic or gray water discharges. However, a State may prohibit the discharge of all sewage within any or all of its waters. Domestic waste consists of all types of wastes generated in the living spaces on board a ship including gray water that is generated from dishwasher, shower, laundry, bath and washbasin drains. Gray water from vessels is not regulated outside state waters. Vessel operators may dump Gray water outside state waters.

The discharge of trash and debris is prohibited in the sea, or into the navigable waters of the United States (33 CFR 151.51-77) unless it is passed through a comminutor and can pass through a 25-mm mesh screen. All other trash and debris must be returned to shore for proper disposal with municipal and solid waste. Because the discharge of trash is prohibited, BOEMRE concludes that no environmental effects are likely to occur as a result of trash discharge.

Over 12,000 round trips are anticipated from site characterization and assessment activities associated with the proposed action over a five and half year period.

In the *Study of Discharges Incidental to Normal Operation of Commercial Fishing Vessels and Other Non-Recreational Vessels Less than 79 Feet* (USEPA, 2010b), USEPA sampled wastewater discharges from vessels of the type associated with the proposed action: tugboats, small research vessels, and supply boats, as well as others. The samples were taken from cities in the Mid-Atlantic and in other areas. Using the samples, USEPA modeled how these vessel types may impact water quality. It was determined that vessels discharging to a relatively large water body were not likely to cause an exceedance of National Recommended Water Quality Criteria. However, there is the potential for these discharges to impact water quality locally and temporarily. Metals were frequently found in bilgewater samples. The volume and make-up of gray water discharge varies by vessel type, but in all cases was potable freshwater bunkered in port (service water). BOEMRE anticipates that vessels associated with the proposed action will also use service water collected at port. The anticipated volume of survey vessels moving in and out of each port would potentially average 43 trips per year per port in Virginia and 67 trips per year per port in New Jersey, Delaware and Maryland (see Section 4.1.1.1.1). This activity over the course of five and one-half years would have a relatively minor impact to water quality. This is particularly so in comparison to the regular activities estimated by the USEPA in these areas, which are modeled at 140,000 vessels annually. Therefore, impacts from vessel discharges associated with the proposed action on harbors, ports, coastal areas, and within the WEAs would be minor, if detectable.

Sediment Disturbance

Sediment disturbance could result from vessel and buoy anchoring, geological and geophysical (G&G) surveys, and structure installation and removal, most of which would take place within the WEAs.

<u>Anchoring</u>: The process of anchoring vessels and buoys, and anchor removal would cause intermittent disturbance of the seafloor, with movement of sediment into the water column followed by sedimentation. The amount and duration of increased turbidity would be dependent upon the activity, the sediment grain size, current velocity, and water depth. Considering that an estimated 12,000 vessel trips are anticipated with the proposed action, at least 12,000 anchorages would take place over five and one-half years. Anchoring and removal are short processes; therefore sediment is expected to settle within a few minutes of disturbance. Short-term impacts to turbidity and water clarity are expected to be local within a discrete area of the WEA. These impacts are anticipated to be minor.

<u>Site Characterization Surveys</u>: The geophysical surveys within the WEAs would not likely influence water quality except for vessel discharges as described above, but sediment coring would cause temporary disturbance of the seafloor and introduction of sediment into the water column, temporary increased turbidity and sedimentation. To the extent that sediment samples are collected by drilling equipment, the disposition of the sediment core material itself could cause short-term water quality impacts such as turbidity and a degradation of water clarity in the immediate area of disturbance. These impacts are anticipated to be temporary and minor.

<u>Installation and Decommissioning</u>: Impacts to water quality resulting from the construction and installation of meteorological towers would consist of sediment dispersal, resuspension and subsequent sedimentation from pile-driving and anchoring. Water quality impacts would occur during decommissioning activities from material dislodged from the piles during removal, and

sediment resuspension and resedimentation during the removal of the tower, foundation, and scour protection system. Construction of the tower or installation of the buoy may create temporary and minor water and sediment impacts.

When the structure is decommissioned, sediments that had collected in the scour control system, mats or rock armor, would be temporarily disturbed. The mats and rock armor would be returned to shore for disposal (see Section 3.1.3.1 of this EA).

Non-Routine Events

During travel to and from ports and harbors, site characterization and site assessment activities, multiple sources of diesel fuel would be present on vessels, generators, and pile driving hammers. Spills could occur during refueling or as the result of an allision or collision.

A vessel allision with the meteorological structures or collision with other vessels may result in the spillage of diesel. Vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. To date, approximately 10 percent of vessel allisions with fixed structures on the OCS caused diesel spills. Spills occurring outside of the WEAs are not projected to have significant impacts due to the size of a projected spill. A spill outside of a WEA could only occur while enroute to and from the WEAs where allisions and collisions are unlikely. From 2000 to 2009, the average spill size for vessels other than tank ships and tank barges was 88.36 gallons (U.S. Department of Homeland Security, USCG, 2011). If a diesel spill were to occur, it would be expected to dissipate very rapidly in the water column of the open ocean, then evaporate and biodegrade within a few days (see Section 3.2.3 of this EA).

The meteorological towers and buoys could also serve as attractants for marine life, which in turn attracts recreational fishermen to the area. Therefore, there is some potential for collisions with recreational fishing boats and accidental release of diesel fuel.

Storms may also cause allisions and collisions that could result in a spill, yet the storm conditions would cause the spill to dissipate faster.

Conclusion

Impacts to coastal and marine waters from vessel discharges associated with the proposed action should be of short duration and remain minimal, if detectable. Minimal impacts would result from a spill since diesel is light and would evaporate and biodegrade within a few days. Since collisions and allisions occur infrequently and rarely result in a spill, the risk of a spill would be small. If a spill occurred, the potential impacts to water quality are not expected to be significant. Storms may disturb surface waters and cause a faster dissipation of diesel if spilled, but impacts to water quality would be negligible and of a short duration. Sediment disturbance resulting from anchoring and coring would be short-term, temporarily impacting local turbidity and water clarity. Therefore, impacts from vessel discharges and sediment disturbance associated with the proposed action on harbors, ports, coastal areas and WEAs would be minor, if detectable.

4.1.2 Biological Resources

4.1.2.1 Coastal Habitats

4.1.2.1.1 Description of the Affected Environment

The Mid-Atlantic WEAs are located offshore of the Atlantic coastal plain. This plain is a flat stretch of land that borders the Atlantic Ocean for approximately 2,200 miles from Cape Cod through the southeast United States. The general description of coastal habitats along the Atlantic Coastal Plain are incorporated here by reference and can be found in Chapter 4.2.13 of the Programmatic EIS (USDOI, MMS, 2007a) and summarized in this section. The following sections include a description of the affected coastal environments for each state.

The four WEAs are located offshore Delaware, Maryland, New Jersey, and Virginia, which have a complex range of diverse coastal habitats consisting of barrier islands, sand spits, beaches, dunes, tidal and non-tidal wetlands, mudflats, and estuaries (USDOI, MMS, 2007a). Much of the Atlantic shoreline in these states has been altered in some degree, in many cases to a substantial extent, and most of the coastal habitats have been historically, and are presently impacted by human activities. Much of this alteration has been from development, vessel and ground traffic, industry, agriculture, beach replenishment, or shore protection activities such as jetties (USDOI, MMS, 2007a).

Delaware

Delaware has approximately 24 miles of oceanfront coastline along the Atlantic Ocean and over 380 miles bordering various estuaries, including Delaware Bay (DNREC, 2009b). Delaware is home to two large ports at New Castle and Wilmington on the Delaware side of the Bay. New Jersey has additional ports on its side (see Section 4.1.3.5.2 of this EA). All of these ports could potentially be used to support the activities contemplated in the proposed action.

Delaware Bay

Delaware Bay is home to several ports that would support activities in the WEAs. The Delaware Bay's coastal resources include extensive areas of tidal wetlands, mudflats and sandy beaches (Cole et al., 2005). Southern Delaware Bay is predominately lined with saline fringe, while northern Delaware Bay is predominately lined with estuarine marsh (Adkins, 2008). Portions of the Bay consist of tidal brackish-water and salt marshes and open waters of creek, river, and bay areas (USDOC, NOAA, NERRS, 2011). The Delaware estuary wetlands, which include the Delaware Bay area, provide critical habitat for 35 percent of the region's threatened and endangered species (Adkins, 2008). The Bay is a critical staging area for migratory shorebird species, and every spring close to a million shorebirds descend on Delaware Bay before resuming their northward migrations. The most important factor for shorebirds migrating to the Delaware Bay is food supply, which includes the world's largest spawning population of horseshoe crabs (Adkins, 2008).

Loss of essential spawning habitat due to erosion and shoreline development can threaten horseshoe crab populations (Tanacredi et al., 2009). Shoreline erosion from natural forces (wind and wave action) and human influenced forces (i.e., development activity, vessel wakes) result in erosion rate of 2 – 6 m per year limiting the available habitat for horseshoe crab spawning areas and nesting and feeding areas for birds.

Rehoboth Bay

Although little vessel activity associated with the proposed action is likely to occur in this area, Rehoboth Bay is part of Delaware's inland bays, which includes, Little Assawoman Bay and Indian River Bays. Depths in these bays are generally shallow (<6 – 7 ft below Mean Lower Low Water (MLLW) (Moffat and Nickel, 2007). Rehoboth Bay has tidal exchange with the Atlantic Ocean through Indian River Inlet, and could provide a limited exchange between ocean and bay waters in event of a diesel spill near the city of Dewey Beach.

New Jersey

New Jersey has 127 miles of coastline and 83 miles of shoreline along the Raritan and Delaware Bays, and over 300,000 acres of tidal wetlands (NJDEP, 2002 and 2008b). At the South end of the New Jersey Atlantic shore, Cape May and Atlantic Counties have short and fairly wide tide dominated barrier islands. Behind the islands, 97 square miles (253 square kilometers (km)) of marshes dominate the small open water bays (USEPA, 2009a). New Jersey is considered the most developed and densely populated shoreline in the country, with only 31 miles of shoreline between Sandy Hook in the north and Cape May Point in the south without human development between the salt marshes and the sea (Richard Stockton College, Coastal Research Center, 2011). New Jersey's coastal area is comprised of a variety of landscapes ranging from elevated headlands to wave-dominated and mixed-energy barrier islands to tidal and freshwater wetlands. Long-term biophysical and climate trends indicate that New Jersey, like other Mid-Atlantic states, will likely be subject to continued shoreline erosion, higher sea levels, and loss of natural coastal buffers (NJDEP, 2011a).

Raritan Bay

The Raritan Bay area of New Jersey (including Sandy Hook, NJ) is home to several ports that would support activities in the WEAs. The shoreline of Raritan Bay consists of 3,600 acres of shallow tidal mudflats, sandflats, and salt marsh. Many state listed species of birds forage along Raritan Bay during breeding season (New Jersey Audubon Society, 2009). Much of the upland and wetland shoreline of Raritan Bay and its associated watersheds have been developed, impaired, or degraded by industrial, commercial, and residential uses (USFWS, 2009).

Maryland

The State of Maryland has several different coastal habitats types along the Atlantic Ocean and the Chesapeake Bay, with 32 miles of coastline along the Atlantic Ocean, including Assateague Island National Seashore, and numerous shallow coastal bays near Ocean City (USEPA, 2009a). The densely populated area of Ocean City occupies roughly 9 miles of coastline and is a likely area for launching survey vessels and/or vessels associated with installing, maintaining, and decommissioning meteorological towers or buoys. Counteracting shoreline erosion in developed areas may continue in the near term (USEPA, 2009a). The Maryland portion of the Chesapeake Bay houses a number of ports, including Baltimore harbor, that could be used to support activities related to the proposed action. Many of these areas are the subject of intense historic and current human development and industry. A description of the natural environs of the Maryland portion of the Chesapeake Bay can be found in the Virginia description below.

Virginia

Virginia has 5,000 miles of shoreline, with 120 miles on the Atlantic Ocean, and over one million acres of non-tidal and non-wetlands (VADEQ, 2011). There are numerous large and small ports located in the Chesapeake Bay of Virginia, especially the large ports in the Hampton Roads area, which could be used to support activities associated with the proposed action. In addition, the City of Virginia Beach south of the entrance to Chesapeake Bay could also be used to support activities associated with the proposed action due to the City's close proximity to the Virginia WEA.

Chesapeake Bay

The Chesapeake Bay is about 200 miles long, is the world's third largest estuary and includes coastlines for both the States of Maryland and Virginia. The Chesapeake supports more than 3,600 species of plants, fish and other animals, including 348 species of finfish, 173 species of shellfish, and over 2,700 plant species. The Chesapeake is a major resting ground along the Atlantic Flyway, with about one million waterfowl wintering over in the bay region, and produces more than 500 million pounds of seafood per year (USEPA, 2009b). Historic and growing commercial, industrial, recreational, agricultural and urban activities and development have heavily impacted and continue to impact the Chesapeake and its living resources. Chemical contaminants, which are often present in sediments and are particularly high near urban areas and commercial ports, can accumulate in tissues of birds, fish, and shellfish. The Baltimore Harbor area in Maryland has been identified as a region of concern where species are likely to be affected by chemical contaminants (USEPA, 2004).

The Chesapeake is also an important commercial waterway, and both power and sail boating are major activities in the area. Sediments are a natural part of the Chesapeake ecosystem, however, accumulation of excessive amounts of sediments is undesirable because they fill in ports and waterways, and carry concentrations of toxic materials (USEPA, 2004). Sediments in the middle Bay are mostly made of silts and clays from shoreline erosion, while sediments in the lower Bay are sandier as a result of shore erosion and inputs from the ocean. Sediments can act as chemical sinks by absorbing nutrients, metals, oil, pesticides and other potentially toxic materials (USEPA, 2004). Shoreline erosion can add sediment to the Bay, and vessel traffic and loss of shoreline vegetation have accelerated natural erosion rates (USEPA, 2004).

4.1.2.1.2 Impact Analysis of the Proposed Action

The proposed leases would be located at least 7 to 18 nm from the nearest shoreline. Therefore, site characterization surveys, and the construction, operation and decommissioning activities of meteorological towers/buoys occurring within the proposed lease areas would have no direct impact on coastal habitats. However, coastal vessel traffic associated with the proposed action and the use of existing coastal and port facilities have the potential to contribute to the impacts on coastal habitats as discussed below.

Routine Activities

Several existing fabrication sites, staging areas, and ports in Delaware, New Jersey, Maryland, and Virginia would support site characterization surveys, and the construction, operation and decommissioning of meteorological towers/buoys as discussed in Section 4.1.3.5 of this EA. No expansion of these existing onshore areas is anticipated in support of the proposed action (see Section 4.1.3.5). Existing channels could accommodate the vessels anticipated to be used, and no additional dredging would be required to accommodate different vessel size(s) as a result of the proposed action. In addition, no cables would be installed to shore to support the meteorological towers or buoys.

Impacts from routine activities may occur from wake erosion and associated added sediment caused by vessel traffic in support of the proposed action. Over 12,000 round trips are anticipated from site characterization and assessment activities associated with the proposed action over a five and half year period. These trips would be divided among nine major and 28 smaller existing ports in Delaware, New Jersey, Maryland, and Virginia. Due to proximity, it is assumed the majority of traffic associated with site characterization and assessment of the Virginia WEA (about 2,800 round trips) would be supported by the 3 major and 9 smaller ports in Virginia. If all ports are used equally, this would average about 43 round trips per year to each of the Virginia ports. Based simply on the number of ports in each state, traffic associated with site characterization and assessment of the WEAs offshore New Jersey (about 6,400 round trips), Delaware (about 1,100 round trips) and Maryland (about 1,700 round trips) would be divided as follows: over half of the traffic supported by 3 major and 11 smaller ports in New Jersey; and the remainder of the traffic split between 3 major and 8 smaller ports in Delaware and Maryland. If all ports are used equally, this would average about 67 round trips per year to each of the ports in New Jersey, Delaware and Maryland.

Wake erosion and sedimentation effects would be limited to approach channels and the coastal areas near the ports and bays used to conduct activities. Given the existing amount and nature (including tanker ships, container ships, and other very large vessels) of vessel traffic into and out of these ports (see Section 4.1.3.5.2), the relatively small size and number of vessels associated with the proposed action would cause a negligible increase, if any, to wake-induced erosion of associated channels. Channels in the immediate vicinity of some major ports (e.g., Trenton, Wilmington, Baltimore, and Hampton Roads) are armored, which prevents most channel erosion regardless of source.

Non-Routine Events

A spill could occur within a channel or bay from WEA-related vessels on their way to or from the ports, or in the WEAs during survey activities, or installation/decommissioning/maintenance of meteorological towers/buoys. If a spill were to occur within a channel or bay and contact shore the impacts to coastal habitats would depend greatly on the type of material spilled, the size and location of the spill, the meteorological conditions at the time, and the speed with which cleanup plans and equipment could be employed. These impacts are anticipated to be minimal since average spill size is likely to be small (approximately 88 gallons) and vessels are expected to comply with USCG requirements relating to prevention and control of oil spills. Due to the distance from shore of the activities and the rapid evaporation and dissipation of diesel fuel (see Section 3.2.4, non-routine spills) a spill occurring within the WEAs would not likely contact shore. Collisions between vessels and allisions between vessels and meteorological towers and buoys is considered unlikely (see Section 3.2.2 of this EA). However in the unlikely event that a vessel allision or collision were to occur, the most likely pollutant to be discharged would be diesel fuel. If a diesel spill were to occur, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (see Section 3.2.3 of this EA).

Conclusion

No direct impacts on coastal habitats would occur from routine activities in the WEAs due to the distance of the WEAs from shore. No anticipated expansion of existing coastal facilities, and the use of existing coastal ports and industrial areas. Indirect impacts from routine activities may occur from wake erosion and associated added sediment caused by increased vessel traffic in support of the proposed action. However, given the volume and nature of existing vessel traffic in these areas, a negligible increase, if any, to wake induced erosion may occur. Potential impacts to coastal habitats from an accidental diesel fuel spill, should one occur, would be negligible, localized, and temporary.

4.1.2.2 Benthic Resources

4.1.2.2.1 Description of the Affected Environment

The Mid-Atlantic WEAs are located in the Mid-Atlantic Bight (MAB) of the Northeast Continental Shelf Large Marine Ecosystem. The following MAB characterization and Table 4.2 are adopted from *Characterization of the Fishing Practices and Marine Benthic Ecosystems of the Northeast U.S. Shelf* (NOAA Technical Memo NMFS-NE-181, 2004 cited as Johnson, 2002). The Nature Conservancy has also compiled several decades of NMFS benthic grab sample data into an informative geodatabase as part of their Northwest Atlantic Marine Ecoregional Assessment (NAM ERA). The TNC data is presented in Appendix A, Figures 1-3. The MAB includes the shelf and slope waters from Georges Bank south to Cape Hatteras, and east to the Gulf Stream. Like the rest of the continental shelf, the topography of the MAB was shaped largely by sea - level fluctuations caused by past ice ages. The shelf's basic morphology and sediments derive from the retreat of the last ice sheet, and the subsequent rise in sea level. Since that time, currents and waves have modified this basic structure.

Physical Features

The shelf declines gently from shore out to between 100 and 200 km offshore where it transforms to the slope (100-200 m of water depth) at the shelf break. In both the Mid-Atlantic and on Georges Bank to the northeast, numerous canyons incise the slope, and some cut up onto the shelf itself. The primary morphological features of the shelf include shelf valleys and channels, shoal massifs, scarps, and sand ridges and swales. The sediment type covering most of the shelf in the MAB is sand, with some relatively small, localized areas of sand-shell and sand-gravel. On the slope, silty sand, silt, and clay predominate.

Sand ridges are more modern in origin than the shelf's glaciated morphology. Their formation is not well understood; however, they appear to develop from the sediments that erode from the shore face. They maintain their shape, so it is assumed that they are in equilibrium with modern current and storm regimes. They are usually grouped, with heights of about 10 m, lengths of 10-50 km, and spacing of about 2 km. Ridges are usually oriented at a slight angle towards shore, running in length from northeast to southwest. The seaward face usually has the steepest slope. Sand ridges are often covered with smaller similar forms such as sand waves, megaripples, and ripples. Swales occur between sand ridges. Since ridges are higher than the adjacent swales, they are exposed to more energy from water currents, and experience more sediment mobility than swales. Ridges tend to contain less fine sand, silt, and clay, while relatively sheltered swales contain more of the finer particles. Swales have greater benthic macrofaunal density, species richness, and biomass due, in part, to the increased abundance of detrital food and the physically less rigorous conditions. Sand waves are usually found in patches of 5-10 with heights of about 2 m, lengths of about 50-100 m, and spacing of about 1-2 km. Sand waves are primarily found on the inner shelf (see Table 4.2 for habitat types), and often observed on sides of sand ridges. Sand waves may remain intact over several seasons. Megaripples occur on sand waves or separately on the inner or central shelf. During the winter storm season, these megaripples may cover as much as 15% of the inner shelf. They tend to form in large patches and usually have lengths of about 3-5 m with heights of about 0.5-1 m. Megaripples tend to survive for less than a season. They can form during a storm and reshape the upper 50-100 cm of the sediments within a few hours. Ripples are also found everywhere on the shelf, and appear or disappear within hours or days, depending upon storms and currents. Ripples usually have lengths of about 1-150 cm and heights of a few centimeters.

Natural and artificial reefs are another important feature of the Mid-Atlantic benthic habitat. Natural reefs, although not well mapped in the Mid-Atlantic, consist largely of exposed rock outcrops or random boulders left by retreating glaciers or rafted from icebergs, or erosion of sediment-covered rock or deltaic deposits of rock, cobble, and gravel along former river channels across a retreating shoreline since the last glacial period. Steimle and Zetlin (2000) report occurrences of northern star coral (*Astrangia poculata*) and molluscan shell deposits that provide biogenic benthic structure to the environment.

Artificial reefs are localized areas of hard structure have been formed by shipwrecks, lost cargoes, disposed solid materials, shoreline jetties and groins, submerged pipelines, cables, and other materials (Steimle and Zetlin 2000). Steimle and Zetlin (2000) cite reports by commercial fishermen of cobbles and loose rock patches associated with gravelly areas in coastal areas. These areas could represent river deltaic deposits during periods of lower sea levels; but some could be ballast stones from old wooden shipwrecks. Off coastal Delaware and south these rocky patch are also associated with "live bottom," i.e. the rocks are colonized by sea whips, stone coral, and other biogenic structural enhancers. While some of reef structure may have been deposited specifically for use as fish habitat, most have an alternative primary purpose; however, they have all become an integral part of the coastal and shelf ecosystem. It is expected that the increase in these materials has had an effect on living marine resources and fisheries, but these effects are not well known. In general, reefs are important for attachment sites, shelter, and food for many species (Johnson, 2002). All of the features discussed above are not well mapped in the Mid-Atlantic WEAs, and it is uncertain whether they exist within the WEAs. The purpose of the site characterization activities is in part to identify the distinct features of the lease area.

However, the State of New Jersey has an artificial reef network of over 15 artificial reefs that it manages in cooperation with the USACE. None of these sites are within the New Jersey WEA. In fact, by design the New Jersey WEA diverts east around the Atlantic City artificial reef in order to avoid any potential impacts or conflicting uses.

Biological Features

As reported by Johnson (2002) the Mid-Atlantic shelf was divided by Boesch (1979) into seven bathymetric/morphologic subdivisions based on faunal assemblages (Table 4.2). Sediments in the region studied (Hudson Shelf Valley south to Chesapeake Bay) were dominated by sand with little finer materials. Ridges and swales are important morphological features in this area. Sediments are coarser on the ridges, and the swales have greater benthic macrofaunal density, species richness, and biomass. Faunal species composition differed between these features, and Boesch (1979) incorporated this variation in his subdivisions (Table 4.2). Much overlap of species distributions was found between depth zones, so the faunal assemblages represented more of a continuum than distinct zones.

Table 4.2

Mid-Atlantic Benthic Habitat Types1

Habitat Type[2]	Depth (m)	Characterization[3] (faunal zone)	Characteristic Benthic Macrofauna
Inner Shelf	0-30	Course sands with finer sands off MD and VA (sand zone)	Polychaetes: *Polygordius, Goniadella,* and *Spiophanes*
Central Shelf	30-50	(sand zone)	Polychaetes: *Goniadella,* and *Spiophanes* Amphipods: *Pseudunciola*
Central and inner shelf swales	0-50	Occurs in swales between sand ridges (sand zone)	Polychaetes: *Polygordius, Lumbrineris,* and *Spiophanes*
Outer shelf	50-100	(silty-sand zone)	Polychaetes: *Spiophanes* Amphipods: *Ampelisca vadrum* and *Erichthonius*
Outer shelf swales	50-100	Occurs in swales between sand ridges (silty-sand zone)	Amphipods: *Ampelisca agassizi, Unciola,* and *Erichthonius*
Shelf break	100-200	(silt-clay zone)	NA
Continental slope	>200	(none)	NA

[1] Johnson, 2002
[2] Boesch, 1979
[3] Pratt, 1973

In general, the Mid-Atlantic WEAs occur at depths between 20 and 40 m. According to the habitat types in Table 4.2 above, the Mid-Atlantic WEAs occur in the inner to central shelf zones. The characteristic benthic macrofauna for these zones are primarily polychaete worms. These species would be vulnerable to impacts from the installation and decommissioning of meteorological observation platforms and some site characterization activities such as benthic grab samples and sub-bottom sampling. It is expected that polychaete worms and other benthic macrofauna would be able to quickly repopulate disturbed areas that are not otherwise occupied by the installed structure itself as these animals are well adapted to life in the highly dynamic environment of the MAB. Marine mammal, sea turtle, and fish interaction with benthic resources is presented in Sections 4.1.2.3, 4.1.2.4, and 4.1.2.7, respectively.

4.1.2.2.2 Impact Analysis of the Proposed Action

Routine Activities

The main potential impacts on benthic resources would be direct contact that could cause crushing or smothering by anchors, the scour control system, or driven piles that may occur during site assessment activities. Most site characterization activities involve remote sensing of the seafloor and are thus not expected to directly impact benthic resources other than fish, whose impacts are addressed in Section 4.1.2.7. Site characterization activities that may disturb the benthic resources include grab samples, borings, vibracores, and CPTs. However, impacts from these activities are expected to be limited to the immediate area of the sample and any anchoring by vessels. It is anticipated that bottom disturbance associated with site assessment activities (the installation of meteorological towers and buoys) would impact the seafloor a maximum radius of 1,500 ft (~450 m) or 52 acres around each bottom-founded structure including all anchorages and appurtenances of the support vessels. This would result in a total of almost 1,500 acres of impacted seafloor in all the WEAs, or less than one percent of the area of all WEAs, if all 12 anticipated meteorological towers were installed and they each disturbed the maximum foreseeable area of seafloor. Should all lessees instead decide to install 2 meteorological buoys on their leases, the maximum area of disturbance would likely be approximately twice that, or 3,000 acres of impacted seafloor – a little less than 2 percent of the total WEA.

The area of ocean bottom affected by a meteorological tower or buoy would range from about a couple hundred square ft if supported by a monopole to 1,500 square ft if supported by a jacket foundation. A scour control system, if used, would be comprised of installed rip rap or artificial seaweed mattresses affixed to the seafloor by anchoring pins and would cover an area of approximately a 30-ft (9-m) radius around the piling. If 12 meteorological towers were built then the total area expected to be impacted by scour control systems or actual scour would be approximately 0.5 acres (1,500ft^2 x 12 meteorological towers). In some areas that are not expected to be subject to scour, or where expected scouring would not compromise the integrity of the structure, scour protection may not be required. If, however, scouring does occur at a given location, the area impacted can be expected to be similar to or slightly larger than the projected area covered by a scour control system (30-ft (9-m)) radius beyond the structure, or 0.5 acres for all 12 sites). Upon decommissioning and removal, the equivalent area would be disturbed by severing the pile foundation legs at least 15 ft (4.5 m) below the mudline (30 CFR 285.910). Removing the scour control system, would disturb the same area disturbed when they were installed and would introduce a proximate cloud of turbidity over the seafloor for each leg. Re-suspended sediment would temporarily interfere with filter feeding organisms until the sediment has resettled. The time of sediment suspension would depend upon ocean currents and sediment grain size, but is anticipated to be short-lived.

The ability of soft-bottom communities to recover in number of individuals to pre-disturbance levels may take 1-3 years depending on the actual species density and diversity in the immediate area at the time of disturbance. Recovery of community composition or trophic structure that exploits all ecologic niches available may take longer (Continental Shelf Associates, Inc., 2004, p. 73).

The duration of activity directly impacting benthic communities from site characterization surveys, meteorological platform installation, and removal would likely be short-term in duration (8 days to 10 weeks for construction and ≤1 week for removal) and, given the limited area of disturbance within each WEA and across all the WEAs, would cause impacts to benthic habitats that are negligible.

Non-Routine Events

Collisions between vessels and allisions between vessels and meteorological towers and buoys is considered unlikely (see Section 3.2.2 of this EA). However in the unlikely event that a vessel allision or collision were to occur, the most likely pollutant to be discharged would be diesel fuel. If a diesel spill were to occur, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (see Section 3.2.3 of this EA).

Conclusion

Impacts of site characterization surveys, and construction, operation, and removal of meteorological towers and buoys on benthic communities would be short-term in duration and negligible in extent. The main potential impacts from routine activities on benthic communities would be direct contact by anchors, driven piles, and scour protection that could cause crushing or smothering. These impacts would be very localized, given the geographic extent scope of the benthic habitat on the Atlantic Continental Shelf, and could only take place in 1-2 percent of the total WEA areas. If a specific area is adversely impacted, the ability of soft-bottom communities to recover in number and diversity of individuals to pre-disturbance levels may take 1-3 years. Recovery of community composition or trophic structure that exploits all ecologic niches available in that particular area may take longer (Continental Shelf Associates, Inc., 2004, p. 73).

Proposed Mitigation Measures

BOEMRE's primary mitigation strategy is avoidance. The Record of Decision (ROD) for the Programmatic EIS lists several best management practices for avoiding sensitive benthic resources. The survey information required under the renewable energy regulations would identify the potential for the presence of particularly sensitive benthic habitats. The exact location of meteorological towers and buoys would be adjusted to avoid adverse effects to sensitive benthic communities, if present. To ensure BOEMRE receives adequate information to review a site assessment plan the following mitigation measure is proposed to be incorporated into any future decision to issue a lease or approve a SAP:

> If surveys conducted during site characterization indicate the presence of sensitive habitats, including but not limited to areas where information suggests the presence of exposed hard bottoms of high, moderate, or low relief; hard bottoms covered by thin, ephemeral sand layers; rocky outcrops; surfclam habitat; scallop habitat; or seagrass patches; then these areas shall be avoided for the installation of meteorological towers, buoys, or other site-disturbing activities.

4.1.2.3 Marine Mammals

4.1.2.3.1 Description of the Affected Environment

The Programmatic EIS gives more detail of the life histories of the marine mammal species outlined in this section and is incorporated by reference and not repeated in its entirety herein. The area for potential effect of the proposed action is the coastal and shelf habitats offshore and in between the four WEAs and the adjacent Mid-Atlantic States and New Jersey (which is considered a part of the North Atlantic in Table 4.3. below).

Approximately 39 species of marine mammals occur in Atlantic waters above the OCS from Florida to Maine. Some species are widespread and have been reported from all Atlantic waters, while other species are generally restricted to smaller areas of the Atlantic OCS. In addition, many of these species are composed of distinct stocks that exhibit distinct distributions within overall population distributions and may be locally abundant in some waters but absent from other areas of the Atlantic OCS (Waring et al., 2007). The Atlantic Coast's marine mammals are represented by members of the taxonomic orders Cetacea, Pinnipedia, and Sirenia.

The order Cetacea includes the mysticetes (the baleen whales) and the odontocetes (the toothed whales, including the sperm whale, dolphins, and porpoises). Occurrence of cetacean species is generally widespread in Northwest Atlantic waters; many of the large whales and populations of smaller toothed whales undergo seasonal migrations along the length of the U.S. Atlantic coast. The order Sirenia is represented by the West Indian manatee, which occurs mainly in the South Atlantic, but individual animals have been documented as far north as New England. The order Pinnipedia includes four species of seal, which are mainly found in the North Atlantic. Table 4.3 lists these species, their general occurrence in the Mid-Atlantic (i.e., offshore Delaware, Maryland, and Virginia) and North Atlantic (of which the area offshore New Jersey is a part) and their typical habitat. For the purpose of interpreting Table 4.3 below, the proposed action and alternatives could only affect those animals in the "coastal" and "shelf" habitats offshore these states; no activities associated with the proposed action or alternatives would take place in or affect the "Slope/Deep" habitats.

Table 4.3

Marine Mammals in the Mid and North Atlantic OCS Waters

Species	Status[b]	General Occurrence[c]		Typical Habitat		
		Mid-Atlantic[e]	North Atlantic[f]	Coastal	Shelf	Slope/ Deep
Order Cetacea						
Suborder Mysticeti (baleen whales)						
Family Balaenidae						
North Atlantic right whale (*Eubalaena glacialis*)	E/D	O	UC	X	X	X
Family Balaenopteridae						
Blue whale (*Balaenoptera musculus*)	E/D	A	O		X	X
Bryde's whale (*Balaenoptera edeni*)		O	EX		X	X
Fin whale (*Balaenoptera physalus*)	E/D	UC	UC	X	X	X
Humpback whale (*Megaptera novaeangliae*)	E/D	UC	UC	X	X	X
Minke whale (*Balaenoptera acutorostrata*)		O	UC	X	X	X
Sei whale (*Balaenoptera borealis*)	E/D	O	UC		X	X
Suborder Odontoceti (toothed whales and dolphins)						
Dwarf sperm whale (*Kogia sima*)		O	UC			X
Pygmy sperm whale (*Kogia breviceps*)		UC	O			X
Sperm whale *(Physeter macrocephalus*)	E/D	UC	UC			X
Family Ziphiidae						
Blainville's beaked whale (*Mesoplodon densirostris*)		O	O			X
Cuvier's beaked whale (*Ziphius cavirostris*)		O	O			X
Gervais' beaked whale (*Mesoplodon europaeus*)		O	O			X
True's beaked whale (*Mesoplodon mirus*)		O	O			X
Sowerby's beaked whale (*Mesoplodon bidens)*		O	UC			X
Family Delphinidae						
Short-beaked common dolphin (*Delphinus delphis*)		C	C		X	X
Pantropical spotted dolphin (*Stenella attenuata*)		O	O			X
Bottlenose dolphin (*Tursiops truncatus*)	D	C	C	X	X	X
Clymene dolphin *(Stenella clymene*)		O	A			X
False killer whale (*Pseudorca crassidens*)		O	A			X
White-sided dolphin (*Lagenorhynchus acutus*)		EX	C		X	X
White-beaked dolphin (*Lagenorhynchus albirostris*		A	O		X	
Killer whale (*Orcinus orca*)		O	O		X	X
Melon-headed whale (*Peponocephala electra*)		O	A			X
Atlantic spotted dolphin *(Stenella frontalis*)		C	C			X
Short-finned pilot whale (*Globicephala macrorhynchus*)		C	O		X	X
Long-finned pilot whale *(Globicephala melas*)		UC	C		X	X
Risso's dolphin (*Grampus griseus*)		C	C			X
Spinner dolphin *(Stenella longirostris*)		O	A			X
Striped dolphin (*Stenella coeruleoalba*)		C	C			X
Harbor porpoise *(Phocoena phocoena*)		O	C	X	X	
Order Sirenia, Family Trichechidae						
West Indian manatee *(Trichechus manatus*)	E	O	O	X		
Order Carnivora, Suborder Fissipeda, Family Phocidae						
Harbor seal (*Phoca vitulina*)		UC	C	X	X	
Gray seal (*Halichoerus grypus*)		O	C	X	X	

Source: Waring et al. (2007).
[b] E = Endangered under the Endangered Species Act; D = Depleted under the MMPA.
[c] The indicated occurrence does not reflect the distribution and occurrence of individual stocks of marine mammals within localized geographic areas, but rather the broad distribution of the species within the larger categories of OCS waters.
[e] Mid-Atlantic includes OCS waters from the South Carolina-North Carolina border to the Delaware-New Jersey border.
[f] North Atlantic includes OCS waters from the Delaware-New Jersey border to the Maine border with Canada.
[g] A = Absent – not recorded from the area; C = Common – regularly observed throughout the year;
EX = Extralimital - known only on the basis of a few records that probably resulted from unusual wanderings of animals into the region; O = Occasional – relatively few observations throughout the year, but some species may be more frequently observed in some locations or during certain times (e.g., during migration); UC = Uncommon – infrequently observed throughout the year, but some species may be more common in some locations or during certain times of the year (e.g., during migration or when on summer calving grounds or wintering grounds).

Non ESA-Listed Marine Mammals

Most of the marine mammals, by species and population density, that occur in the WEAs are not listed as threatened or endangered under the Endangered Species Act (ESA). These species are, however, offered special protections under the MMPA. The Programmatic EIS provides a good overview of the known occurrence of these marine, their distribution, and life histories. There have also been a few recent studies and literature synthesis specifically aimed at offshore areas that include the Mid-Atlantic WEAs and the areas around these WEAs that could be affected by the proposed action. These studies include New Jersey's *Ocean/Wind Power Ecological Baseline Studies Final Report: January 2008 – December 2009* (NJDEP, 2010a) and the Nature Conservancy's comprehensive Northwest Atlantic Marine Ecoregional Assessment (NAM ERA) report (TNC, 2011). Information from these sources is incorporated into this document. The NAM ERA data for marine mammal sightings is included as Appendix B. The information from the New Jersey baseline study, whose Study Area encompassed approximately 97% of the New Jersey WEA, is a good representation of species presence and distribution within the other Mid-Atlantic WEAs, unless otherwise noted.

Bottlenose Dolphin

The most common marine mammal in the Mid-Atlantic WEAs is the bottlenose dolphin (*Tursiops truncates*). The western north Atlantic bottlenose dolphin is divided into two morphotypes – coastal and migratory. The coastal morphotype is subdivided into 7 stocks based largely upon spatial distribution. Generally, the offshore migratory morphotype is found exclusively seaward of 34 km (21 miles) and in waters deeper than 34 m. Within 7.5 km (4.5 miles) of shore, all animals are of the coastal morphotype (USDOC, NOAA, NMFS, Office of Protected Resources, 2011). Thus, both morphotypes are likely to be found in different portions of the Mid-Atlantic WEAs.

The New Jersey Baseline Study did not differentiate between the different stocks in their survey. The New Jersey Baseline Study found that: "bottlenose dolphins may occur in the Study Area during any time of year. Bottlenose dolphins were the most frequently sighted species during the study period. A total of 319 bottlenose dolphin sightings were recorded; the majority of sightings (257) were on-effort. Although large groups of bottlenose dolphins were occasionally sighted (maximum group size=112), the mean group size of 15.3 animals is consistent with the typical group size of coastal bottlenose dolphins (Shane et al., 1986; Kerr et al., 2005). The presence of calves was confirmed in 24% of all sightings. The mean (16.6 m (54.5 ft)) and minimum water depth (1 m [3 ft]) for bottlenose dolphins were the most shallow of all identified cetacean species sighted during the survey and are indicative of bottlenose dolphins' primarily coastal distribution within New Jersey waters (see Toth et al., 2007; in press); however, a bottlenose dolphin sighting represents the deepest water depth at which a cetacean sighting was recorded during this study (34 m 112" ft), suggesting that their distribution within the Study Area is not limited to a particular depth or depth range. Bottlenose dolphin sightings ranged from 0.4 to 37.7 km (0.2 to 20.4 nm) from shore (mean=11.3 km/6.1 nm) which further supports this species' nearshore distribution in the Study Area but is also indicative of occurrence farther offshore in the Study Area. Sea surface temperatures (SSTs) for bottlenose dolphins ranged from 4.8 to 20.3°C (40.6 to 68.5°F) with a mean of 16.3°C (61.3°F). The mean and maximum SST values represent the highest temperatures for all cetacean sightings; this supports the strong seasonality associated with bottlenose dolphin occurrence in the Study Area."

Therefore, while the general assumption has been that bottlenose dolphins are limited to certain ranges by depth offshore, the New Jersey Baseline study found that these animals could be ubiquitous throughout the area that could be potentially affected by the proposed action. As a result, this EA assumes that both types of dolphin could occur in the area of potential effect for all four WEAs.

Minke Whale

Although minke whales are more common to the continental shelf of New England they have been sighted offshore of New Jersey (USDOC, NOAA, NMFS, Office of Protected Resources, 2011; NJDEP, 2010a). Occurrence in the area of the other WEAs is rare or has not been well documented. The New Jersey Baseline study found that minke whales are most likely to occur during winter, but that this species may occur year-round. Four sightings of minke whales were recorded during the survey period; two of which were on-effort and two were off-effort. All sightings were of single individuals. Sightings of minke whales occurred during the winter and spring in water depths ranging from 11 to 24 m (36 to 79 ft) with a mean depth of 18 m (59 ft). SSTs associated with the minke whale sightings ranged from 5.4 to 11.5°C (41.7 to 52.7°F) with a mean of 8.3°C (47.0°F). The winter sightings were recorded in February northeast of Barnegat Light offshore New Jersey. The two spring sightings were recorded in June southeast of Sea Isle City and northeast of Wildwood. Minke whales were sighted within 6.7 and 18.5 km (3.6 and 10.0 nm) from shore with a mean distance of 13.1 km (7.1 nm). As a result, the minke whale would occur in the nearshore areas of the New Jersey WEA and the areas that may be transited by vessels associated with the proposed action within the New Jersey WEA. These whales would likely occur more frequently in the in the winter than in the summer.

Short-Beaked Common Dolphin

In the Mid-Atlantic short-beaked common dolphins generally occur over the continental shelf along the 200-2000-m isobaths and over prominent underwater topography (USDOC, NOAA, NMFS, Office of Protected Resources, 2011). This general description would place them well east of the Mid-Atlantic WEAs as they are all generally inside of the 40m isobath. However, the New Jersey Baseline Study found short-beaked common dolphins actually occur within the area of the New Jersey WEA and between the WEA and the coast. Although occurrence is more likely during the fall and winter (November through March), they may occur at any time of year. A total of 32 short-beaked common dolphin sightings were recorded during the survey period; 23 were on-effort and nine were off-effort. Total group size varied greatly with a minimum group size of one animal and a maximum of 65 animals recorded. The mean group size was 12.8 animals.

Water depth for short-beaked common dolphin sightings ranged from 10 to 31 m (33 to 102 ft). The mean water depth for sightings was 23.2 m (76.1 ft), which is the deepest mean depth for all identified cetacean sightings recorded during the survey period. This may indicate a preference for deeper waters or may be a construct of the fact that the distribution of sightings of short-beaked common dolphins during the study period was relatively far from shore. The mean distance from shore was 23.5 km (12.7 nm) although sightings ranged from 3.0 to 37.5 km (1.6 to 20.2 nm) from shore. SSTs associated with short-beaked common dolphin sightings ranged from 4.7 to 12.4°C (40.5 to 54.3°F) with a mean of 7.1°C (44.8°F). The low mean SST associated with these sightings indicates that the occurrence of these animals in the area of potential effect would be more likely in winter. In fact, short-beaked common dolphins were only sighted in fall and winter (late November through mid-March).

Therefore, while the general assumption has been that these short-beaked common dolphins are limited to certain ranges by depth offshore, the New Jersey Baseline study found that these animals could be present in the New Jersey WEA. It is well known that these dolphins have a range that includes the waters offshore all of the Mid-Atlantic States. As a result, this EA assumes that these dolphins could occur in all four of the WEAs. This EA also assumes that the occurrence of these animals would be more likely in the winter.

Harbor Porpoise

Harbor porpoise may be found in the Mid-Atlantic primarily in the fall and winter in waters around the 92m isobath (USDOC, NOAA, NMFS, Office of Protected Resources, 2011). As with short-beaked common dolphin this general distribution would place them east of the Mid-Atlantic WEAs. However, as was the case for short-beaked common dolphin, the New Jersey Baseline Study found that harbor porpoises occur in the nearshore waters of New Jersey, primarily during the winter (January to March). However, they may also occur during other times of the year. Harbor porpoises were the second most frequently sighted cetacean during the survey period. A total of 51 harbor porpoise sightings were recorded; 42 of these were on-effort and nine were off-effort (Figure 5-10). Total group size for the harbor porpoise was small, ranging from one to four individuals per sighting (mean group size=1.7). Sightings were recorded throughout the Study Area and ranged from 1.5 to 36.6 km (0.8 to 19.8 nm) from shore (mean=19.5 km/10.5 nm). Water depth of sightings ranged from 12 to 30 m (39 to 98 ft) with a mean value of 21.5 m (70.5 ft). SSTs for harbor porpoise ranged from 4.5 to 18.7°C (40.1 to 65.7°F) with a mean of 5.8°C (42.4°F), which is the lowest mean value for all identified cetacean species. The very low mean SST associated with these sightings indicates that their presence in the affected environment is most likely during winter, and over 90% of harbor porpoise sightings during the study period were recorded during winter (mainly February and March). Only three sightings occurred during spring (April and May), and one sighting was recorded during summer (July). The NAM ERA sightings data (TNC 2010) also indicated harbor porpoise may be found inshore of the Virginia WEA in the winter which supports their occurrence during the winter throughout the Mid-Atlantic WEAs and in the waters in between the WEAs and shore.

Harbor Seal

The harbor seal may be found in all nearshore waters of the Atlantic Ocean above about 30°N (approximately Jacksonville, Florida). However, along the U.S. coast they are a seasonal (September – May) inhabitant from southern New England to New Jersey, with occasional sightings into the Carolinas (USDOC, NOAA, NMFS, Office of Protected Resources, 2011). Thus only the New Jersey WEA and the waters between the New Jersey WEA and shore will likely have common occurrences of this marine mammal. The New Jersey Baseline Study concluded that harbor seals may occur offshore New Jersey during any time of the year. However, only a single sighting of an individual harbor seal was recorded during the survey period. This seal was observed in shallow waters (18 m (59 ft)) 9.9 km (5.3 nm) east of Little Egg Inlet in June 2008. The SST associated with this sighting was 11.4°C (52.5°F). The New Jersey Baseline Study indicated that two unidentified pinnipeds recorded near Ocean City, New Jersey in April 2008 were “probably harbor seals,” but this could not be confirmed. There were additional unidentified pinnipeds seen during the surveys but no supposition was made regarding their probable identification.

ESA-Listed Threatened and Endangered Marine Mammals

There are six cetaceans that occur in the Mid-Atlantic that are federally-listed as endangered (Table 4.3). The six whales species are the North Atlantic right whale, fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), and blue whale (*Balaenoptera musculus*). However, of these six species, only three – right, humpback, and fin whales – are likely to occur in and around the Mid-Atlantic WEAs. Right and humpback whales are most likely to occur in and around the WEAs between November and April and fin whales are most likely to occur in the WEAs between October and January. However, acoustic monitoring data indicates that individuals may occur in the WEAs throughout the year (NJDEP, 2010a). Although sperm and sei whales occur in the Mid-Atlantic, sightings data indicate that these species are limited to areas further offshore east of the Mid-Atlantic WEAs.

Manatees are federally listed as endangered. Individual sightings of manatees have occurred in Mid-Atlantic region in the summer months, but a regular migration/occurrence has not been established and any potential encounters with manatees would be highly unlikely.

There is no critical habitat formally identified for marine mammals in and around the Mid-Atlantic WEAs.

New Jersey study (NJDEP, 2010a) that found the following for right, humpback and fin whales (the only ESA-listed marine mammals observed in the Study Area) during shipboard and aerial surveys and passive acoustic monitoring (PAM data was not available for humpback whales). Similar occurrences for these species may expected for the Mid-Atlantic WEAs south of New Jersey as they align with a general migration corridor.

<u>Right Whales</u>

Observed

Right whales were seen as single animals or in pairs (mean group size=1.5). Sightings occurred in water depths ranging from 17 to 26 m (56 to 85 ft) with a mean value of 22.5 m (73.8 ft). Distances from shore ranged from 19.9 to 31.9 km (10.7 to 17.2 nm) with a mean of 23.7 km (12.8 nm). Right whales were seen in winter, spring, and fall in waters with SST ranging from 5.5 to 12.2 degrees Celsius (°C); 41.9 to 54.0 degrees Fahrenheit (°F); mean 10.0°C (50.0°F)). Three sightings were recorded during November, December, and January when right whales are known to be on the breeding/calving grounds farther south (Winn et al., 1986) or in the Gulf of Maine (Cole et al., 2009). The November 2008 sighting just south of the Study Area boundary was of an adult female who must have been migrating through the Study Area on her way to the calving grounds because she was sighted in mid-December 2008 off the coast of Florida (Zani, M., New England Aquarium, pers.comm., 14 January 2009). The sighting recorded in December 2009 near the southern boundary of the Study Area (water depth of 25 m/82 ft) was also of a female that was later sighted off the coast of Georgia in early January 2010 (Zani, M., New England Aquarium, pers. comm., 11 January 2010). Initially, two sightings of right whales were recorded close together in both time and space. Subsequent photo-identification analyses indicate that these sightings were of the same individual North Atlantic right whale. Therefore, the first sighting of this individual is considered the original sighting, and the second sighting is considered a re-sight of the individual. The January 2009 sighting was of two adult males; these whales were sighted offshore of Barnegat Light in the northernmost portion of the Study Area. The whales exhibited feeding behavior (i.e., surface skimming with mouths open) in 26 m (85 ft) of water; however, actual feeding could not be confirmed. During May 2008, a cow-calf pair was recorded in waters near the 17 m (56 ft) isobath southeast of Atlantic City. The pair was sighted in the southeast U.S. in January and February prior to the May sighting, and they were sighted in the Bay of Fundy in August (Zani, M., New England Aquarium, pers. comm., 6 January 2010).

Passive Acoustic Monitoring
Analysis of recordings captured in the Study Area during the baseline study period demonstrated North Atlantic right whale occurrence throughout the year, with a peak number of detection days in March through June (46 days in 2008, 10 in 2009 although June was not represented in 2009). North Atlantic right whales were also detected sporadically in the eastern and northern areas of the Study Area during the summer through the fall in 2008 (two days detected during July, five in August, five in September, one in October, six in November, and one in December) and in 2009 (three in August, six in September, four in October, and one in November). Nine days of detection (mid-January to mid-March 2009) resulted from the December 2008 PAM deployment even though only two of the five deployed pop-ups were recovered. During these winter months, the North Atlantic right whale calls were detected on the pop-up located 21.4 km (12 nm) from shore at a depth of 24 m (79 ft). Winter represents the time of year when North Atlantic right whale mothers and calves are found off the southeast U.S. coast (mainly off northern Florida and southern Georgia; Hamilton and Mayo, 1990; Hain et al., 1992; Knowlton et al., 1992), but it is unknown where the majority of North Atlantic right whale males and females without calves spend their time during this season. Very little data are represented from the migratory corridor (i.e., the eastern U.S. coast from New Jersey to Virginia) between the southern calving grounds and the northern feeding grounds for comparison (Mead, 1986; Knowlton et al., 1992; McLellan et al., 2002); however, these winter detection days are inconsistent with current distribution data.

<u>Humpback Whales</u>
Humpback whales are known to occur regularly throughout the year in the Mid-Atlantic and may occur in the Study Area year-round. Seventeen sightings of humpback whales were recorded during the study period; seven of these were off-effort and 10 were on-effort. Humpback whales were sighted during all seasons; the majority of sightings (nine) were recorded during winter. Humpback whales were sighted as single animals or in pairs (mean group size=1.2). Distance from shore ranged from 4.8 to 33.2 km (2.6 to 18.0 nm; mean=18.4 km/9.9 nm). In mid-September 2008, a mixed species aggregation of a fin and humpback whale was recorded south of Atlantic City. The humpback whale was observed lunge feeding in the vicinity of the fin whale; the water depth of this sighting was 15 m (49 ft). Humpback whale sightings occurred at water depths ranging from 12 to 29 m (39 to 95 ft) with a mean depth of 20.5 m (67.3 ft). This species was sighted in waters with SST ranging from 4.7°C to 19.5°C (40.5 to 67.1°F; mean 10.1°C [50.2°F]).

Fin Whales

Observed

Fin whales were the most frequently sighted large whale species during the survey period. There were a total of 37 fin whale sightings; the majority of these (27) were recorded on effort. Fin whale group size ranged from one to four animals (mean group size=1.5). Water depth for fin whale sightings ranged from 12 to 29 m (39 to 95 ft) with a mean depth of 21.5 m (70.5 ft). SSTs for these sightings ranged from 4.2 to 19.7°C (39.6 to 67.5°F) with a mean temperature of 9.6°C (49.3°F). Fin whales were sighted between 3.1 and 33.9 km (1.7 and 18.3 nm) from shore with a mean distance of 20.0 km (10.8 nm).

Fin whales were sighted during all seasons. Twenty-six sightings were recorded throughout the Study Area during the 2008 surveys. Most of these sightings were recorded during the winter and summer. One mixed-species aggregation of a fin and humpback whale was observed in September. While the humpback whale was lunge feeding, the fin whale surfaced multi-directionally but did not appear to be feeding. One calf was observed with an adult fin whale in August 2008. During the 2009 surveys, fin whales were again the most frequently sighted baleen whale species and were seen in every season except summer for a total of 11 sightings.

Passive Acoustic Monitoring

The fin whale was the most common marine mammal species detected acoustically during PAM of the Study Area. Fin whale pulses were primarily documented in the northern and eastern range of the Study Area where the shelf waters were deeper (>25 m [82 ft]) and distance from shore was greater than 25 km (13 nm). The consistent presence of fin whale pulses indicates that this species, or at least members of this species, can be regularly found along the New Jersey outer continental shelf. Fin whale pulses and downsweeps were documented in every month of acoustic monitoring. The 20-hertz (Hz) infrasonic pulses have duration of ~1 s (Thomson and Richardson, 1995; Charif et al., 2002). Automatic detection software facilitated an examination of all hard drives of data. Fin whales were detected on 47 days from March to May 2008, 62 days from June to September 2008, 31 days from October to December 2008, 57 days from January to March 2009, 16 days in April and May 2009, and 68 days from August to October 2009.

Sightings data for marine mammals has been compiled by the Nature Conservancy for their comprehensive Northwest Atlantic Marine Ecoregional Assessment (NAM ERA). The Nature Conservancy submitted to BOEMRE spatial data of sightings for marine mammals as part of their comments on BOEMRE's NOI to prepare this EA (76 FR 7226 (Feb. 9, 2011)). Relevant sightings data is included in Appendix B. The underlying data sources for these maps are the U.S. Navy's Marine Resource Assessment, which in turn, utilized NMFS survey data. The NAM ERA study does note limitations on the data, particularly with regard to the disparity in spatial scales between the data and the WEAs. However, the overall picture presented in the NAM ERA study is consistent with the predominantly winter (January – March) sightings for humpback and right whales (TNC, 2011).

4.1.2.3.2 Impact Analysis of the Proposed Action

Chapter 5.2.8.2 of the Programmatic EIS discusses the impacts of site characterization and assessment activities on marine mammals. Activities associated with site characterization and assessment that may affect marine mammals include: (1) G&G surveys; (2) construction and/or installation of one or more meteorological observation platforms (i.e., towers and buoys); (3) vessel traffic; (4) discharges of waste materials and accidental fuel releases; and (5) meteorological observation platform decommissioning. The potential effects to marine mammals from these activities can be grouped into the following categories: (1) acoustic effects; (2) benthic habitat effects; (3) vessel collision effects; and (4) other effects (e.g., contact with waterborne pollution). It should be noted that all activities described below are subject to the evaluation under the MMPA. Lessees would need to to consult with NMFS to ensure necessary authorizations (such as IHAs) are obtained prior to beginning survey or meteorological facility construction activities.

Acoustic Effects

This section on acoustic effects summarizes what is known about noise sensitivity in marine mammals and the noise that could be produced as a result of site characterization and assessment activity in the Mid-Atlantic WEAs.

Current Understanding of Noise Sensitivity in Marine Mammals

This section is derived in large part from previous ESA consultations and biological opinions issued by NMFS for BOEMRE Atlantic wind energy projects.

Marine organisms rely on sound to communicate with co-specifics and derive information about their environment. There is growing concern about the effect of increasing ocean noise levels due to anthropogenic sources, particularly vessel traffic on marine mammals. Effects of noise exposure on marine organisms can be characterized by the following range of physical and behavioral responses (Richardson et al., 1995):

1. Behavioral reactions – Range from brief startle responses, to changes or interruptions in feeding, diving, or respiratory patterns, to cessation of vocalizations, to temporary or permanent displacement from habitat.
2. Masking – Reduction in ability to detect communication or other relevant sound signals due to elevated levels of background noise.
3. Temporary threshold shift (TTS) – Temporary, fully recoverable reduction in hearing sensitivity caused by exposure to sound.
4. Permanent threshold shift (PTS) – Permanent, irreversible reduction in hearing sensitivity due to damage or injury to ear structures caused by prolonged exposure to sound or temporary exposure to very intense sound.
5. Non-auditory physiological effects – Effects of sound exposure on tissues in non-auditory systems either through direct exposure or as a consequence of changes in behavior, e.g., resonance of respiratory cavities or growth of gas bubbles in body fluids.

Current thresholds established by NMFS for determining impacts to marine mammals typically center around root-mean-square (RMS) received levels of 180 dB re 1μPa for potential injury, 160 dB re 1μPa for behavioral disturbance/harassment from a non-continuous noise source, and 120 dB re 1μPa for behavioral disturbance/harassment from a continuous noise source. These thresholds are based on a limited number of experimental studies on captive odontocetes, a limited number of controlled field studies on wild marine mammals, observations of marine mammal behavior in the wild, and inferences from studies of hearing in terrestrial mammals. In addition, marine mammal responses to sound can be highly variable, depending on the individual hearing sensitivity of the animal, the behavioral or motivational state at the time of exposure, past exposure to the noise which may have caused habituation or sensitization, demographic factors, habitat characteristics, environmental factors that affect sound transmission, and non-acoustic characteristics of the sound source, such as whether it is stationary or moving (NRC 2003). Nonetheless, the threshold levels referred to above are considered conservative based on the best available scientific information at this time.

Marine Mammal Hearing

Thus, this section addresses the current understanding of marine mammal hearing adopted from Southall et al., 2007 (Table 4.4). In order for activities to adversely affect marine mammals through noise, the animals must be able to perceive the noises produced by the activities. If a species cannot hear a sound, or hears it poorly, then the sound is unlikely to have a significant effect (Ketten, 1998).

Table 4.4

Functional Marine Mammal Hearing Groups, Auditory Bandwidth, and Genera Represented from Each Group

Functional Hearing Group	Estimated Auditory Bandwidth	Genera Represented (number species/subspecies)
Low-frequency cetaceans	7 Hz to 22 kHz	*Balaena, Caperea, Eschrichtius, Megaptera, Balaenoptera* (13 species/subspecies)
Mid-frequency cetaceans	150 Hz to 160 kHz	*Steno, Sousa, Sotalia, Tursiops, Stenella, Delphinus, Lagenodelphis, Lagenorhynchus, Lissodelphis, Grampus, Peponocephala, Feresa, Pseudorca, Orcinus, Globicephala, Orcaella, Physeter, Delphinapterus, Monodon, Ziphius, Berardius,Tasmacetus, Hyperoodon, Mesoplodon* (57 species/subspecies)
High-frequency cetaceans	200 Hz to 180 kHz	*Phocoena, Neophocaena, Phocoenoides, Platanista, Inia, Kogia, Lipotes, Pontoporia, Cephalorhynchus* (20 species/subspecies)
Pinnipeds in water	75 Hz to 75 kHz	*Arctocephalus, Callorhinus, Zalophus, Eumetopias, Neophoca, Phocarctos, Otaria, Erignathus, Phoca, Pusa, Halichoerus, Histriophoca, Pagophilus, Cystophora, Monachus, Mirounga, Leptonychotes, Ommatophoca, Lobodon, Hydrurga, and Odobenus* (41 species/subspecies)
Pinnipeds in air	75 Hz to 30 kHz	Same species as pinnipeds in water (41 species/subspecies)

Source: Southall et al., 2007.

From what is known of marine mammal hearing and the source levels and the volume and frequencies of the meteorological tower construction noise sources (see Section 4.3.5.2), it is evident that, if present in the area where the underwater noise occurs, marine mammals are capable of perceiving construction related noises, and have hearing ranges that are likely to have peak sensitivities that overlap the frequencies of pile driving and vessel sound.

High Resolution Geologic Survey Acoustic Effects

HRG surveys would be employed to characterize ocean-bottom topography and subsurface geology. The HRG survey would also investigate potential benthic biological communities (or habitats) and archaeological resources. Specifically, high resolution site surveys would be used to characterize the potential site of the meteorological tower and to gather the information necessary to submit a COP in the future. HRG surveys associated with the proposed action involve shallow penetration of the seafloor. Therefore, renewable energy-related HRG surveys involve far less energy (and therefore, far less sound introduced into the environment) than do oil and gas-related surveys.

Section 3.1.1.1 details a reasonably foreseeable scenario for HRG surveys. The survey would likely consist of a vessel towing an acoustic source (boomer and/or chirper) about 25m behind the ship and a 600-m streamer cable with a tail buoy. The total Mid-Atlantic WEA survey area includes the entire footprint of the WEAs. Total HRG survey time is conservatively estimated at 13,300 hours for all the Mid-Atlantic WEAs (which would involve 59,800 nm of surveys). The complete state-by-state breakdown of reasonably foreseeable HRG survey activities is presented in Section 3.1.1.1.

The sound levels at the source (i.e., the boomer, chirper survey vessel) would depend on the type of equipment used for the survey. An example of the type of equipment to be used is in Table 3.2. Acoustic energy generated by these survey instruments is directed downward and may be fanned at the seafloor and not directed horizontally. The surveys would likely use the full daylight hours available, approximately 10 hours per day. However, the time that any particular area would experience elevated sound levels would be significantly shorter as the vessel would be ensonifying a limited area along each transect.

The sub-bottom profilers generate sound within the hearing thresholds of most marine mammals that may occur in the action area. As noted in Table 3.2, the chirp has a sound source level of 201 dB re 1μPa rms with a typical pulse length of 32 milliseconds and a pulse repetition rate of 4 per second. A typical boomer has a sound source level of around 205 dB re 1μPa rms with a pulse duration of 150-200 microseconds and a pulse repetition rate of 3 per second. However, actual specifications may vary by manufacturer and the environment where it is to be deployed.

An acoustic evaluation conducted by Cape Wind Associates for its project on Horseshoe Shoal offshore Massachusetts indicated that HRG survey noise dissipated to 180 dB at 16 m from the source for the chirper and 27 m for the boomer. Underwater sound levels dissipated to 160 dB at 227 m from the source for the chirper, and at 386 m from the source for the boomer. However, it should be noted that this information serves as a guide and that different equipment may produce different results in different sub-marine environments. For the purposes of this EA, these zones of ensonification for acoustic harassment have been rounded up to 30m and 400m for the boomer at 160dB and 180dB respectively.

Effects on marine mammal behavior are generally expected to be limited due to avoidance of the immediate area around the HRG survey activities and short-term changes in behavior, falling within the MMPA definition of "Level B harassment." Cetaceans are highly mobile and likely to quickly leave an area when disturbing noise levels are present. The only pinnipeds, harbor seals, are not likely to occur in the area of the survey as the only sighting in the NJ Baseline Study was well inshore of the current NJ WEA. While an HRG survey may disturb more than one individual, the surveys occurring across the WEAs at various times and locations over the course of 5-6 years and the localized and temporary nature of the sound emitted are not expected to result in any population-level effects. Individuals disturbed by HRG survey noise would likely return to normal behavioral patterns after the survey has ceased, after the survey vessel has moved out of the animal's immediate vicinity, or after the animal has left the immediate survey area. Once an area has been surveyed, it is unlikely that it would be surveyed again. As a result, BOEMRE does not anticipate that any area would be precluded from use by these animals for longer than it takes for the vessel to traverse that area.

Moreover, there is wide distribution of cetaceans in the proposed Mid-Atlantic WEAs. Although cetaceans may be present in a WEA during an HRG survey, the likely maximum ranges of the 180 dB and 160 dB isopleths, (estimated at maximum of 30 m and 400 m, respectively) make it unlikely that any cetaceans would be exposed to injurious or disturbing sound levels associated with the survey.

Because of the mobility of the sound source during HRG surveys, and the likelihood that marine mammals would leave the immediate vicinity of the surveys, few individuals may be expected, in most cases, to be present within the survey areas. Thus, potential population-level impacts on marine mammals from HRG surveys are expected to be negligible. It should be noted that mitigation measures – marine mammal exclusion zones monitored by trained observers - are proposed and likely to be required by NMFS through the ESA Section 7 consultation for this action that would further reduce the possibility that any marine mammal would experience a harassing level of sound. In addition, the lessee's surveys would likely require an Incidental Harassment Authorization from NMFS, which would very likely require similar mitigation measures be implemented.

Sub-bottom Reconnaissance Acoustic Effects

The majority of sub-bottom sampling work would be accomplished via CPTs, and to a more limited extent vibracores, which does not require deep borehole drilling. However, some geologic conditions may prevent sufficient data being acquired from vibracores and CPTs and would instead necessitate obtaining a geologic profile via a borehole. Acoustic impacts from borehole drilling are expected to be below the 120 dB threshold established by NMFS for marine mammal harassment from a continuous noise source. Previous estimates submitted to BOEMRE for geotechnical drilling have source sound levels not exceeding 145dB at a frequency of 120Hz (USDOC, NOAA, NMFS, 2009). Previous submissions to BOEMRE also indicated that boring sound should attenuate to below 120 dB by the 150m isopleth. The total drilling time would be dependent upon the target depth and substrate that would be drilled

Since drilling is considered by NMFS to be a continuous noise source, the level of noise considered harassment under the MMPA is 120 dB. It is generally expected that the activity of setting up drilling equipment would deter marine mammals from entering the immediate work area. There would be nothing that would prevent animals from leaving or avoiding areas where drilling would take place. Other sub-bottom reconnaissance activity, such as the use of a CPT, is expected to only have minor acoustic impacts, primarily from vessel engines.

It is anticipated that sub-bottom reconnaissance work as a whole would have temporary effects lasting the duration of the work. These temporary effects include the displacement of marine fauna within the immediate vicinity of the work and some localized sedimentation of flora and sessile invertebrates. The acoustic impacts with this work are minor and ensonify only a small area.

Meteorological Tower Pile-Driving Noise

The type and intensity of the sounds produced by pile driving depend on a variety of factors, including the type and size of the pile, the firmness of the substrate into which the pile is driven, the depth of the water, and the type and size of the impact hammer being used. Thus, the actual sounds produced would vary from area to area. Regardless, this section attempts to capture the range of acoustic impacts from pile driving.

Pile driving is expected to generate sound levels in excess of 200 dB and have a relatively broad band of 20 Hz to >20 kHz (Madsen et al., 2006; Thomsen et al., 2006). Sound attenuation modeling done during construction at Utgrunden Wind Park in the Baltic Sea in 2000 and adopted as the model for the Cape Wind Energy Project (Report 4.1.2-1 (Noise Report)) of the FEIS) indicates that underwater noise levels may be greater than 160 dB re 1 uPa (i.e., NMFS threshold for behavioral disturbance/harassment from a non-continuous noise source) within approximately 3.4 km of the pile being driven. At distances greater than 3.4km from the pile being driven, noise levels will have dissipated to below 160 dB re 1 uPa. It should be noted that these measurements are for a 1.7 MW turbine mounted upon a monopile of approximately 5m in diameter and not for a meteorological tower. Generally, the larger the diameter of the monopole the greater the noise produced from pile driving (Nedwell, 2007). Actual measured underwater sound levels during the construction of the Cape Wind meteorological tower in 2003 were 145-167 dB at 500m with peak energy at around 500Hz.

Alternatively, modeling conducted by Bluewater Wind, LLC for proposed meteorological tower sites in New Jersey and Delaware under Interim Policy leases places the 160 dB isopleth at 7,230 m for Delaware and 6,600 m (USDOC, NOAA, NMFS, 2010a). This model has not been field-verified. Generally, it is anticipated that actual pile driving time would last 3-8 hours per pile driven within the Mid-Atlantic WEAs. The information from Cape Wind Associates and Bluewater Wind represent a good range of the area of ensonification at the 180 dB and 160 dB levels. This is detailed in Table 4.5 below.

Table 4.5

Modeled Areas of Ensonification from Pile Driving

Project (modeled)	Additional Info	180 dB re 1µPa (rms)	160 dB re 1µPa (rms)
Bluewater Wind (Interim Policy Lease offshore Delaware)	3.05m diameter monopole; 900kJ hammer	760m	7,230m
Bluewater Wind (Interim Policy Lease offshore New Jersey)	3.05m diameter monopole; 900kJ hammer	1,000m	6,600m
Cape Wind Energy Project (Lease in Nantucket Sound)	5.05m monopole; 1,200kJ hammer	500m	3,400m

Behavioral disturbance/harassment of marine mammals may occur when individuals are exposed to pulsed noise levels (i.e., non-continuous noise sources such as those generated by an impact pile driver that would be used for pile installation) greater than 160 dB re 1 µPa. In order to minimize the potential effects of pile driving on listed species, BOEMRE has proposed several mitigation measures (Appendix C) that were developed through past ESA Section 7 consultations with NMFS for similar actions in the Atlantic. These mitigation measures are likely to be required by NMFS as part of their biological opinion being prepared for this action and under any IHA permit it issues to a lessee.

During meteorological tower construction, marine mammals in the vicinity of the construction site may be temporarily disturbed (3-8 hours over 3 days) by noise generated during pile driving. Such noise could disturb normal behaviors (e.g., feeding, social interactions), mask calls from co specifics, disrupt echolocation capabilities, and mask sounds generated by predators. Behavioral effects may be incurred at ranges of many miles, and hearing impairment may occur at close range (Madsen et al., 2006). Behavioral reactions may include avoidance of, or flight from, the sound source and its immediate surroundings, disruption of feeding behavior, interruption of vocal activity, and modification of vocal patterns (Watkins and Scheville, 1975; Malme et al., 1984; Bowles et al., 1994; Mate et al., 1994). Depending on the frequency of the noise generated during construction of the meteorological towers, impacts to marine mammals may also include temporary hearing loss or auditory masking (Madsen et al., 2006). The biological importance of hearing loss or behavioral responses to construction noise (e.g., effects on energetics, survival, reproduction, population status) is unknown, and there is little information regarding short-term or long-term effects of behavioral reactions on marine mammal populations.

While sound generated during construction of a meteorological tower may affect more than one individual, population-level effects are not anticipated. Some species are expected to quickly leave the area with the arrival of construction vessels, before pile-driving activities are begun, while individuals remaining in the area may flee with the initiation of pile driving, thereby greatly reducing their exposure to maximal sound levels and, to a lesser extent, masking frequencies. Individuals disturbed by or experiencing masking due to construction noise would likely return to normal behavioral patterns after the construction had ceased (pile driving for each meteorological tower installation is anticipated to be completed within a 3-day period), or after the animal has left the survey area.

Injury of marine species that could be caused by the pile driving noise are expected only in the immediate vicinity of the pile driving activity at distances on the order of 100 m, and behavioral effects at ranges of the order of 20 km or more (Bailey et al., 2010). However, construction of a meteorological tower would be of relatively short duration and limited to a maximum of 10 dispersed locations throughout the Mid-Atlantic WEAs (see meteorological tower/buoy action scenario in Section 3.1.2). Additionally, each of these 12 structures could be constructed at any time within an approximately 5 and one-half year period. Because marine mammals would be expected to leave the immediate vicinity of the tower during its construction, the total area of effect would be so minor in relation to environment in which these animals live, and the timing of construction would be spatially and temporally so dispersed, impacts to marine mammals in general would be of limited duration and intensity.

In the unlikely event that a whale is present within the area of potential effect when the meteorological towers are being installed, it is proposed that no pile driving would occur if any marine mammal is within 7 km of the pile (see Appendix C for detail). As exposure to harassing levels of sound (i.e., 160dB re 1uPa) is likely to only occur within 7 km of the pile being driven, and no pile driving would occur if a whale were within 7 km of the pile, no whales would be exposed to sound levels greater than 160 dB and no whales would be exposed to sound levels at which injury could occur (i.e., 160dB re 1μPa). It is not anticipated that these activities, due to their low number, intensity, dispersed location, and timing over a five and one-half year period, would either individually or cumulatively seriously harm or kill any of these animals. In any case, it is anticipated that such an exclusion zone would be imposed by NMFS in an IHA issued to a lessee.

Vessel Traffic Noise

Marine mammals may also be affected by the noise generated by surface vessels traveling to and from the WEAs. The dominant source of noise from vessels is from the propeller cavitation, and the intensity of this noise is largely related to ship size and speed. Vessel noise from vessels associated with the proposed action would generally produce low levels of noise, anticipated to be in the range of 150 to 170 dB re 1 μPa-m, at frequencies below 1,000 Hz, and would dissipate quickly with distance from the source. Exposure of marine mammals to individual construction or survey vessels would be transient, and the noise intensity would vary depending upon the source and specific location. Reactions of marine mammals may include apparent indifference, cessation of vocalizations or feeding activity, and evasive behavior (e.g., turns, diving) to avoid approaching vessels (Richardson et al., 1995; Nowacek and Wells, 2001). Behavior would likely return to normal following passage of the vessel, and it is unlikely that such short-term effects would result in long-term population-level impacts for marine mammals. Thus, impacts from vessel noise would be negligible if detectible, and short-term.

It should be noted that the areas that could be affected by the proposed action and alternatives are some of the most heavily-trafficked waters in the world and is also host to an active and large fishing industry (see Section 4.1.3 regarding for discussion of other ocean use). While vessel traffic associated with the proposed action may have some impact on marine mammals, that impact would be exceedingly minor compared to the impacts associated with current status-quo vessel activities in the area of potential effect.

Benthic Habitat Effects

Section 4.1.2.2 of this document discusses the benthic resources and the reasonably foreseeable impacts of the proposed action upon those resources. This section only discusses those impacts in relation to marine mammals. Benthic effects from the proposed action that would impact marine mammals are anticipated to be negligible due to limited utilization of the benthic environment by marine mammals and the limited impact to the benthos itself. It is expected that some benthic forage items for marine mammals may become unavailable during certain activities associated with the proposed action, as described below.

Sub-bottom Sampling

The sub-bottom sampling would result in small areas of the seafloor being disturbed for no more than a few days (see Section 4.1.2.2 for a full discussion of the benthic resources and impacts from the proposed action). This activity could conceivably impact marine mammals by removing a small amount of forage items that would otherwise be available to these species. However, due to the small footprint of disturbance, the temporary nature of the action, and likely availability of similar benthic habitat all around the sampling location, it is expected that the proposed action would have negligible benthic effects that could impact marine mammals.

Meteorological Tower/Buoy Installation

It is expected that re-suspension of bottom sediment and the ensuing sedimentation that would occur around a recently-installed installed tower or buoy would have only minor temporary effects that could impact the habitat and food availability for marine mammals for the same reasons as stated above.

Meteorological Tower/Buoy Operation

The installation of a single meteorological tower (total of 12) or buoy (total of 24) within a lease block (total of 12) is not expected to result in any changes in local community assemblage and diversity or the availability of habitat and forage items for marine mammals that could occur in and around the WEAs.

Collision Effects

This section addresses potential for impacts resulting from the collision of marine mammals with structures and vessels associated with the proposed action. A collision with marine life, such as a whale, could result in injury to the animal and/or damage to the facility or vessel. In the case of fixed platforms, BOEMRE anticipates that marine life would simply avoid colliding with the structures.

Vessels associated with site characterization surveys, or construction, maintenance or decommissioning of the meteorological tower could collide with marine mammals, turtles, and other marine animals during transit. To limit or prevent such collisions, NMFS provides all vessel operators with "Whale-watching Guidelines," which is derived from the MMPA. These guidelines suggest safe navigational practices based on speed and distance limitations when encountering marine mammals. The frequency of vessel collisions with marine mammals, turtles, or other marine animals probably varies as a function of spatial and temporal distribution patterns of the living resources, the pathways of maritime traffic (coastal traffic is more predictable than offshore traffic), the volume of vessel traffic, and as a function of vessel speed, the number of vessel trips, and the navigational visibility.

Vessel traffic conducting surveys, and bringing equipment and personnel to meteorological tower construction sites may affect marine mammals either by direct collisions with vessels or by acoustic disturbances from vessels. At least 11 species of cetaceans have been documented to have been hit by ships in the world's oceans, and in most cases the whales were not seen beforehand or were seen too late to avoid collision (Laist et al., 2001; Jensen and Silber, 2004). Whale strikes have been reported at vessel speeds ranging from 2 to 51 knots (2 to 59 mph), with most lethal or severe injuries occurring at ship speeds of 14 knots (16 mph) or more (Laist et al., 2001; Jensen and Silber, 2004). The majority of the vessels anticipated to be associated with the WEAs would be subject, in certain areas, to regulations limiting their speed to 10 knots or less (see below).

Whale strikes have occurred with a wide variety of vessel types, including Navy vessels, container and cargo ships, freighters, cruise ships, and ferries (Jensen and Silber, 2004), all of which are present in the area of potential effects. Collisions with vessels greater than 80 m (260 ft) in length are usually either lethal or result in severe injuries (Laist et al., 2001), although no such vessels are anticipated to be associated with the proposed action.

Ship strikes have been recorded in U.S. waters offshore almost every coastal State. Collisions between whales and vessels have been most commonly reported along the Atlantic Coast, which is busiest in terms of vessel traffic, followed by the Pacific Coast (including Alaska and Hawaii); and the Gulf of Mexico (Jensen and Silber 2004). In addition, most ship strikes appear to occur over or near the edge of the continental shelf (Laist et al., 2001), which is shallower and provides habitat for these animals, and is also host to the a greater concentration of vessel traffic than are the seas beyond the OCS. The most frequently struck species has been the fin whale, followed by humpback, North Atlantic right, gray, minke, southern right, and sperm whales (Jensen and Silber, 2004). Among these species, the North Atlantic right whale, the humpback whale, minke whale, and fin whale are considered most likely to encounter vessels associated with the Mid-Atlantic WEAs.

It should be noted that vessels conducting activities in and around the WEAs would be subject to regulations requiring ships 19.8 m (65 ft) or longer to travel at 10 knots (11.5 mph) or less in certain areas where right whales gather (50 CFR Part 224.105). The purpose of the regulations is to reduce the likelihood of deaths and serious injuries to endangered North Atlantic right whales that result from collisions with ships. This regulation also benefits other marine mammal species. These restrictions extend out to 37 km (20 nm) around major Mid-Atlantic ports. Except for crew boats, which are typically smaller than 19.8 m (65 ft), these restrictions would be applicable to most vessels associated with the proposed action. In addition to the mandatory speed restrictions in these Seasonal Management Areas (SMAs) vessels would also be required to check with NOAA's Sighting Advisory System when Dynamic Management Areas (DMAs) are in place. The full compliance guide can be found at: http://www.nmfs.noaa.gov/pr/pdfs/shipstrike/compliance_guide.pdf.

Considering the existing regulatory measures in place, it is expected that significant impacts would be unlikely to occur due to the limited intermittent activities spread out temporally, as well as geographically, in the Mid-Atlantic WEAs. Additionally, the proposed mitigation measures detailed in Appendix C, and informed through previous ESA Section 7 consultations with NMFS, would likely be required by NMFS through its biological opinion and IHA permit. Moreover, due to the nature and volume of existing and historic vessel traffic in the area of potential effect, it is unlikely that the vessel traffic associated with the proposed action would lead to significant additional effects on the population of marine mammal species.

Discharge of Waste Materials and Accidental Fuel Leaks

Collisions between vessels and allisions between vessels and meteorological towers and buoys is considered unlikely (see Section 3.2.2 of this EA). However in the unlikely event that a vessel allision or collision were to occur, the most likely pollutant to be discharged would be diesel fuel. If a diesel spill were to occur, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (see Section 3.2.3 of this EA). Thus, waste discharges from vessels would not be expected to directly affect marine mammals.

Marine mammals could be adversely impacted by ingestion of, or entanglement with, solid debris. Marine mammals that have ingested debris, such as plastic, may experience intestinal blockage, which in turn may lead to starvation, while toxic substances present in the ingested materials (especially in plastics) could lead to a variety of lethal and sub-lethal toxic effects. Entanglement in plastic debris can result in reduced mobility, starvation, exhaustion, drowning, and constriction of, and subsequent damage to, limbs caused by tightening of the entangling material. The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEMRE (30 CFR 250.300) and the USCG (MARPOL, Annex V, Public Law 100–220 (101 Stat. 1458)). Thus, the entanglement in or ingestion of OCS-related trash and debris by marine mammals would not be expected during normal operations.

Because of the limited amount of vessel traffic and offshore activity that would be associated with surveys and the construction/installation of meteorological towers/buoys, the release of liquid wastes would occur infrequently. The likelihood of an accident resulting in accidental discharges would be limited to the active construction/installation and decommissioning periods of the site assessment. This is because this is the time period when there would be more than one vessel on site conducting complex maneuvers in a restricted space. Survey activity is a much simpler activity usually involving one vessel moving in one continuous direction. Impacts to marine mammals from the discharge of waste materials or the accidental release of fuels are expected to be minor.

Meteorological Tower and Buoy Decommissioning

The decommissioning of meteorological towers and buoys is described in Section 3.1.2. This section primarily addresses the decommissioning of a meteorological tower, as it is more extensive than decommissioning a meteorological buoy.

Upon completion of site assessment activities, the meteorological tower would be removed and transported by barge to shore. During this activity, marine mammals may be affected by sound and operational discharges as described for meteorological tower construction. Removal of the piles would be accomplished by cutting the piles (using mechanical cutting or high-pressure water jet) at a depth of 4.6 m (15 ft) below the mudline (30 CFR 285.910). Marine mammals could be affected by sound during pile cutting. Pile cutting techniques and associated sound levels have yet to be tested and evaluated in the Atlantic wind energy context. It is expected that only animals in the immediate vicinity of the tower (those that had not moved away from the area upon arrival of decommissioning vessels) would be expected to be affected during tower removal and transport, and pile cutting. Disturbance of marine mammals during decommissioning is expected to be similar to that of construction with the exception that pile cutting sound is expected to be much lower than that for pile driving. Impacts from vessel activity during decommissioning are expected to be similar to that during construction.

Conclusion

The proposed action is not anticipated to result in any significant or population-level effects to marine mammals. The potential effects to marine mammals are expected to be very localized and temporary resulting in minimal to negligible harassment depending on the specific activity. The activity and impacts are considered minimal due to the impact producing factor itself in certain instances (e.g., most sonar work and grab samples), and/or the limited spatial and/or temporal extent of the activity in other instances (e.g. vessel transits and pile driving activity). Specifically, harassment from sound and slight increases in the risk of vessel collisions are the primary potential impacts to marine mammals associated with the proposed action, and these effects are not expected to be significant.

Proposed Mitigation Measures

The following proposed mitigation measures, developed from previous ESA Section 7 consultations with NMFS, are intended to reduce or eliminate the potential for adverse impacts to marine mammals. This section proposes that these mitigation measures be incorporated into any future decision to issue a lease or approve a SAP. It is reasonable to assume, based on past ESA consultations, that these requirements or something substantially similar will be required by NMFS. A more detailed description of proposed mitigation measures for ESA-listed marine mammals and sea turtles can be found in Appendix C.

Exclusion Zone During HRG Surveys

Effects on marine mammal behavior are generally expected to be limited to avoidance of the immediate area around the HRG survey activities and short-term changes in behavior, falling within the MMPA definition of "Level B harassment." Although cetaceans may be present in a WEA during an HRG survey, the likely maximum ranges of the 180 dB and 160 dB isopleths, (estimated at maximum of 30 m and 400 m, respectively) make it unlikely that any cetaceans would be exposed to injurious or disturbing sound levels associated with the survey. The risk of exposure would further be reduced by requiring the use of an observer, which would ensure that the survey equipment is not operated if a whale or sea turtle is within 500 m of the survey vessel.

Exclusion Zone During Boring Activities

Since drilling is considered by NMFS to be a continuous noise source, the level of noise considered harassment under the MMPA is 120 dB. As a result, the proposed mitigation measure would require a 200 m exclusion zone for marine mammals and sea turtles during deep hole boring activity.

Pile Driving

Behavioral disturbance/harassment of marine mammals may occur when individuals are exposed to non-continuous noise sources such as those generated by an impact pile driver that would be used for monopole installation. In order to minimize the potential effects of pile driving on listed species, the proposed mitigation measure would require lessees to implement a "soft start" procedure and the requirement that no pile driving occur if any whales or sea turtles are present within 7 km of the pile to be driven. If future field-verified acoustic data indicates the 160 dB isopleths associated with pile driving is greater than 7 km, then future mitigation measures would be modified to reflect the new data, if similar conditions/operating environment warrant the change.

4.1.2.4 Sea Turtles

4.1.2.4.1 Description of the Affected Environment

Of the six species of sea turtles that can be found offshore the U.S., there are four species that potentially utilize the WEAs in the Mid-Atlantic, all of which are listed as endangered or threatened under the ESA (Table 4.6). These species include the loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles. Of these four species only two, the leatherback and loggerhead sea turtles, have had documented sightings within the Mid-Atlantic WEAs. These four species are all highly migratory, and no individual members of any of the species are likely to be year-round residents of areas that could be affected by the proposed action. Individual animals would make migrations into nearshore waters as well as other areas of the North Atlantic Ocean, Gulf of Mexico, and the Caribbean Sea. There is no formally designated critical habitat for sea turtles in the Mid-Atlantic WEAs.

Few researchers have reported on the density of sea turtles in Northeastern waters. However, this information is available from one source (Shoop and Kenney, 1992). Shoop and Kenney (1992) used information from the University of Rhode Island's Cetacean and Turtle Assessment

Program (CETAP[1]) as well as other available sightings information to estimate seasonal abundances of loggerhead and leatherback sea turtles in northeastern waters (CETAP, 1982). The authors calculated overall ranges of abundance estimates for the summer of 7,000-10,000 loggerheads and 300-600 leatherbacks present in the action area from Nova Scotia to Cape Hatteras. Using the available sightings data (2841 loggerheads, 128 leatherbacks and 491 unidentified sea turtles), the authors calculated density estimates for loggerhead and leatherback sea turtles (reported as number of turtles per square km). These calculations resulted in density estimates of 0.00164 – 0.510 loggerheads per square km and 0.00209 – 0.0216 leatherbacks per square km. It is important to note, however, that this estimate assumes that sea turtles are evenly distributed throughout the waters off the northeast, even though Shoop and Kenney report several concentration areas where loggerhead or leatherback abundance is much higher than in other areas. The Shoop and Kenney data, despite considering only the presence of loggerhead and leatherback sea turtles, likely overestimates the number of sea turtles present in the WEAs. This is due to the assumption that sea turtle abundance would be even throughout the Nova Scotia to Cape Hatteras action area, which is an invalid assumption. Sea turtles occur in high concentrations in several areas outside of the action area and the inclusion of these concentration areas in the density estimate skews the estimate for the action area.

This information is supported by the results of the New Jersey study (NJDEP, 2010a) that found the following for leatherback and loggerhead sea turtles (the only sea turtles observed in the vicinity of the New Jersey WEA.

> **Leatherback Sea Turtles**
> Leatherback turtles are more common in Mid-Atlantic waters during the summer and fall; however, this species may occur in the Study Area year-round. Twelve sightings of leatherback turtles were recorded during the surveys; nine of these were on-effort and three were off-effort. All leatherback turtle sightings were of single individuals; eight of the total 12 sightings were thought to be juveniles. Water depths of leatherback sightings ranged from 18 to 30 m (59 to 98 ft) with a mean depth of 24 m (79 ft). The SSTs associated with leatherback turtle sightings ranged from 18.1 to 20.3°C (64.6 to 68.5°F) with a mean of 19.0°C (66.2°F). This mean SST is the highest average value for any species or species group sighted during the survey period and is consistent with the seasonality of leatherback occurrence in the Study Area. Leatherback turtles were sighted only during the summer. The majority of sightings (seven) occurred in the far northern portion of the Study Area. Sightings were recorded from 10.3 to 36.2 km (5.6 to 19.5 NM) from shore with a mean distance of 28.6 km (15.4 NM).
>
> **Loggerhead Sea Turtles**
> Loggerhead turtles are more common in Mid-Atlantic waters during the summer and fall; however, this species may occur in the Study Area year-round. A total of 69 sightings of loggerhead turtles were recorded during the surveys; the vast majority of these (63) were recorded on effort. The 15 unidentified hard-shell turtle sightings recorded during spring and summer may have been loggerhead turtles; however, species identifications could not be confirmed. All loggerhead turtle sightings were of single individuals; four of the total 69 sightings were recorded as juveniles. Loggerhead sightings occurred in water depths ranging from 9 to 34 m (30 to 112 ft) with a mean depth of 23.5 m (77.1 ft). Distance from shore ranged from 1.5 to 38.4 km (0.8 to 20.7 NM; mean=24.6 km/13.3 NM). SSTs associated with these sightings ranged from 11.0 to

90

[1] The CETAP survey consisted of three years of aerial and shipboard surveys conducted between 1978 and 1982 and provided the first comprehensive assessment of the sea turtle population between Nova Scotia, Canada and Cape Hatteras, North Carolina.

20.3°C (51.8 to 68.5°F) with a mean value of 18.5°C (65.3°F). This was the second highest mean SST of all sightings which is consistent with the strong seasonality of loggerhead occurrence in the Study Area. Loggerhead turtles were sighted from late spring through fall. The earliest a loggerhead was sighted was June and the latest was October. Sightings of loggerhead turtles are fairly evenly distributed although over 50% of the sightings were recorded in the eastern half of the Study Area. During the baseline study period, opportunistic sightings of sea turtles were recorded during monitoring efforts conducted in a potential wind farm site southeast of Atlantic City. Experienced observers recorded two juvenile loggerhead turtles during the geophysical surveys in August 2009 (GMI 2009b).

Sightings data for sea turtles has also been compiled by the Nature Conservancy for their comprehensive Northwest Atlantic Marine Ecoregional Assessment (NAM ERA). The Nature Conservancy submitted sightings data for sea turtles as part of their comments on BOEMRE's NOI to prepare this EA (76 FR 7226, February 9, 2011) for this subject action. The underlying source for these maps is the U.S. Navy's Marine Resource Assessment, which in turn utilized NMFS survey data. The NAM ERA study does note limitations on the data, especially in regards to the disparity in spatial scales between the data and the WEAs. The NAM ERA geodatabase was used by BOEMRE to display leatherback and loggerhead sea turtle distribution. This data, presented in Appendix D, is consistent with the distribution described in this section.

Table 4.6

Sea Turtle Taxa of the Western North Atlantic

Order Testudines (turtles)	Relative Occurrence in WEAs*	ESA Status
Family Cheloniidae (hardshell sea turtles)		
Loggerhead sea turtle (*Caretta caretta*)	Common	Threatened
Green sea turtle (*Chelonia mydas*)	Uncommon	Threatened
Hawksbill sea turtle (*Eretmochelys imbricata*)	Rare	Endangered
Kemp's Ridley sea turtle (*Lepidochelys kempii*)	Uncommon	Endangered
Family Dermochelyidae (leatherback sea turtle)		
Leatherback sea turtle (*Dermochelys coriacea*)	Common	Endangered

* The occurrence category is based upon NMFS survey data as present in the TNC NAM ERA geodatabase for sightings with the Mid-Atlantic WEAs and previous endangered species consultations with NMFS.

4.1.2.4.2 Impact Analysis of the Proposed Action

Chapter 5.2.12.2 of the Programmatic EIS discusses the impacts of site characterization activities on sea turtles. Activities associated with site characterization that may affect sea turtles include: 1) G&G surveys; 2) construction and or installation of one or more meteorological observation platforms (e.g., towers, buoys, barges); 3) vessel traffic, 4) discharges of waste materials and accidental fuel releases; and 5) meteorological observation platform decommissioning. The potential effects to sea turtles from these activities can be grouped into the following categories: 1) acoustic effects; 2) benthic habitat effects; 3) vessel collision effects; and 4) other effects. It should be noted that all activities described below are subject to the evaluation under the MMPA. Lessees would need to consult with NMFS to ensure necessary authorizations (such as IHAs) are obtained prior to beginning survey or meteorological facility construction activities.

Acoustic Effects

This section on acoustic effects looks at what is known about noise sensitivity in sea turtles and the noise that could be produced as a result of site characterization and assessment activity in the Mid-Atlantic WEAs.

Current Understanding of Noise Sensitivity in Sea Turtles

This section is derived in large part from previous ESA consultations and biological opinions issued by NMFS to BOEMRE for Atlantic wind energy projects. Much of the general discussion regarding sound and communication for marine organisms is presented in the marine mammal section of this document (see Section 4.1.2.3) and is not repeated here.

The hearing capabilities of sea turtles are poorly known. Few experimental data exist, and since sea turtles do not vocalize, inferences cannot be made from their vocalizations as is the case with baleen whales. Direct hearing measurements have been made in only a few species. An early experiment measured cochlear potential in three Pacific green turtles and suggested a best hearing sensitivity in air of 300–500 Hz and an effective hearing range of 60–1,000 Hz (Ridgway et al., 1969). Sea turtle underwater hearing is believed to be about 10 dB less sensitive than their in-air hearing (Lenhardt, 1994). Lenhardt (1994) used a behavioral "acoustic startle response" to measure the underwater hearing sensitivity of a juvenile Kemp's ridley and a juvenile loggerhead turtle to a 430-Hz tone. Their results suggest that those species have a hearing sensitivity at a frequency similar to those of the green turtles studied by Ridgway et al. (1969). Lenhardt (1994) was also able to induce startle responses in loggerhead turtles to low frequency (20–80 Hz) sounds projected into their tank. Lenhardt further suggested that sea turtles have a range of best hearing from 100–800 Hz, an upper limit of about 2,000 Hz, and serviceable hearing abilities below 80 Hz. More recently, the hearing abilities of loggerhead sea turtles were measured using auditory evoked potentials in 35 juvenile animals caught in tributaries of Chesapeake Bay (Bartol et al., 1999). Those experiments suggest that the effective hearing range of the loggerhead sea turtle is 250–750 Hz and that it's most sensitive hearing is at 250 Hz. In general, however, these experiments indicate that sea turtles generally hear best at low frequencies and that the upper frequency limit of their hearing is likely about 1 kHz. As such, sea turtles are capable of hearing in low frequency ranges that overlap with the dominant frequencies of pile driving and vessel noise, therefore, if exposed to construction-related noise these species may be affected by this exposure. Acoustic harassment thresholds for sea turtles are not as established as they are for marine mammals. Thus this section utilizes harassment thresholds for marine mammals for discussion purposes since these thresholds are limiting factors for the proposed activities.

High Resolution Geologic Survey Acoustic Effects

As discussed in Section 3.1.1, HRG surveys would be used to characterize the potential site of the meteorological tower and possible placement of wind turbines in the future. As previously stated in Section 4.1.2.3, HRG surveys and sub-bottom profiling tools for wind turbine siting only require shallow penetration of the seafloor resulting in relatively low energy (sound) introduced into the environment than some other penetrating technology.

Sections 3.1.1 and 4.1.2.3 detail a proposed action scenario for HRG surveys, which is not repeated herein.

If the surveys occur between June and November, listed sea turtles could be exposed to acoustic effects from the HRG survey. A survey vessel would not likely travel at speeds greater than 4.5 knots while surveying. As the survey vessel travels along the transects it is expected that any sea turtles in the area that are close enough to perceive the sound would swim away from it. As noted in Section 4.1.2.3.2, potentially disturbing levels of noise (i.e., greater than 160 dB) would be experienced only within approximately 400 m of the survey equipment.

In order for a sea turtle to be exposed to injurious levels of noise, the sea turtle would need to be within 27 m of the survey equipment. Given the noise levels produced by the survey equipment and given the expected behavioral response of avoiding noise levels greater than 160 dB, it is extremely unlikely that any sea turtles would swim towards the survey vessel. As such, it is extremely unlikely that any sea turtles would be exposed to injurious levels of noise.

Sea turtles whose behavior is disrupted would likely be expected to resume their behavior after the disturbance has stopped. Available information indicates that sea turtle forage items are available throughout the action area; therefore, while sea turtles may move to other areas within the action area to forage during the times when the survey is occurring, the ability of individual sea turtles to find suitable forage is not expected to be impacted. Likewise, if sea turtles were resting in a particular area they are expected to be able to find an alternate resting area within the action area. Additionally, if sea turtles are migrating through the action area, they may avoid the area with disturbing levels of sound and choose an alternate route through the action area. While the movements of individual sea turtles would be affected by the sound associated with the survey, these effects would be temporary and localized. Sea turtles are not expected to be excluded from large areas due to the proposed activities and there would be only a minimal impact on foraging, migrating or resting sea turtles that would not result in injury or impairment in an individual's ability to complete essential behavioral functions. Major shifts in habitat use or distribution or foraging success are not expected. As changes to individuals movements are expected to be minor and short-term, and are therefore not likely to have population-level effects.

Sub-bottom Reconnaissance Acoustic Effects

Section 4.1.2.3.2 of the EA gives an overview of acoustic effects and is not repeated herein. It is generally expected that the activity of setting up drilling equipment would deter marine mammals, sea turtles, and fish from entering the work area. There would be nothing that would prevent animals from leaving or avoiding areas where drilling would take place. Sea turtles could be exposed to sound levels greater than 120 dB. Other sub-bottom reconnaissance activity, such as the use of a CPT, borings, and grab sampling, is expected to only have minor acoustic impacts, primarily from vessel engines.

Since leatherback, green, Kemp's ridley and loggerhead sea turtles are known to occur in the Mid-Atlantic between June and October and construction may occur during this time period, these species may be exposed to construction-related noise during the construction period. Noise from pile driving could disturb normal behaviors (e.g., feeding) and cause affected individuals to move away from the construction area. The biological importance of behavioral responses to construction noise (e.g., effects on energetic, survival, reproduction, population status) is unknown, and there is little information regarding short-term or long-term effects of behavioral reactions on sea turtle populations. While noise generated during construction of a meteorological tower may affect more than one individual, population-level effects are not anticipated due to the limited area of the activity and the much larger area occupied by the population as a whole. Few individuals are expected to be exposed to construction noise, given the short-term duration of construction activities, geographic area affected, and lack of presence in these areas during portions of the year.

Meteorological Tower Pile-Driving Acoustic Effects

The type and intensity of the sounds produced by pile driving depend on the type and size of the pile, the firmness of the substrate into which the pile is driven, the depth of the water, and the type and size of the impact hammer being used. Thus the actual sounds produced would vary project by project. Section 4.1.2.3.2 fully describes the range of pile driving sound and is thus not repeated here.

The available information on sea turtle behavioral responses to these sound levels indicates that individuals are likely to actively avoid areas with disturbing levels of sound. Avoidance behavior may shorten the exposure period; however, the avoidance behavior could potentially disrupt normal behaviors. A reaction of individual sea turtles to the pile driving is expected to be limited to an avoidance response. Only pile driving occurring during the June – November time frame has the potential to affect sea turtles, as sea turtles are not expected to occur in the action area outside of this time of year.

Sea turtles behaviorally disrupted would be expected to resume their behavior after the pile driving has stopped. As pile driving would occur for approximately 4-8 hours a day, it is likely that sea turtles would be excluded from the area with disturbing levels of sound for at least this period each day. Available information indicates that sea turtle forage items are available throughout the action area; therefore, while sea turtles may move to other areas within the action area to forage during the times when pile driving is occurring, the ability of individual sea turtles to find suitable forage is not expected to be impacted. Likewise, if sea turtles were resting in a particular area, they are expected to be able to find an alternate resting area nearby.

Additionally, if sea turtles are migrating through the action area, they may avoid the area with disturbing levels of sound and choose an alternate route to avoid the sound source. As such, while the movements of individual sea turtles while be affected by the sound associated with the pile driving, these effects would be temporary and localized. It is expected that there would be only a minimal impact on foraging, migrating or resting sea turtles that would not result in injury or impairment in an individual's ability to complete essential behavioral functions. Major shifts in habitat use or distribution or foraging success are not expected.

During pile driving, sound levels would have dissipated to below the 160 dB threshold within a distance of 7 km. Sea turtles within 7 km would be exposed to potentially injurious or harassing levels of sound. However, changes to individual's movements are expected to be minor and short-term, and are therefore not likely to have population-level effects.

Sea Turtle Habitat Effects

Section 4.1.2.2 of this document discusses the benthic resources and impacts from the proposed action upon those resources. This section only discusses those impacts in relation to sea turtles. Impact to sea turtle habitat from the proposed action is anticipated to be negligible due to limited impact to the benthos itself. It is expected that some benthic forage items for sea turtles may become unavailable during some of the proposed activity.

Sub-bottom Sampling

The sub-bottom sampling would result in a negligible temporary loss of some benthic organisms (i.e., less than one ft diameter would be disturbed in the areas where cores are sampled), and a localized increase in disturbance due to vessel activity, including noise and anchor cable placement and retrieval.

Meteorological Tower/Buoy Installation

It is expected that any re-suspension of sediment and subsequent sedimentation that would occur around an installed tower or buoy would have only minor effects that could temporarily impact the habitat and food availability for sea turtles either by the activity itself causing sea turtles to not enter a forage area or the forage itself becoming unavailable due to smothering by sediment or physical structures.

Meteorological Tower/Buoy Operation

The operation of a single meteorological tower or buoy within a leasehold is not expected to result in changes in local community assemblage and diversity nor the availability of habitat and forage items for sea turtles that could occur in the action area as the footprint of the structure is expected to be less than 255 m^2 and the maintenance trips to the structure are limited.

Collision Effects

This section addresses direct impacts from the collision of sea turtles with structures and vessels described in the proposed action. A collision with a sea turtle could result in injury or mortality to the animal.

Vessels associated with site characterization surveys, or construction, maintenance or decommissioning of the meteorological tower could collide with marine mammals, turtles, and other marine animals during transit. To limit or prevent such collisions, NMFS provides all boat operators with "Whale-watching Guidelines," which is derived from the MMPA but provide benefits to sea turtles as well. The frequency of vessel collisions with marine mammals, turtles, or other marine animals probably varies as a function of spatial and temporal distribution patterns of the living resources, the pathways of maritime traffic (coastal traffic is more predictable than offshore traffic), and as a function of vessel speed, the number of vessel trips, and the navigational visibility.

Sea turtles have been killed or injured by collisions with vessels. Because of their limited swimming abilities, hatchlings may be more susceptible than juveniles or adults to vessel collisions. The likelihood of collision would vary depending upon species and life stage, the location of the vessel, and its speed and visibility. Hatchling turtles would be difficult to spot from a moving vessel because of their small size and generally cryptic coloration patterns. While adult and juvenile turtles are generally difficult to observe at the surface during periods of daylight and clear visibility, they are very difficult to spot from a moving vessel when they are resting below the water surface, and during night and periods of inclement weather.

While the towed gear (i.e., the boomer and/or chirper) has the potential to result in interaction with sea turtles, the speed of towing (typically about 3 knots) minimizes the potential for entanglement or vessel strikes during the survey as sea turtles would be able to avoid the slow moving gear and survey vessel. Because of the small amount and short duration of vessel traffic that would be associated with meteorological tower/buoy construction, operation, and decommissioning, population-level impacts to sea turtles from vessel collisions are not expected.

Discharge of Waste Materials and Accidental Fuel Leaks

Collisions between vessels and allisions between vessels and meteorological towers and buoys is considered unlikely (see Section 3.2.2 of this EA). However in the unlikely event that a vessel allision or collision were to occur, the most likely pollutant to be discharged would be diesel fuel. If a diesel spill were to occur, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (see Section 3.2.3 of this EA).

During meteorological tower construction, a variety of sanitary and other waste fluids, and miscellaneous trash and debris, may be generated. Hatchling, juvenile, and adult sea turtles may be exposed to these wastes by discharges from the construction vessels. Operational discharges from construction vessels would be released into the open ocean where they would be rapidly diluted and dispersed, or collected and taken to shore for treatment and disposal. Sanitary and domestic wastes would be processed through shipboard waste treatment facilities before being discharged overboard. Deck drainage would also be processed prior to discharge.

Ingestion of plastic and other non-biodegradable debris has been reported for almost all sea turtle species and life stages (USDOC, NOAA, 2003). Ingestion of waste debris has resulted in gut strangulation, reduced nutrient uptake, and increased absorbance of various chemicals in plastics and other debris (USDOC, NOAA, 2003). Sub-lethal quantities of ingested plastic debris can result in various effects including positive buoyancy, making sea turtles more susceptible to collisions with vessels, increasing predation risk or reducing feeding efficiency (Lutcavage et al., 1997). Some species of adult sea turtles, such as loggerheads, appear to readily ingest plastic debris that is appropriately sized. In oceanic waters, floating or subsurface translucent plastic material and sheeting may be mistaken for gelatinous prey items such as jellyfish. Entanglement in debris (such as rope) can result in reduced mobility, drowning, and constriction of and subsequent damage to limbs (Lutcavage et al., 1997).

The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEMRE (30 CFR 250.300) and the USCG (MARPOL, Annex V, Public Law 100–220 (101 Stat. 1458)). Assuming compliance with these regulations and laws and only accidental releases, very little exposure of sea turtles to solid debris generated during meteorological tower construction would be anticipated.

Meteorological Tower and Buoy Decommissioning

The decommissioning of meteorological towers and buoys is described in Section 3.1.2. This section primarily addresses the decommissioning of a meteorological tower, as it is more extensive than that of a meteorological buoy in that it involves more than just the potential impacts of vessel trips, which are assessed above.

Upon completion of site characterization, the meteorological tower would be removed and transported by barge to shore. During this activity, sea turtles may be affected in the same manner as described for meteorological tower construction. Removal of the mooring piles would be accomplished by cutting the piles (using mechanical cutting or high-pressure water jet) at a depth of 4.6 m (15 ft) below the seabed, and sea turtles in the immediate vicinity could be disturbed by sound during the cutting of the pilings. Pile cutting techniques and associated sound levels have yet to be tested and evaluated in the Atlantic wind energy context. Affected animals may be expected to move away from the immediate vicinity of the site.

Conclusion

The effects to sea turtles, specifically leatherback, loggerhead, Kemp's ridley, and green sea turtles, are expected to be short term and would result in minimal to negligible harassment depending on the specific activity. The activity and impacts are considered minimal due to activity itself in some cases, and the spatial-temporal setting in which the proposed activity would take place. Specifically, harassment from noise, minor loss/displacement from forage areas, and to a lesser degree vessel collisions, are the primary anticipated direct and indirect impacts to ESA-listed sea turtles. These consequences to sea turtles are not anticipated to be significant.

Proposed Mitigation Measures

The following proposed mitigation measures are intended to reduce or eliminate the potential for adverse impacts to sea turtles. This section proposes that these mitigation measures be incorporated into any future decision to issue a lease or approve a SAP. It is reasonable to assume, based on past ESA consultations, that these requirements or a facsimile thereof will be required by NMFS. A more detailed description of proposed mitigation measures for ESA-listed marine mammals and sea turtles can be found in Appendix C.

Exclusion Zone During HRG Surveys

Surveys occurring between June and November could expose listed sea turtles to acoustic effects of the HRG survey. Potentially disturbing levels of noise (i.e., greater than 160 dB) would be experienced only within approximately 400 m of the survey equipment. Therefore, BOEMRE would require that the applicants maintain a 500-m exclusion zone during the survey and that this exclusion zone be monitored for at least 30 minutes prior to ramp up of the survey equipment. The normal duration of sea turtle dives ranges from 5-40 minutes depending on species, with a maximum duration of 45-66 minutes depending on species (Spotila, 2004). As sea turtles typically surface at least every 60 minutes, it is reasonable to expect that monitoring the exclusion zone for at least 60 minutes prior to ramp up and continuing through to full operation would allow the endangered species monitors to detect any sea turtles that may be submerged in the exclusion zone.

Exclusion Zone During Boring Activity

While it is generally expected that the activity of setting up drilling equipment would deter sea turtles from entering the work area, there would be nothing that would prevent animals from leaving or avoiding areas where drilling would take place. BOEMRE would require a 200-m exclusion zone for sea turtles during deep hole boring activity. Therefore, no sea turtles would be exposed to sound levels greater than 120 dB (marine mammal harassment threshold from a continuous acoustic source).

Pile Driving

A proposed 7 km exclusion zone would be monitored by trained endangered species observer for at least 30 minutes. While observers from two locations (at source and 3-4km from source) within the exclusion zone would monitor out to 7km, it is recognized that it is unlikely that sea turtles are able to be observed beyond 500 m. In order to further minimize the potential effects of pile driving on sea turtles, lessees would be required to implement a "soft start" procedure as part of this proposed mitigation measure. The soft start would require that an initial set of three strikes from the impact hammer at 40-percent energy with a one minute waiting period between subsequent 3-strike sets.

4.1.2.5 Birds

4.1.2.5.1 Description of the Affected Environment

The proposed action and alternatives have the potential affect waterbirds and pelagic species of various types, as well as some shorebirds, songbirds and raptors in the waters offshore New Jersey, Delaware, Maryland, and Virginia from the coastline (particularly in harbor areas that would be used by survey and construction vessels) out to the seaward extent of the WEAs.

A listing of all birds that can be found in and offshore New Jersey, along with their status, is available on the New Jersey Division of Fish and Wildlife's website http://www.state.nj.us/dep/fgw/chkbirds.htm. A listing of all birds that can be found in and offshore Delaware is available on the Delmarva Ornithological Society's website at http://www.fw.delaware.gov/NHESP/information/Pages/Endangered.aspx. A listing of all birds that can be found in and offshore Maryland is available on the Department of Natural Resources website at http://www.dnr.state.md.us/wildlife/Plants_Wildlife/rte/rteanimals.asp. A listing of all birds that can be found in and offshore Virginia is available on the Virginia Department of Game and Inland Fisheries website at http://www.dgif.virginia.gov/wildlife/.

Birds in these areas have historically been and will continue to be subject to relatively intense human stressors, such as habitat loss from onshore development, agriculture, hunting, existing vessel, ground and air traffic, and beach recreation. The following categories include birds that are particularly sensitive:

Migratory Birds

Despite the level of human activity present, the Mid-Atlantic Coast nevertheless plays an important role in the ecology of many bird species. The Atlantic Flyway, which encompasses all of the areas that could be potentially affected by the proposed action, is a major route for migratory birds, which are protected under the Migratory Bird Treaty Act of 1918, particularly during the spring and fall migration periods. Chapter 4.2.9.3 of the Programmatic EIS discusses the use of Atlantic Coast habitats by migratory birds.

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 and golden eagles. Take is defined by the Act as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Both the bald and golden eagle winter in and migrate over land in Delaware and New Jersey (NJDEP, Division of Fish and Wildlife, 2009). Bald eagles have historically been associated with forests near the Delaware River and Bay, but nest throughout Delaware and New Jersey. Bald eagles are also found in Maryland and Virginia all year round. Bald eagles have been documented nesting in every county in Maryland, and most are concentrated along the Chesapeake Bay and its tributaries (MDDNR, 2011a).

Golden eagles favor more open areas in western States, and do not typically nest in Delaware and New Jersey (USFWS, 2007). The golden eagle is an occasional winter visitor to the coastal areas of Maryland, and golden eagles do winter in relevant coastal areas of Virginia. Golden eagle migration is strongly associated with the Appalachian ridgelines and does not fly over the ocean. Bald eagles forage and nest along rivers and bays and at times fly along the shore line. Therefore, bald and golden eagles are not expected to occur in the WEAs, and with the exception of immediate bay or harbor areas, are not expected to occur in the where vessels associated with the proposed action would be traveling.

ESA-Listed Birds

Two species of federally endangered or threatened species of birds occur in coastal and marine waters offshore New Jersey, Delaware, Maryland, and Virginia during at least part of the year. The northeastern U.S. population of the roseate tern (*Sterna dougallii dougallii)* is listed as endangered, and the piping plover (*Charadrius melodus*) is listed as threatened. These species use coastal habitats including beaches, marshes, and intertidal wetlands. The red knot (*Calidris canutus rufa*), identified from the Atlantic Coast States as a candidate for listing as threatened or endangered under ESA (USFWS, 2006). All three species may pass through the WEAs during migration.

Piping Plover

The piping plover (*Charadrius melodus*) is a small, stocky, sandy-colored bird resembling a sandpiper. The piping plover was listed as threatened (USFWS, 1985) in its entire range except in the Great Lakes watershed where it is listed as endangered. In 1996, the Revised Recovery Plan for the Atlantic Coast Population was completed (USFWS, 1996). Critical wintering habitat has been established in each of the Gulf Coast States for all three populations (Atlantic, Great Lakes, and Great Plains) of the piping plover (66 FR 36038–36143). The summary below was derived from USFWS species profile (USFWS, 2011a).

Piping plovers return to their breeding grounds in late March or early April. Plovers often gather in groups on undisturbed beaches prior to their southward migration, and by mid-September, depart for their wintering areas. Piping plovers may live to be 8-10 years old and on average, lay four eggs each year.

The Atlantic Coast Population of piping plovers nest along beaches in New Brunswick, Prince Edward Island, Nova Scotia, Quebec, southern Maine, Rhode Island, Massachusetts, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina. These birds winter primarily on the Atlantic Coast from North Carolina to Florida, although some migrate to the Bahamas and West Indies from mid-September to March. Although the precise route of migration is not firmly established it is possible that these birds will fly over the WEAs during migration. Piping plovers are known to occur from March to mid-September in several counties along the Mid-Atlantic that may provide harbor for vessels associated with the proposed action (Table 4.7).

Atlantic Coast piping plovers utilize the open, sandy beaches close to the primary dune of the barrier islands and coastlines of the Atlantic for breeding. They prefer sparsely vegetated open sand, gravel, or cobble for a nest site. They forage along the rack line where the tide washes up onto the beach.

The piping plover nearly disappeared due to excessive hunting for their feathers during the 19th century. Human disturbance often curtails breeding success. Developments near beaches also provide food that attracts increased numbers of predators such as raccoons, skunks, and foxes, and domestic pets. Storm-tides may inundate nests.

Table 4.7

Relevant Counties Along the Mid-Atlantic Where Piping Plovers are Known to Occur

State	County
Delaware	Sussex
Maryland	Worcester
New Jersey	Atlantic
	Cape May
	Monmouth
	Ocean
Virginia	Accomack
	Hampton
	Northampton
	Portsmouth

Source: USFWS, 2011a.

Roseate Tern

The roseate tern (*Sterna dougallii dougallii)* is federally listed as endangered (USFWS, 1987), and its distribution ranges from North Carolina, up to Canada and east to Bermuda. No critical habitat has been designated for this species. The recently published 5-year review contains a comprehensive review on the roseate terns (USFWS, 2010). The summary below was derived from the USFWS species profile (USFWS, 2011b).

The roseate tern is pale, medium-sized (about 40 centimeters in length), black-capped with light-gray wings and back, and during the breeding season, the bird has a rosy tinge on the chest and belly. The roseate tern is a fast flier and a specialized plunge-diver, feeding on small marine fish in shallow water near shore.

Terns hide their nests by nesting in dense vegetation, rocks, driftwood, tires or wooden boxes. Roseate terns arrive at the breeding grounds in April and begin egg laying in May. The terns usually lay one or two eggs, and chicks fledge after 3-4 weeks. Roseate terns flock to specific areas in August for post-breeding dispersal and depart in mid-September for wintering grounds.

In North America, the roseate tern breeds in two discrete areas: from Nova Scotia to Long Island, NY (northeastern population) and around the Caribbean Sea (including the Florida Keys). It is believed to winter in northern South America and along the Brazilian coast. In the Mid-Atlantic, roseate terns are believed to occur during migration, primarily between March-April and September. In Virginia, Accomack, Northampton, and Virginia Beach are host to non-breeding terns, and these areas may also provide harbor for vessels associated with the proposed action. Although occasionally seen on New Jersey beaches, the county level range for roseate terns has not been defined for New Jersey (USFWS, 2011b). Roseate terns are not known to occur in Delaware or Maryland (USFWS, 2011b). Although the precise route of migration is not firmly established, it is possible that these birds will fly over the WEAs during migration.

In the late 19th century, the roseate tern suffered a drastic population decline in the U.S. due to hunting for their feathers. In addition, roseate terns have been displaced from their traditional colonies by gulls resulting in fewer nesting colonies and reduced population size (USFWS, 1987). Given that roseate terns are ground nesters, their eggs and chicks are vulnerable to predation by red fox and Norway rat.

Red Knot

The red knot is a (*Calidris canutus rufa*) shore bird breeds in the central Canadian arctic and winters as far south as Tierra del Fuego in South America. Each May, red knots congregate in Delaware Bay during their northward migration to feed on horseshoe crab eggs (*Limulus polyphemus*) and refuel for breeding in the Arctic.

The red knot has declined dramatically over the past twenty years from a population estimated at 100,000-150,000 to 18,000-33,000 (Niles et al., 2008). The primary threat to the red knot population is the reduced availability of horseshoe crabs eggs in Delaware Bay arising from elevated harvest of adult crabs for bait in the conch and eel fishing industries (Niles et al. 2008). Despite restrictions to the crab harvest, the 2007 horseshoe crab harvest was still greater than the 1990 harvest, and no recovery of knots was detectable (Niles et al., 2009). Although the precise migration route has not been firmly established (Niles et al., 2010), it is possible that these birds will fly over the WEAs during spring and fall migrations.

4.1.2.5.2 Impact Analysis of the Proposed Action

The Programmatic EIS (Chapter 5.2.9.2) discusses the potential impacts of site characterization and assessment activities on birds. Migratory birds, including threatened and endangered species, could be affected by any of the activities contemplated under the proposed action including activities in the WEAs as well as vessel traffic to and from the WEAs.

Discharge of Liquid Wastes, Hazardous Materials, Solid Wastes, or Fuel

Marine and coastal birds could be exposed to operational discharges or accidental fuel releases from G&G surveys and construction sites in the WEAs and vessels accidentally releasing solid debris. Many species of birds (such as gulls) often follow ships and forage in their wake on fish and other prey injured or disoriented by the passing vessel. In doing so, these birds may be affected by discharges of waste fluids (such as bilge water) generated by the vessels. Operational discharges from construction vessels would be released into the open ocean (see Sections 3.2.3 and 4.1.1.2.2) where they would be rapidly diluted and dispersed, or collected and taken to shore for treatment and disposal. Sanitary and domestic wastes would be processed through on-site waste treatment facilities before being discharged overboard. Deck drainage would also be processed prior to discharge. Thus, potential impacts to marine and coastal birds from waste discharges from construction vessels are expected to be negligible. Marine and coastal birds may become entangled in or ingest floating, submerged, and beached debris (Heneman and the Center for Environmental Education, 1988; Ryan, 1987 and 1990).

Entanglement may result in strangulation, the injury or loss of limbs, entrapment, or the prevention or hindrance of the ability to fly or swim, and all of these effects may be considered lethal. Ingestion of debris may irritate, block, or perforate the digestive tract, suppress appetite, impair digestion of food, reduce growth, or release toxic chemicals (Dickerman and Goelet, 1987 and 1988; Derraik, 2002).

The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by the USCG (MARPOL, Annex V, Public Law 100–220 (101 Stat. 1458)). Thus, entanglement in or ingestion of OCS-related trash and debris by marine and coastal birds is not expected, and potential impacts to marine and coastal birds associated with project debris, if any, would be negligible. Because of the amount of vessel traffic and construction activity associated with the construction and operation of a meteorological tower, the placement of a meteorological buoy, or site characterization surveys, the release of wastes, debris, hazardous materials, or fuels would occur infrequently and cease following completion of the activity.

Meteorological Towers

It has been estimated that hundreds of millions of birds are killed each year in collisions with communication towers, windows, electric transmission lines, and other structures (see Klem, 1989 and 1990; Dunn, 1993; Shire et al., 2000). It is possible that some birds may collide with the meteorological towers out in the open ocean and be injured or killed. Because of the small number of meteorological towers proposed and their distance from each other and distance from shore, potential impacts to marine and coastal birds from collisions, should any occur, would be minor. Under good weather conditions, most migratory bird species in the vicinity of the proposed lease areas (at least seven miles from shore) would be flying at an altitude higher than the anticipated meteorological towers.

Due to the small number of anticipated structures scattered over a large area (one tower per averaged-size leasehold of 10 OCS blocks) at distances greater than seven miles from the coast, the proposed action itself is not expected to significantly affect terns or other migratory species. Terns may perch on tower equipment including handrails, equipment sheds, etc. Lattice-type masts (Figure 3.2.a-b) with numerous diagonal and horizontal bars are more likely to provide perching opportunities on the mast than meteorological tower with a monopole mast (Figure 3.1). However, perching does not pose a threat to the birds.

Under poor visibility conditions, all migratory species in the vicinity have the potential to collide with one of the anticipated meteorological towers. Also, lighting on tall structures during periods of fog and rain can disorient birds flying at night (Huppop, et al., 2006). Due to the small number of structures projected and their distance from shore, migratory birds colliding with the anticipated meteorological towers is possible, but very unlikely.

Meteorological Buoys

Meteorological buoys are much closer to the water surface than meteorological towers. Most birds would be flying above the buoy so it is unlikely that birds would collide with a buoy. Buoys also hold less equipment, so there would be much fewer perching opportunities although these opportunities pose no threat to the birds. Although there could be potentially more buoys than towers (Table 3.2), the potential impacts of buoys on birds would similarly be negligible.

Migratory Birds

Most migratory passerines would be flying well above the buoys and towers during the spring and fall migration. Other migratory birds including marine birds, coastal shore birds, and non-ESA birds would rarely encounter these structures due to distance from shore and great distances between buoys and towers. Therefore, the towers and buoys, as well as vessel activities within the proposed lease areas would not likely affect migratory birds.

Bald and Golden Eagles

Bald and golden eagles migrate and forage over land, inland water bodies, and bays - not the open ocean. The anticipated meteorological towers and buoys would be at least seven miles offshore, thus the meteorological towers and buoys including activities within the proposed lease areas would not affect these eagles. Because the proposed action would not require expansion of existing onshore facilities and the vessel trips in coastal waters pose no threat to these animals, impacts to bald or golden eagles or their habitat would not be expected.

Endangered and Threatened Birds

The ESA-listed roseate tern and piping plover including the non-listed red knot may fly through the WEAs during spring and fall migration. These species would rarely encounter buoys and towers due to great distances between buoys and towers. Therefore, the towers and buoys including activities within the proposed lease areas would not affect migratory birds.

Conclusion

While birds may be affected by vessel discharges, the presence of meteorological towers and buoys, and accidental fuel releases, no significant impacts are anticipated. The risk of collision would be minor due to the small number of meteorological towers proposed, their size, and their distance from shore and each other. The impact of meteorological buoys on ESA listed and non ESA listed migratory birds is expected to be negligible, because they are much smaller and close to the water surface and similarly dispersed. The impact of meteorological towers on ESA listed and non ESA listed migratory birds is also expected to be minor at most for the same reasons.

Proposed Mitigation Measures

The following proposed mitigation measures are intended to reduce or eliminate the potential for adverse impacts to birds. This section proposes that these mitigation measures be incorporated into any future decision to issue a lease or approve a SAP:

1) To reduce the potential to attract and/or disorientate birds at night during fog and rain, the lessee shall use only red flashing strobe-like lights (not steady burning) to meet FAA requirements for meteorological towers. Navigational safety lights for towers and buoys shall be installed in compliance with USCG requirements. The lessee shall leave any additional lights (e.g., work lights) on only when necessary and hooded downward and directed when possible, to reduce upward illumination and illumination of adjacent waters. These requirements apply to lighting on the meteorological tower as well as all support vessels.
2) Meteorological towers should 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.

4.1.2.6 Bats

4.1.2.6.1 Description of the Affected Environment

Species of bats that currently or historically occur in New Jersey, Delaware, Maryland, and Virginia are detailed in Table 4.8. Eight of these species inhabit caves and/or mines during all or part of the year and are referred to as cave bats while the remaining six species are referred to as tree bats. Three of the bat species are federally listed as endangered, and they are the Indiana bat, gray bat and Virginia big-eared bat. None of the other bat species are candidates for listing as threatened or endangered (USFWS, 2011c). The silver-haired bat, eastern red bat, and hoary bat are considered the migratory tree bats in North America due to their seasonal migrations over several degrees of latitude (Cryan, 2003).

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. It is also known that they fly along the coast. For instance, on the Mid-Atlantic coast, the eastern red, hoary, and silver-haired bats, use Assateague Island National Seashore, a barrier island off the coast of Maryland during migration (Johnson et al., 2011).

Bat migration over the open ocean has also been documented. For example, the hoary bat on Southeast Farallon Island, approximately 48 km west of San Francisco, migrates to the mainland in fall (Cryan and Brown 2007) and several bat species in Europe cross the Baltic Sea in migration between southern Sweden and Denmark (Ahlén et al., 2009). However, information with regard to bat species found in the Mid-Atlantic and the associated migration routes is limited. Most information on offshore bat activity in the Mid-Atlantic comes from The New Jersey Ecological Baseline Study which includes survey results for bats over the New Jersey WEA offshore New Jersey out to 20 nm (NJDEP, 2010a, Appendix B). Shipboard surveys were conducted in March, April, May, June, August, September, and October 2009. No bats were detected during the 2009 March, April or June surveys, and one was detected in May. Over eight nights in August, September, and October, 53 bats were detected. Of the total 54 recordings, the eastern red bat was the most common bat detected, but they were detected in the fall offshore along the Delmarva Peninsula while only a few hoary bats and big brown/silver-haired bats were detected in spring and fall. The mean distance from shore was 5.2 nm, with the farthest distance being 10.4 nm (NJDEP, 2010a, Appendix B). Given that no bats were detected during the New Jersey surveys at a distance greater than 10.5 nm from shore, it is unlikely that bats will be present in the majority of the WEAs, most of which are further offshore (e.g., all of the Virginia WEA is greater than 18 nm from shore). However, it is possible that some bats may be present in the Delaware and Maryland WEAs, which are 10 nm from shore. This study shows the presence of bats in the New Jersey WEA, located more than 7 nm offshore, is sporadic at best. This would be similar for the Delaware and Maryland WEAs, which are located 10 or more nm offshore.

Table 4.8

Occurrence ("X") of Bats by State

Common name	Scientific name	NJ[1]	DE[2]	MD[3]	VA[4]
Cave Bats					
Big brown bat	*Eptesicus fuscus*	X	X	X	X
Eastern small-footed bat	*Myotis leibii*	X		X	X
Indiana bat [E]	*Myotis sodalist*	X		X	X
Gray bat [E]	*Myotis grisescens*				X
Little brown bat	*Myotis lucifugus*	X	X	X	X
Northern long-eared bat	*Myotis septentrionalis*	X	X	X	X
Tri-colored bat	*Perimyotis subflavous*	X	X	X	X
Virginia big-eared bat [E]	*Corynorhinus townsendii virginianus*				X
Tree Bats					
Eastern red bat	*Lasiurus borealis*	X	X	X	X
Evening bat	*Nycticeius humeralis*			X	X
Hoary bat	*Lasiurus cinereus*	X	X	X	X
Seminole bat	*Lasiurus seminolus*				X
Silver haired bat	*Lasionycteris noctivagans*	X	X	X	X
Southeastern bat	*Myotis austroriparius*				X

[E] = Federally listed as endangered.
[1] (NJDEP, 2011b)
[2] (DEDFW, 2011)
[3] (MDDNR, 2011b)
[4] (VADCR, 2011)

4.1.2.6.2 Impact Analysis of the Proposed Action

Only the silver-haired bat, eastern red bat, and hoary bat would possibly migrate or forage through the WEAs. While their presence in the proposed action area would be sporadic at most, potential impacts to these bats include avoidance or attraction responses to the structures due to noise, lighting, and the possible presence of insects.

Routine Activities

Site Assessment Activities

Based on the above information, the lack of a land mass or vegetation seven or more nm offshore for bat roosting, the presence of bats in the WEAs is unlikely. Thus, impacts to bats are not expected during construction, operation, or decommissioning within the WEAs, especially in the Virginia WEA. In the New Jersey, Delaware and Maryland WEAs, any impacts from tower construction noise, if any, on these species would be short-term and temporary during the eight day to ten week construction periods of the nine anticipated meteorological towers. It would take 1-2 days to install each of the meteorological buoys anticipated in the New Jersey, Delaware and Maryland WEAs. Noise effects could include avoidance or attraction responses to structures because of noise, but such effects would be difficult to distinguish from similar effects from lighting or the visual presence of the structures. Unlike large-scale wind turbines used at commercial wind facilities, the small wind turbines (with blades less than 2 m) that may be used for charging batteries on the anticipated meteorological towers and buoys are not expected to impact bats.

Because of the anticipated distance between the meteorological towers and buoys and the sporadic occurrence of bats, there would be no additive effect of constructing all the meteorological towers or placement of buoys on bats.

In addition to collecting meteorological and oceanographic data, these meteorological towers and buoys would provide platforms that would assist in conducting biological studies, including monitoring of bats, to aid in future environmental assessments of OCS activities under the regulations.

Site Characterization Activities

If bats are present, impacts from site characterization would be limited to avoidance or attraction responses to the vessels conducting surveys. Though greater than 90% of the surveys projected under the proposed action would occur within the WEAs, the presence of bats in the WEAs is unlikely during those surveys. While bats are more likely to be present during the surveying of a potential cable route to shore for each of the 13 anticipated leaseholds, less than 10% of the surveys projected under the proposed action would be associated with surveying of potential cable routes. These potential avoidance and attraction responses are not anticipated to have any effect on bats in coastal areas.

Non-Routine Events

It is remotely possible that migrating bats may on occasion be driven to offshore OCS waters by a storm and subsequently into a tower. However, the land-based roosting, breeding, and foraging behavior of bats, as well as their limited home ranges and echolocation sensory systems, suggest that the risk of them being blown so far out of their habitat range, and the unlikelihood that a bat so blown off course could return from the open oceans above the WEAs even if it did not strike a tower, makes the likelihood of any impact due to collision negligible.

Conclusion

While it is unlikely that bat species would be foraging or migrating through the area, these mammals may on occasion be driven to the project area by prevailing winds and weather. In the event bats are present, impacts would be limited to avoidance or attraction responses. Because of the anticipated distance between the meteorological towers and buoys, there would be no additive effect of constructing all the anticipated meteorological towers or placement of buoys on bats. In fact, the anticipated data collection activities may assist in future environmental analyses of impacts of OCS activities on bats. To the extent that there would be any impacts, the overall impact to bats by the proposed action would be negligible, if measurable.

Proposed Mitigation Measures

Proposed mitigation measures for birds, Section 4.1.2.5, including lighting restrictions and prohibition on guy wires may reduce or eliminate potential impacts on bats.

4.1.2.7 Fish and Essential Fish Habitat

4.1.2.7.1 Description of the Affected Environment

4.1.2.7.1.1 Fish

The Mid-Atlantic continental shelf has very diverse and abundant fishery resources due, in part, to its overlapping species ranges from New England and the south Atlantic. The New Jersey Baseline Study cites over 250 fish species in the Mid-Atlantic with 15% as temperate species and 75% as tropical-subtropical species (NJDEP, 2010a). Table 4.9 characterizes the major demersal finfish assemblages of the Mid-Atlantic Bight (MAB) which is also applicable to the Mid-Atlantic WEAs. Many of the fish species found in the Mid-Atlantic WEAs are of importance due to their value as commercial and/or recreational fisheries. However, some of the species are of special concern due to their depleted population status. All of the species present play a role in the ecosystem of the MAB as predator, prey, or in some other ecosystem function. A description of fishing activities and the economic value of fisheries is detailed in Section 4.1.3.6, Commercial and Recreational Fishing Activities, of this EA.

Fisheries

Table 4.9, gives a general guide to the demersal finfish assemblages in the Mid-Atlantic, however, in addition to the demersal finfish, there are also important shellfish and pelagic finfish that may be found in the area of the Mid-Atlantic WEAs. Important managed shellfish in the Mid-Atlantic continental shelf include scallops, horseshoe crabs, surfclams, and ocean quahogs. Pelagic species include herring, menhaden, bluefin tuna, sandbar sharks, and scalloped hammerhead sharks. A complete list of the species with EFH designated in the Mid-Atlantic WEAs through the Magnuson-Stevens Fishery Conservation and Management Act is included in Section 4.1.2.7.1.2 of this EA.

Species of Concern

Marine fish species of concern include the shortnose sturgeon, which is federally-listed as endangered, and can be found off the coasts of New Jersey and Delaware. It is also possible, although unlikely, that adult Atlantic salmon may occur off the coast while migrating to New England rivers to spawn; certain Gulf of Maine populations of Atlantic salmon are listed as endangered. Both the shortnose sturgeon and the Atlantic salmon are anadromous, meaning they spawn in rivers and spend their adult lives in the open ocean. The shortnose sturgeon is found in nearshore estuaries and rivers, including the Delaware River and Delaware Bay. Approximate age of females at first spawning is 11 years in the Hudson and Delaware Rivers. Females generally spawn every three years, although males may spawn every year. Threats to the species have included pollution, loss of access to spawning habitats and overfishing, both directly and incidentally (USDOC, NOAA, NMFS, 2010d).

Other fish species of concern that are found in the Mid-Atlantic include one ESA candidate species, the Atlantic sturgeon (listing currently in proposed rulemaking), and several Federal Species of Concern. The species of concern include three shark species; the dusky shark, the porbeagle shark, and the sand tiger shark; two herring; the alewife, blueback herring; Atlantic bluefin tuna; and the rainbow smelt (USDOC, NOAA, NMFS, 2010e). An additional fish species whose status is under review is the American eel, for which USFWS is the lead Federal agency responsible for conservation.

The Atlantic sturgeon, another anadromous species, may be found in rivers and nearshore habitats throughout the Mid-Atlantic but only recently confirmed to be in the Delaware River (New Jersey and Delaware) and the James River (Virginia). Primary threats to Atlantic sturgeon include habitat degradation and loss, ship strikes, and general depletion from historical fishing. Atlantic bluefin tuna (*Thunnus thynnus*) is a highly migratory, pelagic species that is found from the Gulf of Mexico to Newfoundland in coastal and open ocean environments. Spawning is principally in the Gulf of Mexico and in the Florida Straits (USDOC, NOAA, NMFS, 2011). The dusky shark may be found in the Mid-Atlantic, occurring from the surf zone to well offshore, and from surface waters to depths of 39.6 m (1300 ft). The dusky shark is not commonly found in estuaries due to a lack of tolerance for low salinities. The species migrates northward in summer and southward in fall. Sand tiger sharks may also be found in the Mid-Atlantic. They are generally a coastal species, usually found from the surf zone to depths of about 22.9 m (75 ft). They are, however, sometimes found at depths of 182.9 m (600 ft). Porbeagle sharks are pelagic and rarely enter shallow coastal waters. They are distributed in the water column from the surface down to depths of up to 1,000 ft. On the Atlantic OCS the species range from Maine to New Jersey with the primary concentration the Gulf of Maine and Georges Bank. However, EFH for porbeagle has been identified on the continental shelf off Virginia.

Herrings and smelts are generally found throughout the Mid-Atlantic in nearshore waters, coastal bays and estuaries up to spawning grounds in upstream riverine habitats. Their decline has generally been attributed to loss of upstream habitat due to man-made impediments (i.e., dams) and fishing pressure.

American eel (*Anguilla rostrata*) are found in fresh, brackish, and coastal waters from the southern tip of Greenland to northeastern South America. American eels begin their lives as eggs hatching in the Sargasso Sea. They take years to reach freshwater streams where they mature, and then they return to their Sargasso Sea birth waters to spawn and die. They are the only species of freshwater eels in the Western Hemisphere. Threats to American eel include habitat loss, including riverine impediments, pollution and nearshore habitat destruction; and fishing pressure (Greene et al., 2009).

Table 4.9

Major Recurrent Demersal Finfish Assemblages of the Mid-Atlantic Bight During Spring and Fall

Season	Species Assemblage				
	Boreal	**Warm Temperate**	**Inner Shelf**	**Outer Shelf**	**Slope**
Spring	Atlantic cod Little skate Sea raven Monkfish Winter flounder Longhorn sculpin Ocean pout Silver hake (Whiting) Red hake White hake Spiny dogfish	Black sea bass Summer flounder Butterfish Scup Spotted hake Northern searobin	Windowpane flounder	Fourspot flounder	Shortnose greeneye Offshore hake Blackbelly rosefish White hake
Fall	White hake Silver hake (whiting) Red hake Monkfish Longhorn sculpin Winter flounder Yellowtail flounder Witch flounder Little skate Spiny dogfish	Black sea bass Summer flounder Butterfish Scup Spotted hake Northern searobin Smooth dogfish	Windowpane flounder	Fourspot flounder Cusk eel Gulf stream flounder	Shortnose greeneye Offshore hake Blackbelly rosefish White hake Witch flounder

Source: Colvocoresses and Musick (1984).

4.1.2.7.1.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires fishery management councils to: 1) describe and identify EFH in their respective regions; 2) specify actions to conserve and enhance that EFH; and 3) minimize the adverse effects of fishing on EFH. The Act requires Federal agencies to consult on activities that may adversely affect EFH designated in fishery management plans. Chapter 4.2.11.3 of the Programmatic EIS also provides a broad overview on EFH in the Atlantic.

Additionally, fishery management councils identify habitat areas of particular concern (HAPCs) within fishery management plans. HAPCs are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation. None of the individual Mid-Atlantic WEAs overlaps with a designated HAPC. However, sandbar shark HAPC is located inshore of New Jersey, Delaware, and Virginia WEAs which may be transited by vessels and/or surveyed for site characterization of possible cable routes to shore.

BOEMRE has determined that EFH has been designated for the following species for one or more life stages in one or more of the Mid-Atlantic WEAs:

New England Fishery Management Plan Species

Atlantic herring	Monkfish	Smooth skate
Atlantic sea scallops	Ocean pout	Thorny skate
Barndoor skate	Offshore hake	Witch flounder
Clearnose skate	Red hake	Yellowtail flounder
Haddock	Rosette skate	Winter flounder
Little skate	Silver hake	Windowpane flounder

Mid-Atlantic Fishery Management Plan Species

Atlantic mackerel	Surfclam	Spiny dogfish
Black sea bass	Monkfish	Summer flounder
Bluefish	Ocean quahog	Illex squid
Butterfish	Scup	Loligo squid

South Atlantic Fishery Management Plan Species

Cobia	King mackerel	Spanish mackerel

Atlantic Highly Migratory Species Fishery Management Plan Species

Albacore tuna	Porbeagle	Caribbean Sharpnose
Atlantic angel shark	Sand tiger shark	Shark
Atlantic bigeye tuna	Sandbar shark	Galapagos Shark
Atlantic bluefin tuna	Scalloped hammerhead	Narrowtooth Shark
Atlantic sharpnose	Shortfin mako	Sevengill Shark
Atlantic skipjack	Silky shark	Sixgill Shark
Atlantic swordfish	Thresher shark	Smooth Hammerhead
Atlantic yellowfin tuna	Tiger shark	Shark
Basking shark	White marlin	Smalltail Shark
Blue marlin	White shark	Smooth Dogfish
Blue shark	Bigeye Sand Tiger	Longbill Spearfish
Dusky shark	Shark	Blacktip Shark
Longfin mako	Bigeye Sixgill Shark	

4.1.2.7.2 Impact Analysis of the Proposed Action

Acoustic Effects

This section on acoustic effects is a brief summary of what is known about sound sensitivity in marine fish and the impacts of sound that could be produced as a result of site characterization and assessment activity in the Mid-Atlantic WEAs.

The auditory thresholds of marine fish that could occur in the Mid-Atlantic WEAs are not well studied. A fishes inner ear and the lateral line overlap in the frequency range to which they respond. The lateral line appears to be most responsive to signals ranging from below one Hz to between 150 and 200 Hz (Coombs et al., 1992), while the ear responds to frequencies from about 20 Hz to several thousand Hz in some species (Popper and Fay, 1993; Popper et al., 2003). The specific frequency response characteristics of the ear and lateral line varies among different species and is probably related, at least in part, to the life styles of the particular species.

As for sound production in fish, Myrberg (1980) states that members of more than 50 fish families produce some kind of sound using special muscles or other structures that have evolved for this role, or by grinding teeth, rasping spines and fin rays, burping, expelling gas, or gulping air. Sounds are often produced by fish when they are alarmed or presented with noxious stimuli (Myrberg, 1981; Zelick et al., 1999). Some of these sounds may involve the use of the swim bladder as an underwater resonator. Sounds produced by vibrating the swim bladder may be at a higher frequency (400 Hz) than the sounds produced by moving body parts against one another. The swim bladder drumming muscles are correspondingly specialized for rapid contractions (Zelick et al., 1999).

Myrberg (1981) has identified various categories of acoustic communication that are used by fishes. These are startle or warning sounds that may help protect individuals and groups from predation; courting sounds used as part of the usual mating behaviors including advertisement; swimming sounds used in schooling and aggregation; aggressive sounds used when competing for mates; sounds used in other aggressive interactions (e.g., in territorial defense); sounds used by interceptor species to avoid predation or to locate prey; and sounds overheard and used to competitive advantage by competitors. Sounds are known to be used in reproductive behavior by a number of fish species, and the current data lead to the suggestion that males are the most active producers. Sound activity often accompanies aggressive behavior in fish, usually peaking during the reproductive season. Those benthic fish species that are territorial in nature throughout the year often produce sounds regardless of season, particularly during periods of high-level aggression (Myrberg 1981). In addition to the behaviors classified by Myrberg (1981) as communication, it is also likely that hearing is used to help form a general image of the auditory scene that may include both other fishes and abiotic sound sources and scatterers.

High Resolution Geological Survey Acoustic Effects

Sections 3.1.1 and 4.1.2.3 detail a proposed action scenario for HRG surveys, which is not repeated herein.

The impact of HRG survey noise on marine fish that could occur in the Mid-Atlantic WEAs is not well understood. Generally, noise generated by HRG surveys may have physical and/or behavioral effects on fish. Hastings et al. (1996) suggested that sounds 90 to 140 dB above a fish's hearing threshold may potentially injure the inner ear of a fish. This suggestion was supported in the findings of Enger (1981) in which injury occurred only when the stimulus was 100 to 110 dB above threshold at 200 to 250 Hz for the cod. Hastings et al. (1996) derived the values of 90 to 140 dB above threshold by examining the degree of masking and how similar the masking signal and test signal are. The data on other species are much less extensive. Chapman and Hawkins (1973) found that ambient noise at higher sea states in the ocean have masking effects in cod, haddock, and pollock. Additionally, sound could also produce generalized stress (Wysocki et al., 2006). Thus, based on limited data, it appears that for fish communication masking and stress may occur in fish exposed to this level of sound.

Effects on fish are generally expected to be limited to avoidance of the area around the HRG survey activities and short-term changes in behavior. The region of best hearing in the majority of fish for which there are data available is from 100 to 200 Hz up to 800 Hz. Adult fish are highly mobile and may be expected to quickly leave an area when disturbed. While an HRG survey may disturb more than one individual, routine surveys are not expected to result in population-level effects. Individuals disturbed by a survey would likely return to normal behavioral patterns after the survey has ceased (or after the animal has left the survey area).

Fish are not expected to be exposed to sound pressure levels that could cause hearing damage. Side-scan sonar, which uses a low-energy, high-frequency signal, is not expected to affect fish, based on fish hearing data. Because of the limited immediate area of ensonification and duration of individual HRG surveys that may be conducted during site assessment, few fish may be expected in most cases to be present within the survey areas. Thus, potential population-level impacts on fish from HRG surveys are expected to be negligible.

Sub-bottom Reconnaissance Acoustic Effects

Acoustic impacts from borehole drilling are expected to be below 120 dB. Previous estimates submitted to BOEMRE for geotechnical drilling have source sound levels not exceeding 145dB at a frequency of 120Hz (USDOC, NOAA, NMFS, 2009). Previous submissions to BOEMRE also indicated that boring sound should attenuate to below 120 dB by the 150m isopleth.

Meteorological Tower Pile-Driving Acoustic Effects

Section 3.1.2 and 4.1.2.3 detail a proposed action scenario and acoustic effects for pile driving, which is not repeated herein.

Meteorological tower construction noise could disturb normal behaviors (e.g., feeding) of marine fish. Depending upon the several factors, including the sound source and physical oceanographic features, behavioral effects may be incurred at ranges of many miles, and hearing impairment may occur at close range (Madsen et al., 2006). As discussed in the impacts from HRG survey, behavioral reactions may include avoidance of, or flight from, the sound source and its immediate surroundings, disruption of feeding behavior, and generalized stress (Wysocki et al., 2006). Fish that do not flee the immediate action area during the pile driving procedure could be exposed to lethal sound pressure levels.

Benthic Effects

Section 4.1.2.2 of this EA discusses the benthic resources and impacts from the proposed action upon those resources. This section only discusses those impacts in relation to fish and their habitat. Benthic effects from the proposed action that would impact fish and fish habitat is anticipated to be temporary and limited to the immediate area surrounding the activity.

Sub-bottom Sampling

As stated in Section 4.1.2.2 of this EA, the sub-bottom sampling would result in a negligible temporary loss of some benthic organisms (i.e., less than one ft diameter would be disturbed in the areas where cores are sampled), and a localized increase in disturbance due to vessel activity, including noise and anchor cable placement and retrieval. This activity could impact marine fish by removing a small amount of forage items for these species. However, due to the small footprint, the temporary nature of the action, and likely availability of similar benthic habitat around the sampling location, it is expected that this activity would have negligible benthic effects that could impact federally-managed fish species that occur in the Mid-Atlantic WEAs.

Meteorological Tower/Buoy Installation

The installation of a meteorological buoy and/or the construction of a meteorological tower would have benthic effects that are temporary in nature. It is anticipated that there would be some sediment that would become suspended around deployed anchoring systems and around monopoles resulting from the installation activity. This sediment would be dispersed and settle on the surrounding seafloor. Depending upon the currents this could potentially smother some benthic organisms. However, as mentioned previously the Mid-Atlantic Bight is considered a high energy environment that sees much sediment transport in its natural state. It is expected that any sedimentation that would occur around an installed tower or buoy would have only minor temporary effects that could impact the habitat and food availability for federally-managed fish species. The loss of benthic habitat as a result of scour and/or scour control systems around foundations and moorings is discussed in Section 4.1.2.2 of this EA. Sessile marine invertebrates, including molluscan shellfish, would be lost in the footprint of the foundation/mooring and any scour control system. It is expected that finfish would leave the area of the foundation and scour control system for adjacent, non-impacted areas.

Meteorological Tower/Buoy Operation

It is expected that the installation of meteorological towers and large anchoring systems, that if introduced to soft sediments would introduce an artificial hard substrate that opportunistic benthic species that prefer such substrate could colonize. In addition, minor changes in species associated with softer sediments could occur due to scouring around the pilings (Hiscock et al., 2002). Certain fish species (e.g., tautog, black sea bass, Atlantic striped bass) would likely be attracted to the newly formed habitat complex, and fish population numbers in the immediate vicinity of the anchors and monopoles are likely to be higher than in surrounding waters away from the structures. However, a single meteorological tower or buoy within a lease block is not expected to result in significant changes in local community assemblage and diversity nor the availability of habitat and forage items in the action area.

Discharge of Waste Materials and Accidental Fuel Leaks

Collisions between vessels and allisions between vessels and meteorological towers and buoys is considered unlikely (see Section 3.2.2 of this EA). However in the unlikely event that a vessel allision or collision were to occur, the most likely pollutant to be discharged would be diesel fuel. If a diesel spill were to occur, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (see Section 3.2.3 of this EA). It expected that pelagic fish and larval fish that can be found high in the water column would be negatively impacted by such a spill. However, these impacts are not expected to be significant to the populations they represent due to the temporary nature of a spill limited area over where a spill effect. Overall impacts to fish resources from diesel spills resulting from collisions are expected to be minimal.

Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. Operational discharges from construction vessels would be released into the open ocean where they would be rapidly diluted and dispersed, or collected and taken to shore for treatment and disposal. Sanitary and domestic wastes would be processed through on-site waste treatment facilities before being discharged overboard. Deck drainage would also be processed prior to discharge. Thus, waste discharges from construction vessels would not be expected to directly affect fish or their habitat.

Fish can be adversely impacted by the ingestion of, or entanglement with, solid debris. Fish that have ingested debris, such as plastic, may experience intestinal blockage, which in turn may lead to starvation, while toxic substances present in the ingested materials (especially in plastics) could lead to a variety of lethal and sub-lethal toxic effects. Entanglement in plastic debris can result in reduced mobility, starvation, exhaustion, drowning, and constriction of, and subsequent damage to, limbs caused by tightening of the entangling material. The discharge or disposal of solid debris into offshore waters from OCS structures and vessels is prohibited by BOEMRE (30 CFR 250.300) and the USCG (MARPOL, Annex V, Public Law 100−220 [101 Statute 1458]). Thus, entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during normal operations. Because of the limited duration and area of vessel traffic and construction activity that might occur with construction, operation, and decommissioning of a meteorological tower and/or met buoy, the release of liquid wastes would occur infrequently. Accidental fuel release during site characterization activities is expected to minimal. Thus overall impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels during site assessment and site characterization activities are expected to be minor.

Meteorological Tower and Buoy Decommissioning

The decommissioning of meteorological towers and buoys is described in Chapter 3 of this EA. Upon completion of site assessment, the meteorological tower would be removed and transported by barge to shore. During this activity, fish may be affected by noise and operational discharges as described for meteorological tower construction. Removal of the piles would be accomplished by cutting the piles (using mechanical cutting or high-pressure water jet) at a depth of 4.6 m (15 ft) below the seabed. Fish could be affected by noise produced by pile cutting equipment. Only fish in the immediate vicinity of the characterization site (those that had not moved away from the area upon arrival of decommissioning vessels) would be expected to be affected during tower removal and transport, and pile cutting. Disturbance of fish during decommissioning is expected to be minor.

Natural and Unanticipated Events

There is a potential for natural and/or unanticipated events to cause impacts to the environment during site assessment activities. In the case of a natural event, a hurricane or severe storm may impact meteorological towers or buoys at some time during the operation. Depending on the severity of the event, components of the facility could be damaged, destroyed, or cut loose resulting in temporary sea hazards until the device can either be retrieved, as in the case of a buoy, repaired, or removed. It should be noted that buoys have GPS systems that alert the investigators if they move beyond their operating area. The USCG and mariners would be notified immediately if this were to happen. Similar alerts would occur if a meteorological tower were experience severe damage.

As with any structure placed the ocean, there is a chance that a vessel, other than a maintenance or construction vessel, could collide with the structure causing catastrophic damage to the vessel, tower or both. This type of collision is unanticipated since it would require a loss of vessel power or steerage, high winds or a sea state that would drive the vessel toward the structure, and failure of the vessel's and/or structure's design to withstand the impact. In the absence of these factors current regulatory measures require placement of structures outside of traffic lanes, lighting, and mariner notifications of the placement of structures that should prevent collisions of this type from occurring. If an unanticipated collision were to occur, and a vessel's cargo was discharged, the impacts would depend upon that of the type and amount of cargo discharged, whether oil, liquefied natural gas, chemicals, or other commodities.

Conclusion

The proposed action and the potential effects of HRG survey noise on marine fish are generally expected to be limited to avoidance around the HRG survey activities and short-term changes in behavior. Thus, potential population-level direct and indirect impacts on fish for HRG surveys is expected to be negligible.

Meteorological tower construction noise could disturb normal behaviors. As discussed in the analysis of HRG surveys, behavioral reaction may include avoidance of, or flight from, the sound source. Fish that do not flee the immediate action area during pile driving procedure could be exposed to lethal sound pressure levels. Additionally, due to likelihood of mitigation measures required by NMFS for endangered species as evidenced by previous Section 7 consultations for similar activity and presented as proposed mitigation measures in Appendix C, this impact would be further minimized. Measures to protect endangered marine mammal and sea turtles will benefit fish and likely include the implementation of a "soft start" procedure and that no pile driving occur if any whales or sea turtles are present within 7 km of the pile to be driven.

As a result of sub-bottom sampling small footprint, it is expected this activity would have negligible benthic effects that could impact federally-managed fish species that may occur in the Mid-Atlantic WEAs. Impacts related to meteorological towers/buoys installation, operation and decommissioning is expected to be minor and not expected to result in changes in local community assemblage and diversity.

Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. The entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during normal operations. Impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor due to the limited number of structures and vessels involved with their construction, operation, and decommissioning.

There is a potential for natural and/or unanticipated events to cause impacts to the environment during site assessment activities. A natural event such as a severe storm may impact meteorological towers or buoys at some point during operation. If unanticipated collisions were to occur, and a vessel's cargo was discharged, the impacts would depend upon that of the type and amount of cargo discharged at the time. Due to the limited number of structures anticipated in Chapter 3 of this EA and the considerations for their placement, the likelihood of natural and unanticipated events from occurring is rare.

Proposed Mitigation Measures

As discussed above, various aspects of site assessment and characterization activities may impact fish resources. It is anticipated that the primary impact would come from meteorological tower construction. This activity could disturb cause behavioral effects at ranges of many miles, and hearing impairment may occur at close range (Madsen et al., 2006). Fish that do not flee the immediate area of pile driving could be exposed to terminal sound pressure levels.

Although these impacts are not anticipated to have population-level effects on individual fish populations or stocks, mitigation measures likley to be required by NMFS for endangered species this impact would be further minimized. Measures to protect endangered marine mammal and sea turtles will benefit fish and likely include the implementation of a "soft start" procedure and that no pile driving occur if any whales or sea turtles are present within 7 km of the pile to be driven. The requirements resulting from previous ESA Section 7 consultations with NMFS are incorporated into Appendix C as proposed mitigation measures for this action.

4.1.3 Socioeconomic Conditions and Impacts

4.1.3.1 Archaeological Resources

Offshore New Jersey, Delaware, Maryland and Virginia to the seaward extent of the WEAs, where bottom disturbing activities associated with the proposed action would occur, has the potential to contain historic and prehistoric archaeological resources. While indistinguishable from existing traffic, vessel traffic associated with the proposed action would be visible from coastal areas of New Jersey, Delaware, Maryland and Virginia that would support the proposed action.

4.1.3.1.1 Description of the Affected Environment

A general description of archaeological resources (prehistoric and historic) in the Atlantic Region generally can be found in Chapter 4.2.19 of the Programmatic EIS. The WEAs and potential cable corridors offshore New Jersey, Delaware, Maryland and Virginia (see Figure 4.6 for an example), where bottom disturbing activities associated with the proposed action would occur have the potential to contain historic and/or prehistoric archaeological resources.

Offshore archaeological resources in these general areas include numerous shipwrecks dating from as early as the 16th century (Koski-Karell, 1995; USDOI, BOEMRE, 2011b). The potential for finding shipwrecks increases in areas such as historic shipping routes, approaches to sea ports, reefs, straits, and shoals. The greatest concentration of shipwrecks per-linear mile of coastline in the Atlantic Region is found offshore the Mid-Atlantic states (USDOI, BOEMRE, 2011b). Offshore Maryland has the highest ratio of shipwrecks to miles of coastline, with over 19 shipwrecks per linear mile of coastline. Despite a relatively long coast of 112 miles, Virginia's 2,306 shipwrecks place it second with about 15 sites per mile of coastline. Offshore Delaware and New Jersey also have a very high ratio of shipwrecks per linear mile of coastline (USDOI, BOEMRE, 2011b, Section 12.6.3, Table 12-2). The distribution of wrecks offshore New Jersey, Delaware, Maryland and Virginia appears to closely correlate to vessel traffic, especially in the vicinity of port approaches and navigational hazards (Crothers, 2004; French, 1987; Matson, 1998; Morgan, 1989; Smith, 2003; USDOI, BOEMRE, 2011b). Using information from the BOEMRE Atlantic OCS Shipwreck Database, all four Mid-Atlantic WEAs and potential cable routes to shore lie entirely within areas characterized as having high probability zones for shipwrecks. A high probability zone is defined as the likelihood of encountering five (5) or more recorded or unknown wrecks per OCS block as part of cultural resource investigations (USDOI, BOEMRE, 2011b). An average-size leasehold of 10 OCS blocks would have the likelihood of 50 or more recorded or unknown wrecks.

The State of Delaware Historical and Cultural Affairs submitted two documents in response to BOEMRE's NHPA Section 106 consultation request: *Historic Context for Aids to Navigation in Delaware* and *Historic Archeological Context on the Maritime Theme with the Sub-theme Shipwrecks, Coastal Zone (1495-1940+/-).* Based on these documents, there is the potential to find a wide variety of shipwrecks from 17th century to 20th century ocean-going vessels particularly in the port areas. However, during the late 19th century, USACE engaged in wreck removal activity to clear navigation channels in the Delaware area. This activity may have reduced the number of potential shipwrecks present today. According to the Koski-Karell report, Delaware has a statewide predictive model for potential shipwreck distribution that classifies areas as having high, moderate or low potential for containing historically significant shipwrecks.

The identification of a shipwreck is necessary for making an assessment of its historical significance. While an unidentified vessel's name may not be readily determined, its physical characteristics usually provide data concerning its type, chronology, and function. That information enables the evaluation of a sunken vessel to be made in terms of its significance. Off the coast of Delaware specific information has been compiled to identify and classify types of ships that may have wrecked. The ship types have been categorized by watercraft design, which is closely related to chronological vintage and vessel function, and the level of potential significance has been provided (Koski-Karell 1995, p. 68).

Offshore archaeological resources also include submerged prehistoric sites (Nordfjord, 2006). The WEAs and potential cable corridors are located within regions of the OCS that may have been above sea level and available to aboriginal human populations during the last ice age (Garrison et al., 2011). Sea level data provides a guide as to where to look for drowned archaeological sites on the OCS. The highest rate of sea level rise during a period of known prehistoric occupation along the Middle Atlantic, which best estimates currently place at 11,600–11,100 years before present day (B.P.). This period, which based on sea level curves for the region corresponds to 55–42 m isobaths and encompasses all of the WEAs, experienced rapid sea level rise averaging 200–300 cm per year (Lowery, 2009), and represents a time when intact archaeological sites may have had a better chance of being inundated rapidly and preserved. This period was followed by a much slower rate of sea level rise (approximately 0.8 cm per year) until ca. 7000 B.P., after which the rate of sea level rise slowed even further (0.2 cm per year or less). After 7,000 B.P., archaeological sites presumably would have a higher frequency of erosion or destruction by the process of marine transgression (USDOI, BOEMRE, 2011b, Section 6.3).

4.1.3.1.2 Impact Analysis of the Proposed Action

Chapter 5.2.19 of the Programmatic EIS discusses impacts to archaeological resources that could occur from site assessment surveys, and construction, operation, and decommissioning of offshore structures. Impacts to archaeological resources offshore New Jersey, Delaware, Maryland and Virginia to the seaward extent of the WEAs that could occur from bottom disturbance and spills associated with site characterization surveys and site assessment activities (the installation of meteorological towers/buoys) associated with proposed action are discussed below. Viewshed impacts from vessels and structures associated with the proposed action are also discussed below.

Routine Activities

Site Characterization Activities

Site characterization activities, which include HRG surveys and geologic surveys (core sampling/testing), are not expected to impact offshore archaeological resources. Due to the cost associated with geologic surveys of the WEAs and potential cable corridors, it is assumed that these bottom disturbing geologic surveys would occur on each lease after HRG surveys. The HRG surveys, which would not disturb the bottom, should identify any archaeological resources and enable geologic surveys to avoid these resources (*see* GGARCH guidelines). The data collected during HRG surveys and interpreted by trained archaeologists and geologists would indicate any potential archaeological resources, so that the lessee can develop and implement appropriate avoidance measures prior to each geologic sampling, avoiding the cost of unnecessary or additional sampling. *See* Section 3.1.2 of this EA.

Any visual impacts of vessel traffic associated with survey activity to onshore cultural resources would be limited and temporary in nature, and would most likely not be distinguishable from existing vessel traffic.

Site Assessment Activities

Meteorological towers installed under the proposed action would be virtually invisible from shore based on the narrow profile of the structure, distance from shore, earth curvature, waves, and atmosphere (see Section 3.1.3.1, Visual Aesthetics, of this EA). Existing ports and other onshore infrastructure are capable of supporting site assessment activities with no expansion (see Sections 3.1.3.1 and 3.1.3.2). Any visual impacts to onshore cultural resources would be limited and temporary in nature and would consist predominately of vessel traffic, which most likely would not be distinguishable from existing vessel traffic.

It is anticipated that bottom disturbance associated with the installation of meteorological towers and buoys would disturb the seafloor in a maximum radius of 1,500 ft (~450 m) or 162 acres around each bottom-founded structure. This includes all anchorages and appurtenances of the support vessels. This would result in almost 6,000 acres of impacted seafloor, less than one percent of the WEAs, if all 12 anticipated meteorological towers were constructed and 25 meteorological buoys were installed. Direct impacts to archaeological resources within 1,500 ft of each meteorological tower and buoy would be the result of direct destruction or removal of archaeological resources from their primary context. Although this would be extremely unlikely given that the surveys described above would be conducted prior to the installation of any structure (see e.g., 30 CFR 285.610 and 285.611), should contact between the proposed activities and a historic or prehistoric site occur, there may be damage to or loss archaeological resources.

Archaeological resources are protected under the existing renewable energy regulations. In general, the lessee's SAP must contain information that would assist BOEMRE in complying with the NHPA and other relevant laws (30 CFR 285.611(a),(b)(6)). The lessee must also describe the archaeological resources that could be affected by the activities proposed in the plan, or that could affect the activities proposed in the plan.

BOEMRE advocates mitigation through avoidance. Avoidance strategies seek to ensure that harm or damage to objects of historical or archaeological significance would be minimized or non-existent. Should the surveys reveal the possible presence of an archaeological resource in an area that may be affected by its planned activities, the applicant would have the option to demonstrate through additional investigations that an archaeological resource either does not exist or would not be adversely affected by the seafloor/bottom-disturbing activities (30 CFR 285.802(b)).

If the lessee, while conducting activities, discovers a potential archaeological resource such as the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of historic objects, piles of ballast rock), prehistoric artifacts, and/or relict landforms, etc. within the project area the lessee is to:

1) Immediately halt seafloor/bottom-disturbing activities within the area of discovery;
2) Notify BOEMRE within 72 hours of its discovery;
3) Keep the location of the discovery confidential and take no action that may adversely affect the archaeological resource until BOEMRE has made an evaluation and instructs the applicant on how to proceed (30 CFR 285.802(a)(1)-(3) and 285.902(e)).

BOEMRE may require the lessee to conduct additional investigations to determine if the resource is eligible for listing in the National Register of Historic Places (NRHP) (30 CFR 285.802(b)). If further investigations indicate the archaeological resource is potentially eligible for the NRHP, BOEMRE would inform the lessee as to how to protect the resource, or how to mitigate the adverse effect to the resource.

Non-Routine Events

Diesel spills could occur due to vessel collisions or during generator refueling (see Section 4.1.1.2 of this EA discussing oil spills and impacts). If a diesel spill were to occur, it would be expected to dissipate very rapidly and not reach the seafloor or the coast (see Section 3.2.3 of this EA).

It is possible that an anchorage (from either a meteorological buoy or support vessel) may be unintentionally dragged across the seafloor in a storm event. This is unlikely since it is not expected that survey activities would not take place in periods of rough weather (see Section 3.1.2.4, Timing, of this EA) and that in reviewing a SAP, BOEMRE would ensure that appropriately-weighted anchorages would be used for a buoy (30 CFR 285.606, 285.610 and 285.801). The likelihood that archaeological resources could be impacted by a non-routine event, such as a spill or storm, is minimal. In addition, the results of HRG surveys required before SAP approvals should provide the information needed for BOEMRE to further assess the likelihood of damage to known sites from these unanticipated drag events. If a site is determined to have been potentially damaged, then BOEMRE may require the lessee to conduct additional investigations to determine whether the archaeological resources are potentially eligible for the NRHP, and if so, how to mitigate any potential adverse effect to the resource (30 CFR 285.802(b)).

Conclusion

Offshore New Jersey, Delaware, Maryland and Virginia to the seaward extent of the WEAs, where bottom disturbing activities associated with the proposed action would occur, has the potential to contain historic and prehistoric archaeological resources. However, the information generated from the lessee's initial site characterization activities and existing regulation measures would provide a significant reduction in any potential for seafloor/bottom-disturbing activities (e.g. core samples, anchorages and installation of meteorological towers and buoys) to cause damage or significant impacts to archaeological or historic resources. Visual impacts to onshore cultural resources would be limited and temporary in nature, and consist predominately of vessel traffic which most likely would not be distinguishable from existing vessel traffic.

Proposed Mitigation Measures

The following proposed mitigation measures are intended to reduce or eliminate the potential for adverse impacts to archeological resources by ensuring sufficient survey coverage, so that these resources can be identified and avoided. This section proposes that these mitigation measures be incorporated into any future decision to issue a lease or approve a SAP:

- On April 21, 2011, BOEMRE posted *"Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information Pursuant to 30 CFR Part 285,"* which provides recommended strategies, techniques, and elements for developing the data necessary to readily determine the absence or presence of sites, structures, or objects of historical or archaeological significance. *See* http://www.boemre.gov/offshore/RenewableEnergy/RegulatoryInformation.htm. This measure would require compliance with the latest BOEMRE guidelines to ensure that the area surveyed and resolution of the data presented would be sufficient to reliably cover any portion of the site that would be affected by the activities proposed in the plan, including all seafloor/bottom-disturbing activities.
- Severe storm events could cause anchorages that are not appropriately-weighted, to be unintentionally dragged across the seafloor and therefore, could impact archaeological resources. This measure would require that, in cases where archaeological resources are nearby, anchorages would surveyed after each severe storm event to ensure that they have remained in place.

4.1.3.2 Recreational Resources

4.1.3.2.1 Description of the Affected Environment

The coastal beaches, barrier islands, estuarine bays and sounds, river deltas, and tidal marshes of New Jersey, Delaware, Maryland and Virginia are used for recreational activity by residents of the local areas and tourists. Beaches are a major recreational resource that attracts tourists and residents to the coastal counties for fishing, swimming, shelling, beachcombing, camping, picnicking, bird watching, and other activities. The scenic and aesthetic values of beaches play an important role in attracting visitors. Recreation and tourism provide employment and wages in the coastal counties. The coastal waters of these areas would be transited by vessels associated with the proposed action. Recreational fishing is discussed in Section 4.1.3.6 of this EA.

New Jersey

The coastal counties of New Jersey are host to substantial recreation, particularly in connection with marine fishing and beach-related activities. The shorefronts along these counties in New Jersey contain a diversity of natural and developed landscapes and seascapes.

Table 4-12 presents employment in tourism-related industries in 2004 (National Ocean Economics Program, 2008). This source defines tourism related employment and wages as those from the following travel-related industries: amusement and recreation services, boat dealers, eating and drinking places, hotels and lodging places, marinas, recreational vehicle parks and campsites, scenic water tours, sporting goods retailers, zoos, and aquaria. The USEPA reports 263 beaches in the 5 coastal counties (Atlantic, Cape May, Middlesex, Monmouth, and Ocean) in New Jersey, which is summarized in Table 4-11 (USEPA, 2008b).

Maryland

Maryland's coastline and beach recreation areas attract many local citizens, as well as out-of-state visitors. Popular recreational activities include swimming, boating, fishing and sunbathing. There are a total of 68 beaches along the coast in the following counties, which is summarized in Table 4-11 (Anne Arundel, Baltimore, Calvert, Cecil, Kent, Queen Anne's, Somerset, St Mary's and Worcester) USEPA, 2008. Table 4-12 presents employment in tourism-related industries in 2004 (National Ocean Economic Program, 2008).

Virginia

Virginia's coastline accommodates recreational activities such as swimming, fishing, boating, jogging, camping, hiking and sunbathing. Virginia has a total of 47 beaches in the following coastal counties which is summarized in Table 4-11 (Accomack, Gloucester, Hampton, King George, Mathews, Newport News, Norfolk, Northampton, Virginia Beach and York) USEPA, 2008b. Table 4-12 presents employment in tourism-related industries in 2004 (National Ocean Economic Program, 2008).

Delaware

Sussex County is the coastal county of Delaware and is host to substantial recreation, particularly in connection with marine fishing and beach-related activities. The shorefronts along Sussex County offer a diversity of natural and developed landscapes and seascapes.

Delaware has 26 miles of Atlantic Ocean coastline in Sussex County. The USEPA reports 21 beaches in the coastal county of Sussex, which is summarized in Table 4-11 (USEPA, 2008b). Table 4-12 presents Delaware's ocean tourism and recreation economy by county in 2004.

Table 4.10

Number of Coastal Beaches in New Jersey, Maryland, Delaware and Virginia by County

Coastal Counties	Number
Middlesex – NJ	4
Monmouth – NJ	58
Ocean – NJ	84
Atlantic – NJ	48
Cape May – NJ	69
Sussex – DE	21
Anne Arundel – MD	27
Baltimore – MD	3
Calvert – MD	9
Cecil – MD	6
Kent – MD	8
Queen Anne's – MD	1
Somerset – MD	2
St, Mary's – MD	2
Worcester – MD	10
Accomack – VA	2
Gloucester – VA	1
Hampton – VA	2
King George – VA	1
Mathews – VA	1
Newport News – VA	4
Norfolk – VA	9
Northampton – VA	2
Virginia Beach – VA	24
York - VA	1
Total	399

Source: USEPA, 2008b.

Table 4.11

Related Tourism and Recreation Economy by County, 2004

New Jersey Counties	Employment	Wages
Atlantic	7,304	$126,533,089
Cape May	7,451	$140,660,261
Middlesex	1,510	$25,334,877
Monmouth	7,226	$120,926,902
Ocean	9,530	$148,370,859
Total	33,021	$561,825,988
Maryland Counties	**Employment**	**Wages**
Anne Arundel	11,917	$234,873,811
Baltimore	2,415	$33,447,117
Calvert	1,327	$14,709,539
Cecil	2,009	$27,550,770
Queen Anne's	1,682	$31,417,192
Somerset	442	$4,462,424
St. Mary's	2,175	$24,267,003
Worcester	977	$12,282,840
Total	22,944	$383,010,696
Delaware Counties	**Employment**	**Wages**
Sussex	6,102	$96,770,541
Total	6,102	$96,770,541
Virginia Counties	**Employment**	**Wages**
Accomack	422	$4,814,147
Gloucester	1,061	$12,418,216
Hampton	1,425	$16,426,950
King George	270	$2,808,593
Mathews	87	$708,437
Newport News	3,615	$43,621,282
Norfolk	6,303	$89,217,010
Northampton	424	$4,285,660
Virginia Beach	12,460	$168,069,426
York	1,282	$16,355,606
Total	27,349	$358,725,327

Source: National Ocean Economic Program, 2008.

4.1.3.2.2 Impact Analysis of the Proposed Action

Routine Activities

Impacts on recreational resources are not anticipated in connection with the proposed action. As discussed in Section 4.1.3.5, existing ports or industrial areas are expected to be used by vessels associated with the proposed action. Expansion of these existing facilities is not anticipated. Due to the distance to shore of the WEAs, it is estimated that most of the anticipated meteorological towers would not be visible from shore (see Section 3.1.3, Visual Aesthetics). The few meteorological towers located nearer to shore would be virtually invisible from shore due to the anticipated widths of these structures, and to the nominal atmospheric conditions offshore of the Atlantic coast. It is most likely that vessel traffic associated with the proposed action would use established nearshore traffic lanes. Chapter 5.2.22 of the Programmatic EIS concluded that, as tourism and recreation exists in its current state in the context of existing military, commercial, and recreational water and air vessels that currently traverse these coastal areas, it is unlikely that there would be any detrimental impact on tourism and recreation from the additional vessels associated with the proposed action. No information has been presented that would tend to invalidate discussion in the Programmatic EIS.

Non-Routine Events

The potential impacts of non-routine events on water quality are discussed in Section 4.1.1.2 of this EA. Spills could occur during refueling or as the result of a collision. Since the anticipated meteorological towers would be located 7 or more miles offshore, if a diesel spill occurred in the WEAs, it is unlikely a diesel spill would reach the shore. If a diesel spill were to occur, it would be expected to dissipate very rapidly and biodegrade within a few days. From 2000 to 2009, the average spill size for vessels other than tanker ships and tank barges was 88.36 gallons (U.S. Department of Homeland Security, USCG, 2011).

Litter on recreational beaches adversely affects the ambience of the beach environment, detracts from the enjoyment of beach activities, and increase administrative costs to maintain beaches. Due to the limited nature of the proposed activities and their distance from shore, it is unlikely that recreational beaches in New Jersey, Maryland, Delaware and Virginia would be impacted by waterborne trash as a result of the proposed action. Any beached litter and debris as a result of the proposed action is unlikely to be perceptible to beach users or administrators given the amount of vessel traffic and debris currently traversing the coastal areas of these states.

Conclusion

Due to the distance of the proposed lease areas from shore, the fact that no new coastal infrastructure would be necessary, and the small amount of vessel traffic associated with the proposed action that would be present in any given recreational area, no impacts to coastal recreational resources from routine activities or potential spills are expected. While impacts could occur from marine trash and debris, it is unlikely that they would be perceptible. Potential impacts to recreational fishing are discussed in Section 4.1.3.6 of this EA.

Proposed Mitigation Measures

The following proposed mitigation measures are intended to reduce or eliminate the potential for adverse impacts to recreational resources from the accidental release of trash and debris. This section proposes that these mitigation measures be incorporated into any future decision to issue a lease or approve a SAP:

To reduce or eliminate the risk of intentional and/or accidental introduction of debris into the marine environment all vessel operators, employees and contractors actively engaged in offshore operations would be required to be briefed on marine trash and debris awareness and elimination. The lessee would also be required to ensure that its 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.

4.1.3.3 Demographics and Employment

4.1.3.3.1 Description of the Affected Environment

Chapter 4.2.18 of the Programmatic EIS describes the heterogeneity of the Atlantic region's sociocultural systems, which is reflected by a variety of demographic, employment, income, land-use, and infrastructure patterns in the coastal communities of the affected states. The Atlantic region consists of a number of contrasting types of economic areas, which include metropolitan areas and large urban areas with highly complex economic structures; urban areas that serve a smaller number of more specialized economic functions; and a large number of local and regional market areas with relatively simple economic structures and smaller, less-diversified labor markets. Population and economic data for the shore adjacent counties of New Jersey, Delaware, Maryland and Virginia that would host onshore activities associated with the proposed action is presented in Table 4.12 below.

Table 4.12

Population and Economic Data for Shore Adjacent Counties of New Jersey, Delaware, Maryland and Virginia

State	Population	Establishments	Employment	Wages
New Jersey	4,603,659	134,919	1,988,958	$106,274,699,102
Delaware	873,092	28,417	412,760	$19,651,828,841
Maryland	2,770,774	72,708	1,254,334	$59,066,786,132
Virginia	2,164,775	60,172	1,107,847	$53,526,184,202

Sources: National Ocean Economics Program, 2011a and 2011b.

4.1.3.3.2 Impact Analysis of the Proposed Action

The proposed action would require various support services primarily within the coastal counties of Virginia, Maryland, Delaware and New Jersey. Due to the short duration of survey, construction, and decommissioning activities, any benefit to the population and economy would be short-term. Survey, construction, and decommissioning activities are not expected to employ many workers relative to the existing employment numbers (Table 4.12 above). Little activity is associated with maintenance and operation of the meteorological towers and buoys.

Conclusion

The proposed action is expected to have negligible but positive impacts on the population and employment of coastal counties of Virginia, Maryland, Delaware and New Jersey that would provide support services for the proposed action.

4.1.3.4 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629 (February 11, 1994)), requires Federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations. See the Final Alternative Energy Programmatic EIS for a complete description of method of analysis (USDOI, MMS, 2007a, pp 4-114 to 4-115,).

Impact Analysis

The proposed leases would be located seven or more nm from the nearest shoreline. Therefore, the data gathering activities or construction occurring within the proposed lease areas would not have disproportionately high or adverse environmental or health effects on minority or low-income populations. Only the use of existing coastal facilities has the potential to impact minority or low-income populations. However, existing fabrication sites, staging areas, and ports would support survey, construction, operation and decommissioning activities as discussed in Section 4.1.3.5 of this EA. No expansion of these existing onshore areas is anticipated to support the proposed action.

Conclusion

Due to the distance from shore and the use of existing facilities, the proposed action is not expected to have disproportionately high or adverse environmental or health effects on minority or low-income populations.

4.1.3.5 Land Use and Coastal Infrastructure

4.1.3.5.1 Description of the Affected Environment

As described in Sections 3.1.2 and 3.1.3 of this EA, and discussed further below, existing ports or industrial areas in New Jersey, Delaware, Maryland and Virginia are expected to be used in support of the proposed action. Existing sites would be used for fabrication, as staging areas, and crew/cargo launch sites for the installation, operation, and decommissioning of meteorological towers and buoys, and to conduct surveys. Expansion of these existing facilities is not anticipated in support of the proposed survey, construction, operation, or decommissioning activities. Based on prior site assessment proposals, proximity to the lease blocks, capacity to handle the proposed activities, and/or established business relationships between port facilities and lessees would be the key determinants of where a lessee would chose to stage its operations. Of the 149 largest ports (measured by annual cargo tonnage) in the United States, 35 are located along the East Coast (ERG, 2010). Because site characterization work is generally smaller in scale, infrastructure requirements are also likely to be smaller. Due to their proximity to the WEAs, the majority of the onshore activities associated with the proposed action would take place at nine major ports and 28 smaller ports in New Jersey, Delaware, Maryland and Virginia as described in the following section.

4.1.3.5.2 Impact Analysis of the Proposed Action

To survey the WEAs and potential cable routes, site characterization surveys would have to be conducted by multiple vessels and likely over several years per leasehold due to the number of survey miles projected. The Atlantic survey industry is not as established as the Gulf of Mexico industry, which primarily serves the oil and gas exploration and production industry. Survey ships in the Gulf of Mexico are generally 170 to 200 ft long and require a diesel refueling station. Because there is a smaller number of East Coast survey companies, lessees may be limited to where survey operations can launch from. For Atlantic surveys, 65 to 100 ft long vessels can be expected. Vessels must be able to accommodate a crew for several days and large enough to mount enough cable to tow instruments. These vessels may also require facilities with large cranes to load and unload large pieces of equipment, which would require a commercial port (Irion, personal communication, 2011).

HRG surveys and sub-bottom sampling work can either depart from one of the 35 large commercial ports or 129 smaller commercial ports (if those ports meet the requirements of the expedition) along the Eastern Seaboard. Because the research vessels that are used for HRG surveys and bottom sampling are smaller than most commercial vessels and require a smaller navigation channel depth, expeditions can depart out of most commercial ports. The proximity of a survey contractor to the lease blocks and/or established business relationships between ports and contractors would likely be the key determinants of where survey work would originate.

A meteorological tower platform would be constructed or fabricated onshore at a facility called a platform fabrication yard. Production operations at fabrication yards would include cutting, welding, and assembling of steel components. The yards occupy large areas with equipment including lifts and cranes, welding equipment, rolling mills, and sandblasting machinery. The location of these fabrication yards is directly tied to the availability of a large enough channel that would allow the towing of these bulky and long structures. The average bulkhead depth needed for water access to fabrications yards is 15-20 ft. A fabricator must also consider other physical limitations, such as the ability to clear bridges and navigate tight corners within channels. Thus, platform fabrication yards must be located at deep-draft seaports or along wider and deeper inland channels. The meteorological tower would be manufactured at a commercial facility in sections, and then shipped by truck, rail, or sea to the onshore staging area. The meteorological tower would be partially assembled and loaded onto a barge for transport to the installation site. Final assembly of the tower would be completed offshore.

A meteorological buoy can vary in height, breadth hull type and anchoring method. There are several meteorological buoy manufacturers located domestically with headquarters in Colorado, California and Florida (JCOMMOPS, 2011). International meteorological buoy manufacturers and designers are also likely competitors with domestic firms. Deepwater Wind, LLC is currently assembling a buoy that was manufactured in Norway and then trucked into the Rhode Island facility. Once constructed, the 15-ton buoy would be barged to a testing location (Kuffner, 2010). Whether the buoys originate domestically or internationally, it is likely that for future assessment work, buoys would arrive from manufacturers to lessee's staging areas by truck, rail or sea, then assembled and fitted with instrumentation and then tested before deployment via a vessel with enough deck space to accommodate a structure potentially up to 12 m as well as a crane to lower the buoy into the sea (USDOC, NOAA, 2007).

Currently there are four proposed OCS wind energy projects in various states of planning for the installation of meteorological towers and/or buoys off the coasts of New Jersey and Delaware, including Bluewater Wind New Jersey, LLC; Fishermen's Energy of New Jersey, LLC; and Deepwater Wind, LLC. Fishermen's Energy has proposed using Barney's Dock in the smaller Atlantic City Port. Bluewater has proposed the Port of Wilmington, Delaware as the fabrication site and staging area for construction and installation for its proposals off of Delaware and New Jersey. Bluewater would also use the Delaware Bay Launch located in the town of Milford, Delaware and the Indian River Marina located in the town of Rehoboth Beach, Delaware as crew boat and/or small cargo barge launch sites to support construction and operation activities. Deepwater Wind, on the other hand demonstrates that an established relationship with a particular port or area may be a stronger determinant of where companies would centralize their operations. Deepwater has proposed using a site in Rhode Island to manufacture its 105-ft-tall floating "spar buoy" and plans on deploying the buoy by barge to Block Island, RI for testing purposes, then finally shipped to its New Jersey lease area (Kuffner, 2010).

New Jersey

Of the 35 largest ports (measured by annual cargo tonnage) along the East Coast, New Jersey is home to three of these ports: Camden, Paulsboro and Trenton. With a 40-ft main channel depth, four terminals with eight berths between them, 1 multipurpose bulk/container crane with a capacity of 95 tons, and direct access to highways I-676, I-76, Rte. 130 and I-295, and rail access via Rail Connections CP Rail System, CSX, and Norfolk Southern, the Port of Camden is well-positioned to provide a link within the OCS wind supply chain (ERG, 2010). New Jersey is also home to the joint New York/New Jersey Port which maintains a 45-ft main channel depth and 0-24, 25-49, 50-100, 100+ Ton Lifts as well as fixed, mobile and floating cranes (World Port Source, 2011). Several major ports, both within the state of New Jersey and in surrounding states, exist near the WEA offshore New Jersey that are suitable to support the fabrication and staging of meteorological towers or buoys. Some of these ports include the Port of New York and industrial ports accessible via the Delaware Bay and Delaware River in Delaware and Pennsylvania (Atlantic Renewable Energy Corporation and AWS Scientific, Inc., 2004). For HRG surveys and bottom sampling, New Jersey has eleven smaller ports with varying capacities including Atlantic City that may be used (ERG, 2010).

Maryland

Of the 35 largest ports (measured by annual cargo tonnage) along the East Coast, Baltimore, Maryland is one of these ports. With 16 cargo terminals and facilities, 13 berths, a 50-ft main channel depth, as well as access to I-95, I-395, I-695, and intermodal connections to CSX Intermodal and Norfolk Southern, Baltimore is well positioned to provide a link within the OCS wind supply chain (ERG, 2010). There are several major ports in surrounding states near the WEA offshore Maryland that are suitable to support the fabrication and staging of meteorological towers or buoys. Some of these ports include the Port of New York and New Jersey and industrial ports accessibly via the Delaware Bay and Delaware River in New Jersey, Delaware, and Pennsylvania (Atlantic Renewable Energy Corporation and AWS Scientific, Inc., 2004). For HRG surveys and bottom sampling, Maryland has five smaller ports with varying capacities that includes Annapolis (World Port Source, 2011) that may be used.

Delaware

Of the 35 largest ports (measured by annual cargo tonnage) in the United States, located along the East Coast, Delaware is home to two of these ports: New Castle and Wilmington. The Port of Wilmington is an existing 308-acre onshore industrial site with access to port infrastructure including seven deepwater general cargo berths, a tanker berth, and a floating berth for roll-on roll-off (Ro-Ro) container vessels on the Christina River, and an automobile and Ro-Ro berth on the Delaware River. The Port of Wilmington is the busiest terminal on the Delaware River handling over 400 vessels per year (Port of Wilmington, 2011). The Port of Wilmington also has truck access via I-95 and rail via CSX and Norfolk Southern (ERG, 2010). "The Delaware Bay is home to the world's largest freshwater port and a strategic national port. The port receives over 3,000 commercial vessel arrivals annually carrying over 78 million metric tons of cargo worth over $47 billion. This steadily increasing trend in vessel traffic is projected to double by 2020" (Marriott and Frantz, 2007).

Several major ports in surrounding states exist near the WEA offshore Delaware that are suitable to support the fabrication and staging of meteorological towers or buoys. Some of these ports include the Port of New York and New Jersey and industrial ports accessibly via the Delaware Bay and Delaware River in New Jersey and Pennsylvania (Atlantic Renewable Energy Corporation and AWS Scientific, Inc., 2004). For HRG surveys and bottom sampling, Delaware has three smaller ports that may be used.

Virginia

Of the 35 largest ports located along the East Coast, three of these ports are located in Virginia: Hampton Roads, Hopewell and Richmond. With a 50-ft main channel depth, 4 cargo terminals, 18 berths, a Ro-Ro berth, and several post-Panamax cranes, access to several interstate systems and railways, as well as an initiative to use more environmentally-friendly equipment, the Port of Virginia (which is comprised of the three marine terminals in the Hampton Roads area) is well-positioned to provide a link within OCS wind supply chain (Rondof, 2009; ERG, 2010). For HRG surveys and bottom sampling, Virginia has nine smaller ports including several located within the Hampton Roads area that may be used (World Port Source, 2011).

Conclusion

Existing ports or industrial areas are expected to be used, and expansion of these existing facilities is not anticipated to support the proposed action. No significant impact on land use or coastal infrastructure is expected.

4.1.3.6 Commercial and Recreational Fishing Activities

4.1.3.6.1 Description of the Affected Environment

The area encompassed by the Mid-Atlantic WEAs is used actively for both commercial and recreational fishing. The following section discusses these activities in the context proposed action in the WEAs. An overview of commercial and recreational fishing for the entire Atlantic region is discussed in Chapters 4.2.23.1 and 4.2.23.2 of the Programmatic EIS, respectively. Section 4.1.2.7 of this EA discusses fish and fish habitat present in the Mid-Atlantic WEAs.

Recreational Fishing

The Mid-Atlantic region boasts an active recreational fishing sector in coastal waters and in waters over the WEAs. Between 2008 and 2010, New Jersey, Delaware, Maryland, and Virginia averaged 550,000, 24,000, 67,500, and 54,250 recreational fishing trips in Federal waters respectively (USDOC, NOAA, NMFS, Office of Science and Technology, 2011). The top recreational fish species by weight in the Mid-Atlantic for the same time period were bluefish, black sea bass, Atlantic striped bass, and dolphin (USDOC, NOAA, NMFS Office of Science and Technology, 2011). Figures 4.3 and 4.4 below show recreational fishing effort density in and around the Mid-Atlantic WEAs using NMFS vessel trip report data for chartered fishing vessels and recreational fishing party vessels. The data is a sum of the total days fished for the calendar year period 2004 – 2008. Spatial angling data from private fishing vessels is not available.

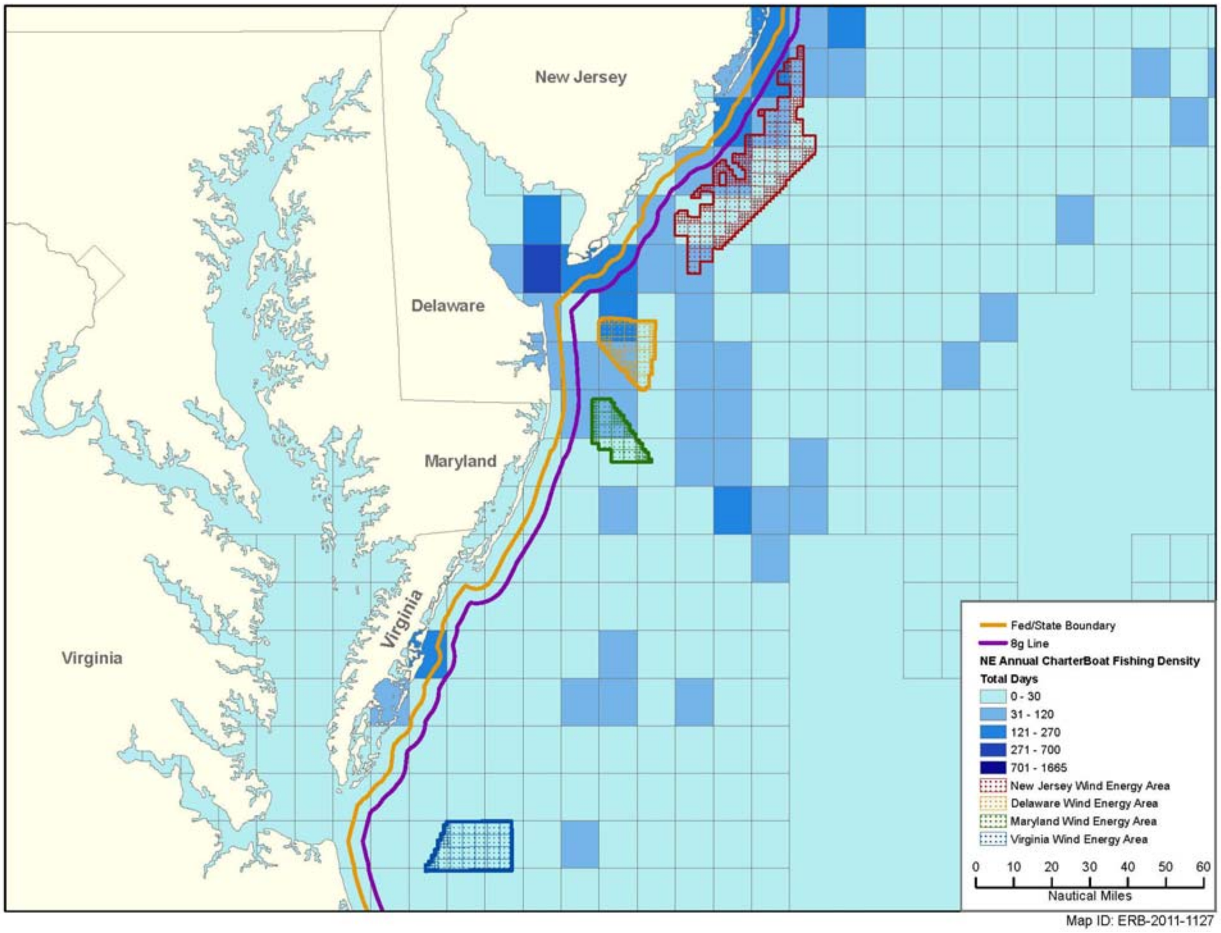

Figure 4.2. Recreational charter boat fishing effort 2004-2008.

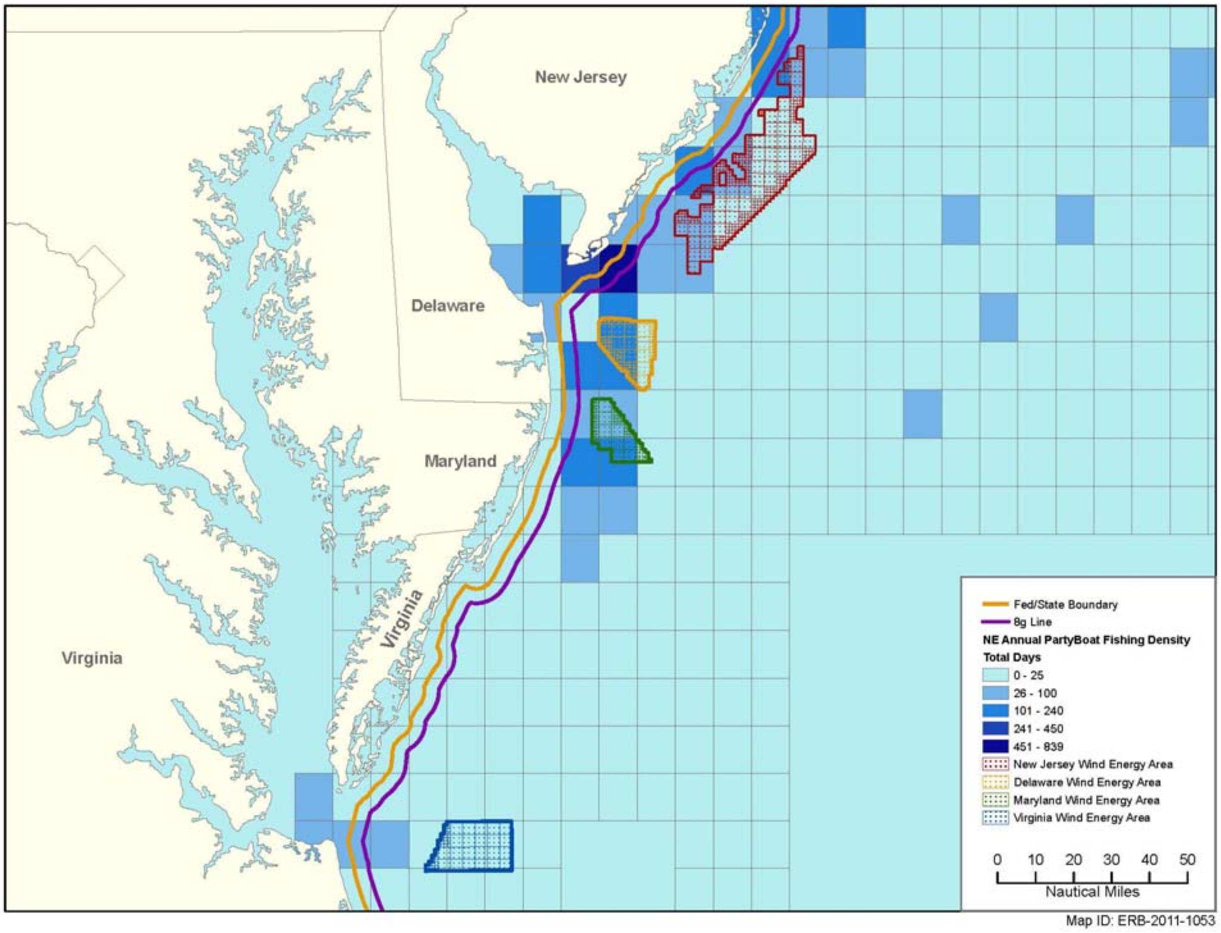

Figure 4.3. Recreational party boat fishing effort 2004-2008.

Commercial Fishing

The most important species by dollar value present in and around the Mid-Atlantic WEAs are sea scallops, surfclams, ocean quahogs, menhaden, striped bass, and blue crab (USDOC, NOAA, NMFS, Office of Science and Technology, 2011). The total landed commercial fishery weight and value for each state in 2009 is presented in Table 4.13. However, it should be noted that that state of landing may not reflect the area from which the fishery is prosecuted. For instance, Federal regulations prohibit striped bass fishing beyond 3 miles from shore (50 CFR 697.7(b)), blue crab is primarily an estuarine species, and ocean quahogs are generally harvested in deeper and/or colder waters than those directly adjacent to New Jersey where they are landed. Figure 4.4 shows commercial fishing effort for all gear types in the Mid-Atlantic WEAs. The data is a sum of the total days fished from NMFS' vessel trip reports in each 30 minute (approximately 30 nm) square block for the calendar year period, 2004 – 2008.

Table 4.13

Total Commercial Fishery Landed Weight and Value in 2009

State	Metric Tons	Pounds	$
Delaware	2,272.60	5,010,175	7,535,780
New Jersey	73,300.80	161,598,836	149,032,131
Maryland	30,986.60	68,312,955	76,057,117
Virginia	193,346.80	426,252,313	152,729,830
Total	299,906.80	661,174,279.00	385,354,858.00

Source: USDOC, NOAA, NMFS, Office of Science and Technology, 2011.

Fishing Ports

The Mid-Atlantic is home to some of the top national commercial fishing ports by value and landed weight. Table 4.14 shows the National ranking top ports by value adjacent to the Mid-Atlantic WEAs.

Table 4.14

Top Ports by National Value Rank Adjacent to WEAs

Rank	Port(s)	State	Millions of Pounds	Millions of Dollars
5	Cape May-Wildwood	NJ	63.9	73.4
6	Hampton Roads Area	VA	18	68.1
34	Reedville	VA	349.4	25.9
39	Point Pleasant	NJ	18.4	20.2

Source: USDOC, NOAA, NMFS Office of Science and Technology, 2011.

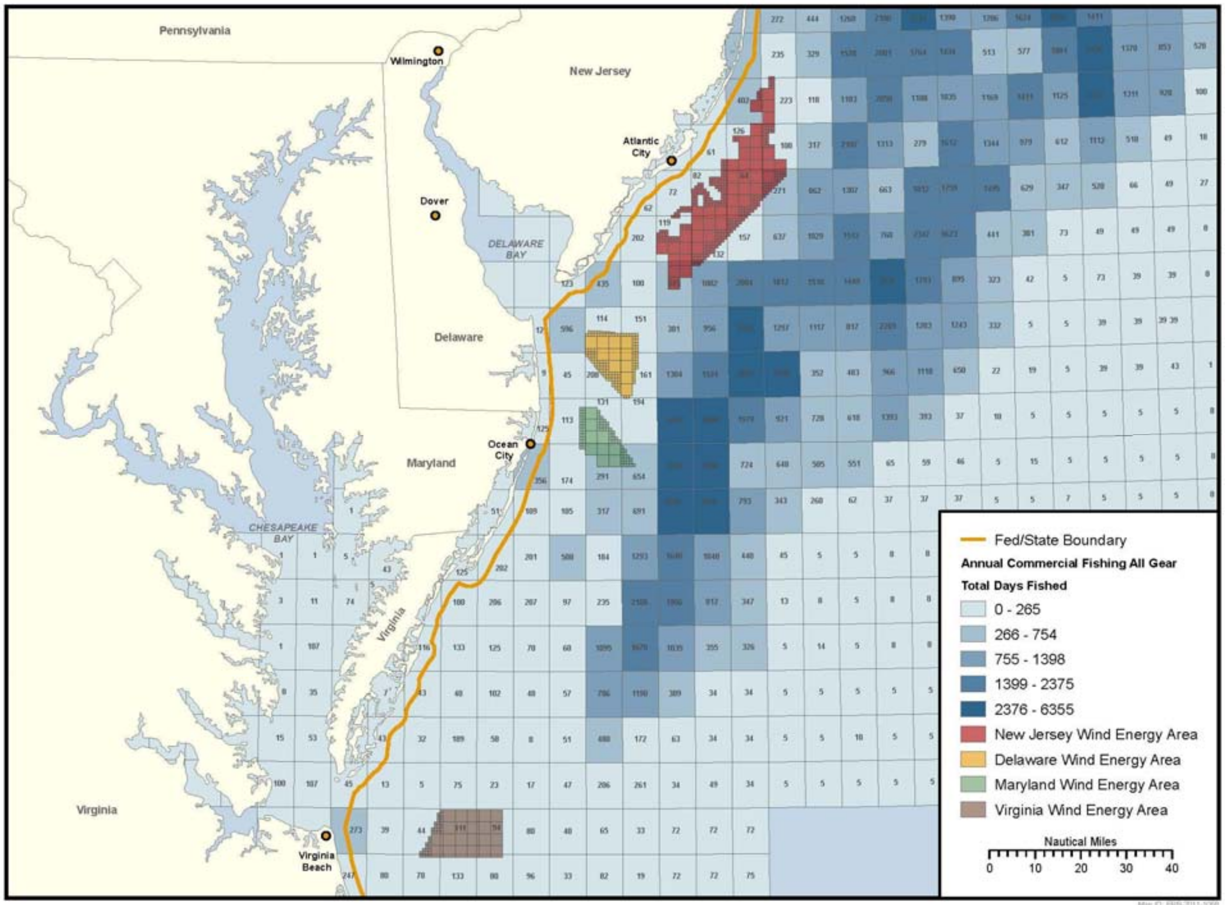

Figure 4.4. Annual Commercial Fishing – All Gear.

4.1.3.6.2 Impact Analysis of the Proposed Action

The following section discusses the potential impacts from the proposed action on commercial and recreational fishing activities in the Mid-Atlantic WEAs. The proposed action has two primary activities that could impact commercial and recreational fishing activities. These activities are: Routine activities (e.g. deployment and operation of a meteorological buoy or construction of a meteorological tower, and vessel traffic from surveys); and non-routine activities (e.g. allision with structures and accidental fuel discharge). The potential effects to commercial and recreational fishing activities can be grouped into two broad categories: (1) displacement; and (2) target species availability. Chapter 5.2.23.2 of the Programmatic EIS discusses impacts of typical site characterization and assessment activities on commercial and recreational species, while Section 4.1.2.7.2 of this EA discusses impacts specific to the proposed action on fish species and their habitat.

Routine Activities

Fishing Displacement

During site characterization and installation of meteorological buoys and towers, fishing vessels (primarily recreational party and recreational charter vessels) could be excluded from fishing grounds for short durations in order to avoid conflicts with survey vessels and/or construction vessels. It is anticipated that during installation and decommissioning of a meteorological tower or buoy, a radius of about 1,500 ft around the site would be needed for the movement and anchoring of support vessels. It is estimated to take 1 to 3 days to install a meteorological buoy and 1 to 10 weeks to install a meteorological tower. Displacement during site characterization surveys is estimated to be on the order of hours versus days. Site characterization surveys, and construction and decommissioning activities would likely occur during spring and summer months, which overlaps with both recreational and commercial fishing seasons.

Sections 3.1.3.1 and 3.1.3.2, describe the proposed action and the estimated footprint of meteorological tower and buoy. The area of ocean bottom affected by a meteorological tower or buoy would range from about two hundred square ft if supported by a monopole to a couple thousand square ft if supported by a jacket foundation. Fishing activities would be precluded from the footprint of the met observation platform. However, it is not anticipated that recreational and commercial fishing activities would be precluded from the immediate area outside the footprint. Since there is no electricity transmitted from met observation platforms, there are no electrical cables connecting the structures to shore or to other structures. It is likely that tying up to the structure by a vessel would be prohibited by the project developer as it is private property. The temporary displacement from vessel traffic avoidance, and construction activity is not anticipated to result in any measurable economic loss due to decreased fish catches or from reduced access to fishery resources.

It is very unlikely that activities associated with the proposed action would affect commercial fishing, as the majority of commercial fishing effort is outside the WEAs (see Figure 4.4). Although commercial fishing vessels could transit the WEAs, it is unlikely that survey activities or construction activities (projected to temporarily occupy less than one percent of the WEAs) would unreasonably interfere with access to the active fisheries beyond the WEAs.

Any of the anticipated meteorological towers would be removed to at least 5 m (15 ft) below the mudline to ensure that nothing would be exposed that could interfere with future lessees and other activities in the area (30 CFR 285.910). Once the meteorological towers are removed, the proposed sites would pose no obstacle to commercial or recreational fishing.

There are numerous port and marina locations shoreward of the Mid-Atlantic WEAs that may be utilized by commercial fishing vessels, recreational vessels, and project vessels. The projected number of vessel trips at any of these ports or marinas would be negligible (see Sections 3.1.2.6 and 3.1.3.4 of this EA).

Disturbances to Fish Resources

Fish resources could be temporarily affected by acoustic surveys associated with site characterization activities and by pile-driving activities associated with the installation of meteorological towers. The most substantial would be the acute acoustics associated with pile driving. It is anticipated that any fish in the immediate area of pile driving would flee upon commencement of activities. Moreover, soft-start pile driving is industry practice, and would likely be required by NMFS to ensure that marine mammals are not affected by the activity. However, if fish do not flee the area during the soft start pile driving procedure there could be limited mortality. Also during platform installation there would be increased turbidity resulting in temporary habitat loss. Post construction, it is expected that there would be both positive and negative impacts to fish habitat which would be negated in any case after decommissioning.

These impacts are not expected to have population-levels effect that would impact fisheries catch within or between fishing seasons.

Non-Routine Events

The potential impacts of non-routine events on water quality are discussed in Section 4.1.1.1.2 of this EA. During the various phases of the proposed action, multiple sources of diesel fuel would be present in vessels, generators, and pile driving hammers. Though unlikely, spills could occur during refueling or as the result of a collision. These would disperse, evaporate and biodegrade within a few days. From 2000 – 2009, the average spill size for vessels other than tank ships and tank barges were 88.6 gallons (U.S. Department of Homeland Security, USCG, 2011), and, should the proposed action result in a spill in any given area, BOEMRE anticipates that the average volume would be the same. If such a diesel spill were to occur, it would be expected to dissipate very rapidly, and would evaporate and biodegrade within a few days, resulting in negligible impact.

Conclusion

The increase in vessel traffic, and activities related to the installation/operation of the meteorological towers and buoys would not measurably impact commercial or recreational fishing activities, total catch of fish and shellfish, or navigation over any substantial period of time. Any impacts, such as localized fishing displacement and/or target species availability within the immediate area of proposed activities, would be of short duration, limited area, and temporary, and result in negligible, if detectible, impact to fishing.

Proposed Mitigation Measures

The following proposed mitigation measures are intended to reduce or eliminate the potential for adverse impacts to commercial and recreational fishing. This section proposes that these mitigation measures be incorporated into any future decision to issue a lease or approve a SAP:

Notification of Fishermen: To reduce potential economic impacts on commercial fishermen, lessees would be required to notify fishermen of construction and decommissioning activities via the USCG Local Notice to Mariners and daily broadcasts on Marine Channel 16. The notification would allow commercial and recreational fishermen to plan fishing trips to avoid the area where the activity would be taking place. This measure would save both time, fuel, and reduce the potential of any site use conflicts.

Additional Mitigation Measures: In addition, the mitigation measures that have been proposed to reduce or eliminate potential impacts on fish and EFH (Section 4.1.2.7.2 of this EA) and recreational resources (Chapter 4.1.3.2.2) would also benefit commercial and recreational fishing.

4.1.3.7 Other Uses of the OCS

4.1.3.7.1 Description of the Affected Environment

The vessel traffic and structures associated with the proposed action could pose a conflict with other existing and future uses of the OCS, including military activities, NASA activities, marine transportation, radar, other renewable energy activities, and the Marine Minerals Program

(MMP). These activities are discussed below with the exception of commercial and recreational fishing, and recreational boating, which are discussed in Sections 4.1.3.6 and 4.1.3.2 of this EA, respectively.

Military Activities

Chapter 4.2.16 of the Programmatic EIS discusses the numerous military use areas off the Atlantic Coast where the U.S. Navy, Marine Corps, Air Force, and Special Operations Forces conduct various testing, training and operational missions. The WEAs are located in naval operating areas (OPAREAS), which are offshore areas where the Navy conducts training exercises, military warning areas and restricted areas. Navy fleet and Marine Corps amphibious warfare training occurs nearly every day all along the east coast in these areas, as well as open ocean areas (USDOI, MMS, 2007a). The level of activity varies from unit-level training to full-scale Carrier/Expeditionary Strike Group pre-deployment certification exercises. Military aircraft test and train within special use airspace overlying the coast and in offshore warning areas (USDOI, MMS, 2007a). The U.S. Navy, USCG, Air Force and Air National Guard are responsible for various search and rescue missions that may be conducted anywhere on the Atlantic coast, including the areas in and near the WEAs. This may include the use of low flying aircraft and helicopters offshore.

The Atlantic City OPAREA is an area used for surface, sub-surface and air warfare training exercises located off the coast of New Jersey (Global Security, 2011). Approximately 40 OCS blocks in the New Jersey WEA are located in Warning Area 107A (W-107A) and roughly 1 ½ OCS blocks are located in Warning Area 107C (W-107C). The W-107A and W-107C areas are designated special use airspace over the Atlantic City OPAREA and are used for surface-to-air gunnery exercises using conventional ordnance and exercises (Global Security, 2011). The Virginia Capes OPAREA (VACAPES) is located off the Delaware, Maryland, Virginia and North Carolina coasts (see Figure 4.5). The north boundary of the VACAPES OPAREA is located 37 nm off the entrance to Delaware Bay at latitude 38º45' N, the farthest eastern boundary is 184 nm east of Chesapeake Bay at longitude 72º41' W, and the western boundary lies approximately 3nm off the coastline (Dept of Navy, 2008). The entire Delaware and Maryland WEAs, and approximately half of the Virginia WEA are located within the VACAPES OPAREA. Additionally, roughly half of the Delaware WEA and the entire Maryland WEA are located in Warning Area 386 (W-386). The W-386 air, surface, and sub-surface areas are utilized extensively to conduct air-to-air, air-to-surface, surface-to-air, and surface-to-surface missile exercises, gunnery exercises, and rocket exercises using conventional ordnance. Additional naval activities include supersonic flight operations, mine warfare training, and laser operations. When W-386 airspace is not in use for military activities it may be released to the FAA (U.S. Department of the Navy, 2008). The Virginia WEA also includes part of the W-387 surface transit corridor.

NASA Activities and Wallops Flight Facility

NASA Goddard Space Flight Center's Wallops Flight Facility (WFF) is located on Virginia's Eastern Shore between the Virginia and Maryland WEAs (see Figure 4.5). Portions of the Maryland WEA are located within the range of a U.S. Navy radar facility located at WFF and used to track launch and flight activities conducted by NASA and its partners. The radar may be used to track air-to-air, air-to-surface, surface-to-air, and surface-to-surface missile exercises, gunnery exercises, aircraft flights and rocket launches. When the Wallops Island radar is not in use for range support activities it may be released to the FAA (U.S. Department of the Navy, 2008).

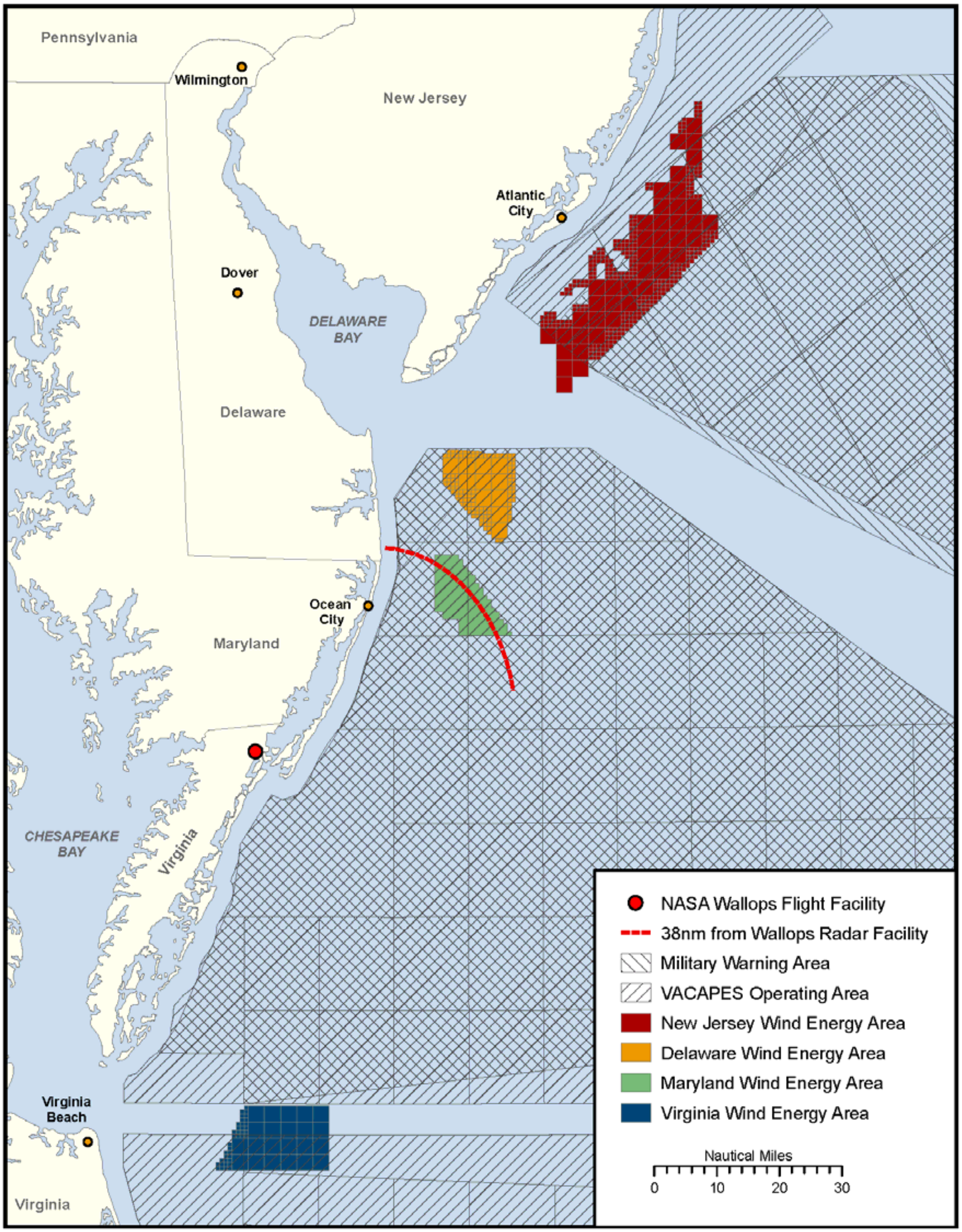

Figure 4.5. **Military Activity Areas and Uses.**

Marine Transportation

The general description of vessel traffic along the North Atlantic coast is incorporated here by reference and can be found in Chapter 4.2.17 of the Programmatic EIS (USDOI, MMS, 2007a). There are many major ports in the vicinity of the WEAs (see Section 4.1.3.5, Land Use and Coastal Ports Infrastructure of this EA). Vessels using these ports include military, commercial, recreational, and research vessels. Additionally, offshore waterways or shipping lanes are often not designated on navigational charts; and instead vessels follow routes determined by their destination, depth requirements, and weather conditions (Dept of Navy, 2008). Section 4.1.3.6 of this EA has information on recreational and commercial fishing vessel activity.

Shipping densities and vessel types vary along the Atlantic seaboard, with the highest vessel density levels associated with access routes to the major Atlantic ports. Commercial vessel traffic typically concentrates at the entrances of large bays, such as the Chesapeake and Delaware Bays. These two bays provide access to several major U.S. east coast ports, including Baltimore, Maryland; Philadelphia, Pennsylvania; Wilmington, Delaware; and the Hampton Roads area of Virginia. The Virginia WEA, near the entrance to Chesapeake Bay, has higher shipping densities and greater concentrations of commercial vessel traffic than the New Jersey WEA. Additionally, the Delaware and Maryland WEAs, adjacent to the entrance of Delaware Bay, also have similarly higher levels of shipping density and traffic concentrations than the New Jersey WEA (see Figure 4.6).

To facilitate organized, safe access to major ports, a non-mandatory TSS has been defined by the USCG near the mouths of both the Chesapeake and Delaware Bays. Commercial shipping in the area of major ports and bays is managed by TSSs and precautionary areas designated by 33 CFR 167 (see Figure 4.6).

The Delaware Bay TSS consists of two approaches (SE and NE), a two-way traffic route, and a precautionary area located shoreward of the approaches (see Figure 2). Each approach consists of an inbound and outbound lane, the exact coordinates of which are defined in 33 CFR 167.170 – 167.172. A two-way traffic route is located along the north side of the TSS and is recommended by the USCG for use by tug and tow traffic entering or leaving the bay (33 CFR 167.173). A precautionary area is located on the shoreward side of the TSS (Dept of Navy, 2008). None of the Mid-Atlantic WEAs overlap with an existing TSS (see Figure 4.6).

The Maryland WEA is located at its nearest point approximately 1 nm from the southern approach (SE) TSS to Delaware Bay. The Delaware WEA is located adjacent to both TSS approaches (SE and NE), to Delaware Bay. At the nearest point, the Delaware WEA is 500 m from the TSS boundary line for the SE and NE approaches. See Figure. 4.6.

The Virginia WEA is located approximately 10 nm seaward of the Chesapeake Bay TSS. See Figure 4.6. The Chesapeake Bay TSS consists of two approaches (southern and eastern) and a two-mile radius precautionary area located shoreward of the approaches. The southern approach also consists of an inbound and outbound lane; however, between the lanes is a deep-water route to be used by ships both inbound and outbound with drafts greater than 45 ft. in freshwater, and for Navy aircraft carriers (see Figure 4.6) (Dept. of Navy, 2008). The eastern approach has an inbound and an outbound lane, the exact coordinates of which are defined in 33 CFR 167.200 – 167.203, with a no-transit area between each lane designated to keep the opposing traffic lanes separate. Ships frequently anchor in the vicinity of TSSs, in unofficial anchorage areas, while waiting to go to port. This occurs particularly offshore of Delaware Bay (USCG, personal communication, 2008). Authority to create official anchorage grounds beyond 3 nm offshore was received by the USCG under the USCG Authorization Act of 2010 (U.S. Department of Homeland Security, USCG, personal communication, 2011). In June 2010 the USCG notified BOEMRE of its intention to establish an anchorage ground east of and adjacent to the SE approach to Delaware Bay (see Figure 2.1) (U.S. Department of Homeland Security, USCG, 2011). As discussed in Chapter 1 of this EA, this area has been removed from the Delaware WEA. There are currently no proposed anchorage areas for approaches to the Chesapeake Bay.

Maritime commercial shipping vessel traffic is an important component of United States commerce, and both the Delaware and Chesapeake Bays experience large amounts of maritime vessel traffic annually. In 2010, the top ten U.S. ports accounted for 58 percent of all oceangoing vessel calls; three of those ports are accessed through the Delaware and Chesapeake Bays. According to the U.S. Department of Transportation Maritime Administration, 7,559 oceangoing vessels made 62,747 calls at U.S. ports in 2010 (USDOT, MARAD, 2011a). Of these calls, 35 percent were by tankers, 31 were by containerships, 17 percent were by dry bulk vessels, 9 percent were by roll on – roll off vessels carrying vehicles for import and export, and 6 percent were by general cargo ships (USDOT, MARAD, 2011a). The Virginia Ports, VA, which includes all Hampton Roads area ports (e.g., Norfolk, Newport News, and Portsmouth), is ranked the third largest port in the U.S. for both dry bulk and container vessel calls; Philadelphia, PA is the sixth largest port for tanker calls; and Baltimore, Maryland is the nation's largest port for roll on – roll off vessel calls. Currently, the Virginia Ports is the fifth busiest port in the U.S with 3,021 vessel calls; and Philadelphia, Pennsylvania and Baltimore, Maryland are ranked ninth and tenth with 2,022 and 2,011 vessel calls each, respectively (USDOT, MARAD, 2011a).

United States freight tonnage of all types, including exports, imports, and domestic shipments, is expected to grow 73 percent by 2035 from 2008 levels (USDOT, MARAD, 2011b). Traffic density and commercial vessel sizes are also expected to increase in the future to reflect this estimated increase in shipments. Completion of the Panama Canal widening project in 2014 will double the Canal's tonnage volume by 2025 and allow larger vessels access to the east coast ports of the United States (Panama Canal Authority, 2006). Additionally, the establishment of the U.S. Maritime Administration America's Marine Highway program in 2008 created a program to transfer commercial transportation from land routes to coastal waterways in an effort to reduce greenhouse gases and traffic congestion along the east coast (USDOT, MARAD, 2011b). In August, 2010 the Secretary of Transportation identified a Marine Highway Corridor extending from Miami, Florida to Portland, Maine (USDOT, MARAD, 2011b). Increased vessel traffic associated with site characterization surveys, and the construction, operation, and decommissioning of meteorological towers/buoys could occur simultaneously, and possibly overlap, with these projected increases in current vessel traffic levels from both the widening of the Panama Canal and the designation of the M-95 Marine Highway Corridor.

Offshore waterways or shipping lanes are often not designated on navigational charts; instead vessels follow routes determined by their destination, depth requirements, and weather conditions (Dept of Navy, 2008). Commercial shipping traffic is often located outside USCG recommended routes and traffic schemes out in the open sea (U.S. Department of Navy, 2008). BOEMRE and the USCG jointly identified heavily used marine vessel traffic routes (see Figure 4.7(a), (b) and(c)) from known vessel routing measures and analysis of existing Automatic Information System[2] (AIS) data for the Mid-Atlantic WEAs, concentrating on areas near the

139

[2] AIS is a maritime safety communications system standardized by the International Telecommunications Union and adopted by the International Maritime Organization (IMO) that provides vessel information, including, type, position, course, speed and other safety-related information automatically to appropriately equipped shore stations,

entrances to the Chesapeake and Delaware Bays. These areas are identified in Figure 4.7(a) and (c).

Additionally, tug and towboat routes are also often not designated on navigational charts; instead tug/ towboats follow routes determined by their destination, depth requirements, and weather. These vessels are smaller than commercial shipping vessel traffic, slower than commercial vessels when towing, and often avoid areas with larger vessels for safety and navigational reasons. Unofficial tug/towboat routes were identified through discussions between BOEMRE and maritime stakeholders at the following meetings: Baltimore Harbor Safety and Coordination Committee meeting December 8, 2010; Mariners' Advisory Committee for the Bay and River Delaware (MAC) meeting December 9, 2010; MAC Wind Energy Working Group meeting April 27, 2011; and the Virginia Maritime Stakeholder meeting June 10, 2011. In addition, public comments received in response to the Maryland Request for Interest (November, 2010); the Delaware Call for Information (June, 2010) in the *Federal Register*; and the NOI for this EA in the *Federal Register* (February, 2011) provided information on traditional vessel usage of tug/towboat routes along the Mid Atlantic coastline that confirmed the locations of unofficial routes previously identified in meetings between BOEMRE and maritime stakeholders (see Figures 1.2, 1.3, 2.1, and 2.3). An unofficial but heavily used tug/towboat route exists along the Mid-Atlantic coast connecting New York to Norfolk, Virginia near all four WEAs. This route is used to reduce vessel congestion along other navigation routes, and reduce fuel consumption, air emissions and journey time (AWO, 2010). The American Waterways Operators (AWO), a national trade association for the tugboat, towboat, and barge industry, identified two important unofficial heavily used tug/towboat routes occur near the Virginia WEA: (1) a route 6 – 8 nm offshore Virginia used by tugs/towboats when approaching or exiting the Chesapeake Bay; and (2) another route 35 nm off the Virginia shore near the Chesapeake Bay for traffic operating north and south bound connecting ports of New York to ports of Florida (AWO (b), 2011). Traffic using these routes often must alter course in periods of adverse weather or rough seas that could conflict with the proposed action. The Virginia WEA is located as near as ~10nm and as far as ~40 nm offshore Chesapeake Bay and is close to these unofficial tug/towboat routes. Another unofficial tug/towboat route exists through a portion of the Maryland WEA bisecting at roughly a 45-degree angle from the SW corner towards the NE side (Broadley, 2010).

The USCG anticipates providing BOEMRE with additional navigational safety recommendations upon completion of the Atlantic Coast Port Access Route Study (ACPARS) in May 2012. The goal of the ACPARS (see 76 FR 27788, May, 11, 2011) is to enhance navigational safety by examining existing shipping routes and waterway uses, and, to the extent practicable, reconcile the paramount right of navigation within designated port access routes with other reasonable waterway uses such as the leasing of OCS blocks for construction and operation of offshore renewable energy facilities. The ACPARS will focus on the coastwise shipping routes and near coastal users between Western Atlantic coastal ports, approaches to coastal ports, and future uses of those ports (including impacts of the widening of the Panama Canal in 2012). The ACPARS will include analysis of current vessel traffic density, fishing vessel information, and agency and stakeholder experience in vessel traffic management, navigation, ship handling, and effects of weather. The data gathered during the ACPARS may result in the establishment of new vessel routing measures, modification of existing routing measures, or disestablishment

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other ships, and aircraft (U.S. Department of Homeland Security, USCG, Navigation Center, 2011). It is required equipment on all vessels greater than 300 gross tons. Since AIS transponders are not required on vessels < 300 gross tons, its usefulness in analysis is limited and reflects only a portion of total vessel traffic.

of some existing routing measures of the Atlantic coast from Maine to Florida. More specifically, the ACPARS study results may recommend that the USCG modify the existing TSSs, create one or more precautionary areas, and/or identify area(s) to be avoided.

Radar

There are numerous military and civilian radar systems that provide radar coverage along the U.S. coastline. Radar can experience signal interference from tower-like structures and the radar's ability can be degraded by this interference; meteorological towers could affect nearby radar usage and abilities. BOEMRE consulted with the FAA on the proposed action of this EA. On 22 April, 2011 the FAA responded that interference would be negligible from meteorological towers to radar systems unless the towers are situated within a quarter mile of active radar, which is not anticipated (Edgett-Baron, personal communication, 2011).

Other Renewable Energy Projects

There are other reasonably foreseeable renewable energy activities offshore the Mid-Atlantic coast that could occur in the same timeframe as the proposed action in both state waters and on the OCS. Figure 4.6 denotes the locations of these proposed projects.

State Waters

In state waters, the USACE is currently reviewing an application for a proposed project to install six wind turbine generators approximately 2.8 miles east of Atlantic City, New Jersey (ACOE, 2010).

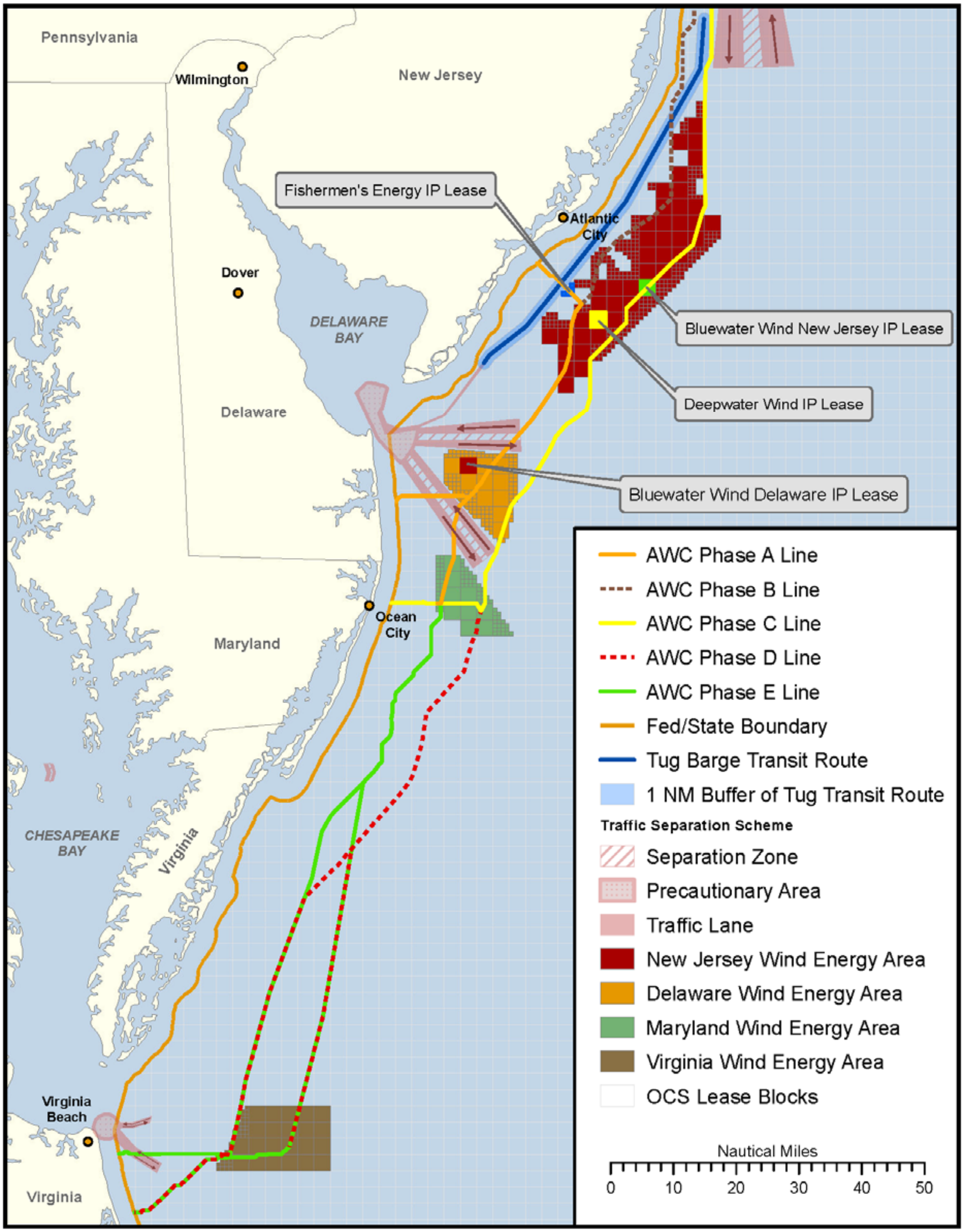

Figure 4.6. Interim Policy leases, traffic separation schemes and the proposed Atlantic Wind Connect project.

Interim Policy Leases on the OCS

BOEMRE issued four Interim Policy leases on the OCS offshore New Jersey and Delaware in November 2009 for wind resource data collection facilities (meteorological towers/buoys). Under these Interim Policy leases, the lessee has the right to install a meteorological tower or buoys for the purposes of assessing the wind and ocean resources on the lease. The environmental impacts associated with these leases were discussed in the Interim Policy EA. If the holder of an Interim Policy lease wishes to propose a commercial wind energy project, it must first acquire a commercial lease of an appropriate size (Interim Policy leases do not contemplate development, and are issued for single OCS blocks to support meteorological towers and buoys).

Three Interim Policy leases were issued offshore New Jersey in the following lease blocks: Wilmington NJ 18-02 Blocks 6931, 6836 and 7033. One Interim Policy lease was issued offshore Delaware in lease block Salisbury NJ 18-05 Block 6325. BOEMRE is awaiting submittal of final meteorological tower/buoy project plans for these leases, and no construction has taken place at this point in time. Increased vessel traffic associated with construction and remaining survey activities for the four Interim Policy leases could occur simultaneously, and possibly overlap, with the proposed action.

Electrical Transmission Lines

In March 2011, BOEMRE received an unsolicited right-of-way (ROW) grant application from Atlantic Wind Connection (AWC) for a subsea backbone transmission system in state waters and on the OCS offshore the states of New York, New Jersey, Delaware, Maryland and Virginia (see Figure 4.6). The purpose of the project is to transmit electricity generated by future offshore commercial wind facilities to onshore markets. The project would include nine offshore electrical converter platforms and 756 miles of cabling, with 650 miles on the OCS, 38 miles in state waters and 67 miles on shore (AWC, 2011). The project is proposed to be built in five distinct phases: the first phase would connect southern New Jersey and Delaware with up to 2,000 MW capacity; the second phase would connect southern New Jersey to the northern New Jersey/New York metropolitan area; the third phase would connect Maryland to New Jersey/New York metropolitan area; the fourth phase would connect Maryland to Virginia; and the final phase would connect Delaware to Virginia (AWC, 2011). AWC estimates construction would occur over approximately 10 years and the entire system could be operational by 2021. This EA only considers increased vessel traffic associated with survey activities during site characterization for the potential cable route which could occur simultaneously, and possibly overlap, with the proposed action.

Marine Minerals Program

Loss of sand from the Mid-Atlantic beaches, dunes and barrier islands is a serious problem that affects both the coastal environment and the economy. Rising sea levels due primarily to climate change are likely to accelerate beach erosion and coastal inundation, and will make storms and associated floods more intense, exacerbating erosion (NJ DEP, 2010). The artificial replacement of lost sand through renourishment cycles for beaches or coastal areas require quantities of sand that are not currently available from state sources. For example, it is estimated for the period 2014 to 2044 at least 7.6 million cubic m of sand will be required to maintain Ocean City, Maryland beaches and new sand sources are needed outside state waters to meet increased demand (Maryland Geological Survey, 2011). Submerged shoals located offshore

New Jersey, Maryland and Virginia between the WEAs and the shore have been identified as long-term sources of sand (sand burrow sites) for coastal erosion management (USDOI, MMS, 2007a); However, none of these sites are located within the boundaries of the WEAs. These offshore sites could provide compatible sand for immediate/emergency repair of beach and coastal damage from severe coastal storms (USDOI, MMS, 2007a) and are an environmentally preferred resource because they generally lie beyond the local wave base and the influence of the nearshore physical regime where long-term dredging can result in adverse changes to local wave climate and the beach (USDOI, MMS, 2007a).

4.1.3.7.2 Impact Analysis of the Proposed Action

Chapter 5.2.17 of the Programmatic EIS discusses the impacts that site characterization and assessment could have on marine traffic. The proposed leases would be located 7 or more miles from the nearest shoreline. Increased vessel traffic from survey activities and construction, operations and decommissioning of meteorological towers/buoys would increase vessel traffic within the WEAs and between the WEAs and shore. This increase in traffic could pose conflict with other uses of the OCS and associated activities. Therefore, site characterization surveys, and the construction, operation and decommissioning activities of meteorological towers/buoys occurring within the proposed lease areas have the potential to directly impact coastal and offshore vessel traffic and other uses of the OCS as discussed below. Non-routine activities could include collision between vessels, an allision between a vessel and a meteorological tower/buoy, and/or accidental spills of diesel or oil.

BOEMRE consulted with the DOD, on the proposed action of this EA. On May 2, 2011, the DOD responded that the impact to the Navy's training areas and other DOD activities from site characterization surveys and installation, operation and decommissioning of meteorological towers/buoys offshore Delaware, New Jersey, Maryland, and Virginia could be mitigated given site specific stipulations in consultation with the DOD (Engle, personal communication, 2011). BOEMRE also consulted with NASA on the proposed action. On 21 April, 2011, NASA responded that the impact from the proposed action to the WFF facilities and other NASA activities from survey vessels and the installation, operation and decommissioning of meteorological towers/buoys offshore Maryland and Virginia would be negligible (Mitchell, personal communication, 2011).

Routine Activities

Vessel Traffic

Direct impacts from routine activities may occur as a result of increased vessel traffic in support of the proposed action. It is anticipated that one or two surveys vessels would be active in any given WEA at any given time to conduct site characterization activities. Additional vessel activity would be required during the time that meteorological tower/buoy construction, operations, and decommissioning takes place; these activities are expected to require two to three vessels at any one time, such as a vessel to tow and assist in buoy placement, a specialized jack-up vessel for installing foundation pilings for a tower, or during routine maintenance. These trips would occur within and nearby the heavily trafficked areas through the entrances to the Delaware and Chesapeake Bay. These heavily trafficked areas are already expecting additional increases in traffic density and the addition of larger classes of commercial vessels associated with the completion of the Panama Canal widening in 2014 and identification of a Marine Highway Corridor extending from Miami, Florida to Portland, Maine) during the time period of the proposed action. Tug/towboat traffic associated with the marine highway corridor may occur within the WEAs and has the potential to overlap, or occur simultaneously with the vessel traffic associated with the proposed action.

Because the additional vessel activity associated with the proposed action within the WEAs is anticipated to be so small (1-2 survey vessels in addition to 2-3 vessels associated with site assessment activities in a single time/space over a period of five and one-half years) when compared with existing and projected future vessel traffic in the area, it is not reasonably foreseeable that the number of vessels transiting the WEAs for these activities would significantly increase vessel density levels or alter known shipping patterns.

Likewise, the additional vessel activity associated with the proposed action in harbor and coastal areas and on the high seas between the coastal areas and the WEAs is anticipated to be miniscule (e.g., 5-6 extra vessel trips per month per harbor over a period of five years) when compared with existing and projected future activity in these areas. Therefore, it is not reasonably foreseeable that the number of vessels associated with the proposed action using the harbors and transiting coastal waters out to the WEAs would significantly increase vessel density levels or alter existing shipping patterns.

Meteorological Towers/Buoys

Though the Delaware, New Jersey, and Virginia WEAs are not located within designated TSSs, meteorological towers/buoys may still pose an obstruction to navigation if placed in areas with high vessel traffic. The Maryland WEA is within roughly 1 nm of the heavily trafficked entrance to the Delaware SE TSS. The placement of any meteorological tower within a TSS is prohibited (see 33 CFR Section 1223) (U.S. Department of Homeland Security, USCG, personal communication, 2011). Any placement of meteorological towers/buoys would be mitigated by USCG required marking and lighting, including avoidance of heavily trafficked areas within the WEAs identified in (see Figure 4.7(a), (b) and (c)). Meteorological towers/buoys would also be considered Private Aids to Navigation, which are regulated by the USCG under 33 CFR 66. A Private Aid to Navigation is a buoy, light or day beacon owned and maintained by any individual or organization other than the USCG. These aids are designed to allow individuals or organizations to mark privately owned marine obstructions or other similar hazards to navigation. The Delaware, Maryland, and Virginia WEAs are located in areas of higher vessel traffic densities where large commercial shipping vessels often transit.

BOEMRE consulted with both the USCG and the FAA on the proposed action in the Mid Atlantic WEAs. Marking and lighting of meteorological towers/buoys in accordance with USCG and FAA standards would mitigate any conflicts with USCG uses (such as search and rescue activities) in the Mid-Atlantic (U.S. Department of Homeland Security, USCG, personal communication, 2011). Mitigation measures including "A Publication of Notice(s) to Mariners" would be necessary to limit navigational risks during construction, installation and decommissioning of any meteorological towers/buoys. Marking of locations of towers/buoys on navigational charts would greatly reduce potential navigational risks to all vessel types, including tug and towboats (U.S. Department of Homeland Security, USCG, personal communication, 2011). If the anticipated meteorological towers are taller than 199 ft, each lessee would be required to file a "Notice of Proposed Construction or Alteration" with the FAA per federal aviation regulations (14 CFR 77.13). The FAA is in the process of finalizing guidance for the marking and lighting of meteorological towers less than 199 ft tall that is projected to be applicable to meteorological towers/buoys by the end of 2011 (Edgett-Baron, personal communication, 2011). According to the FAA, specific mitigation measures, including lighting requirements, would be applied on a case by case basis (Edgett-Baron, personal communication, 2011). Any meteorological tower/buoys greater than 199 ft tall and within 12 nm of shore would require an additional Obstruction Evaluation and a Determination of Hazard/No Hazard by the FAA.

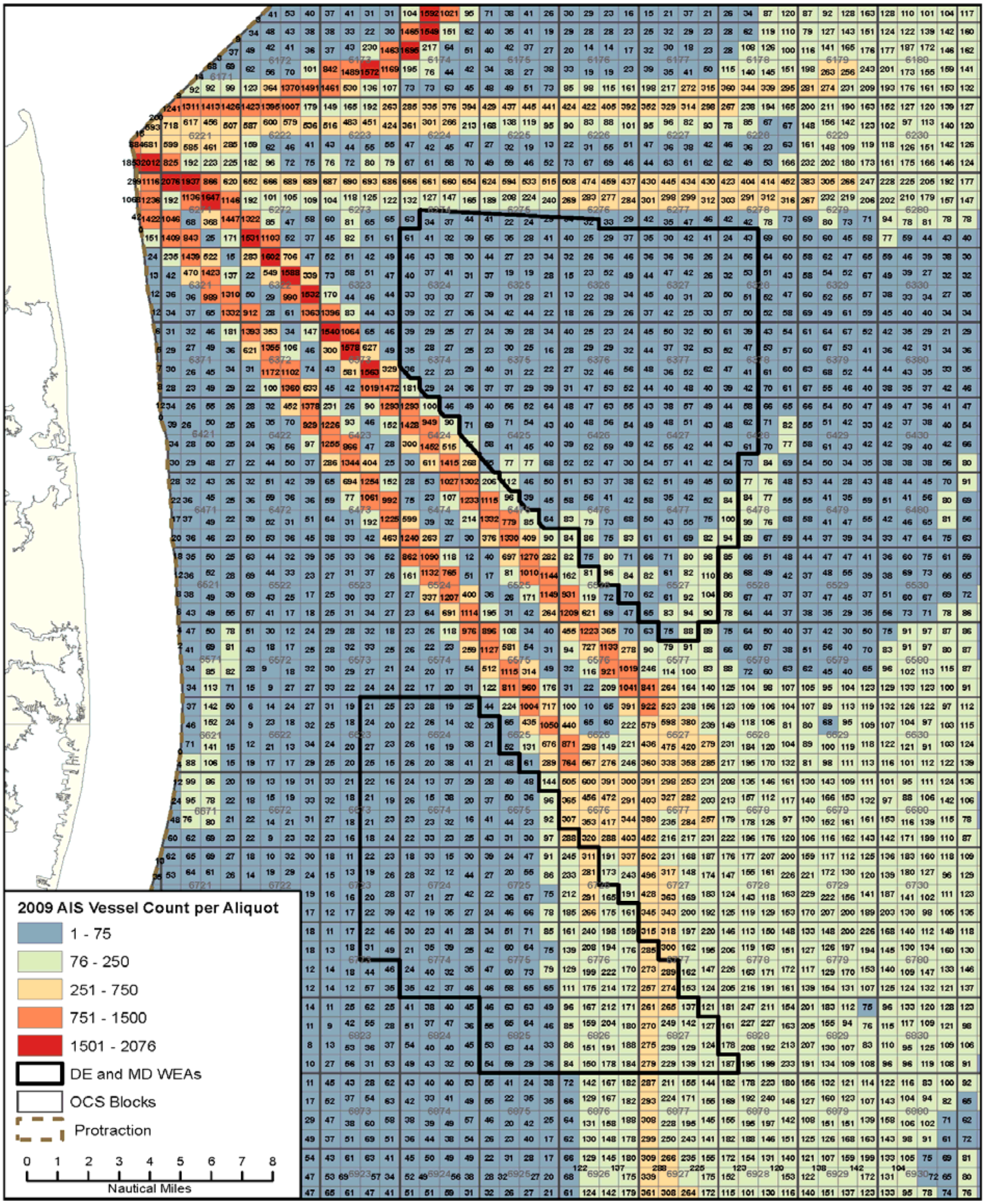

Figure 4.7a. Delaware and Maryland AIS Vessel Count Data 2009.

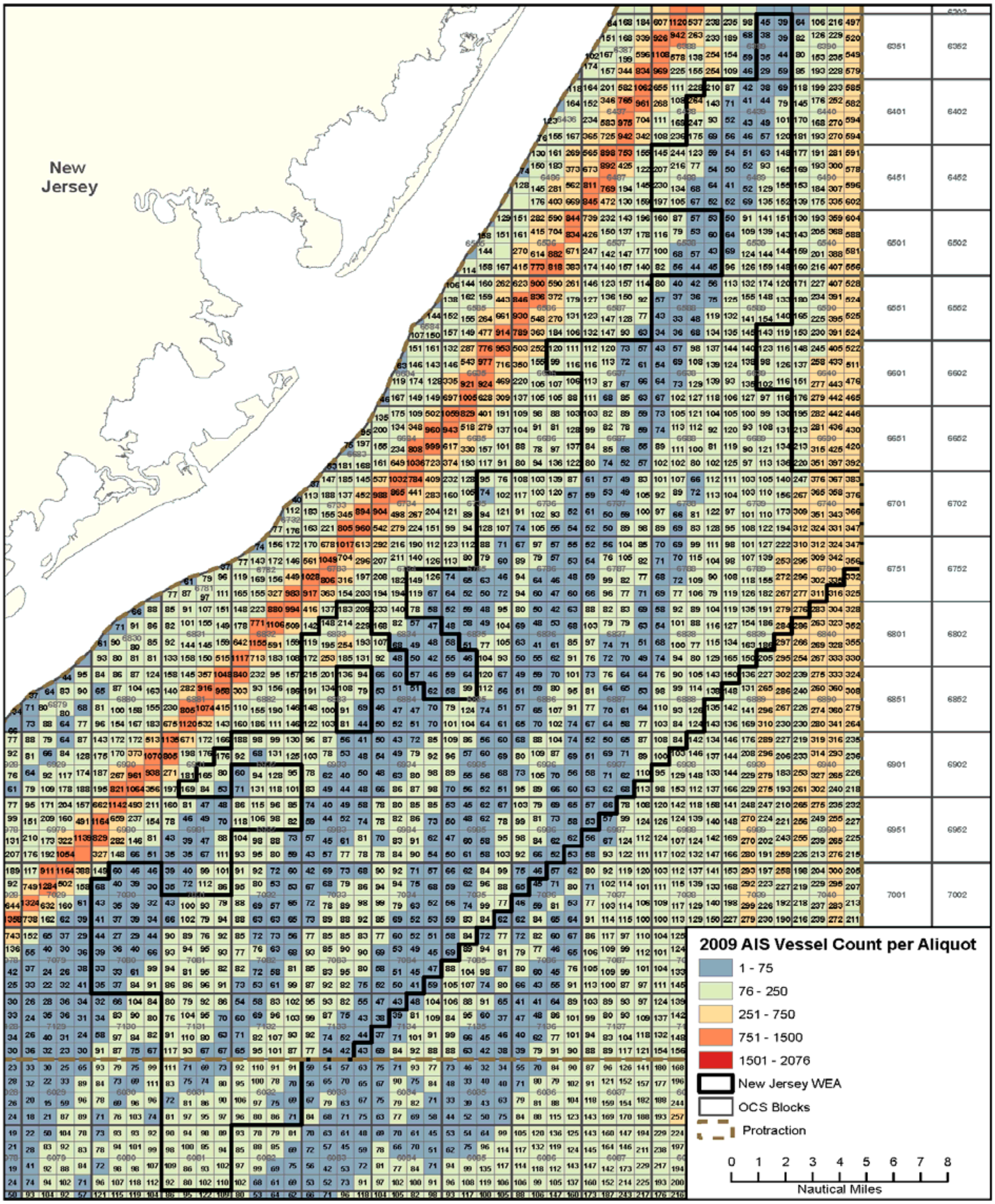

Figure 4.7b. New Jersey AIS Vessel Count Data 2009.

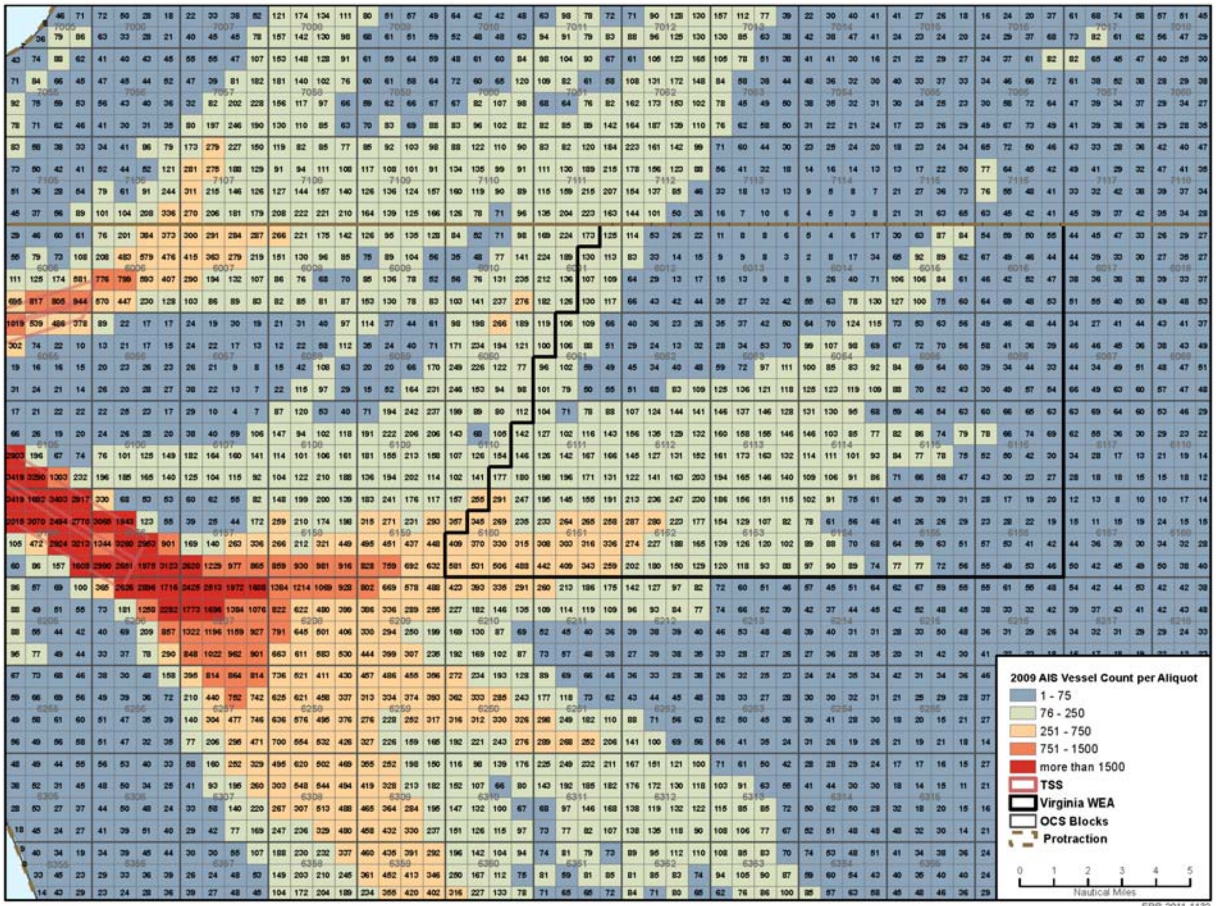

Figure 4.7c. Virginia AIS Vessel Count Data 2009.

Non-Routine Events

The vessel traffic associated with site characterization surveys, and the construction, operation and decommissioning of meteorological towers/buoys in very close proximity to the major shipping lanes and ports serving the Delaware and Chesapeake Bays would insubstantially increase the probability of a vessel collision(s) and/or allision(s). In 2010, 97 percent of the oil and gas tanker calls in the U.S. were by double-hulled vessels, up 78 percent five years earlier (USDOT, MARAD, 2011). Double-hulled tankers are much less likely to release oil from collision and/or allision than single-hulled tankers. A multitude of government studies and independent reviews recommend double hulls as the single most effective technology to prevent future oil spills from tankers (DF Dickens Associates, Ltd., 1995).

AIS data (see Figure 4.7(a-c)) indicates that the majority of large commercial vessels, which include cargo vessels, container vessels, and oil tankers, operate within and near the TSS lanes, and follow distinct patterns in order to approach/depart these lanes, often concentrating in heavily-used unofficial approach/departure areas near the entrances and exits of the TSS lanes.

The WEAs were designed to avoid the TSS lanes and the heavier trafficked approach/departure areas associated with those TSSs. When BOEMRE considers any individual SAP, it will further consider local vessel traffic to ensure tower placement would reduce the already small likelihood of commercial or recreational vessel collision or allision with structures associated with the proposed action.

An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not reasonably foreseeable as a result of the proposed action due to the distance from shore of the activities, the strong likelihood that a meteorological tower would collapse without serious damage to an oil tanker. It is unlikely that vessels would collide with meteorological towers/buoys due to USCG requirements relating to marking and lighting of meteorological towers/buoys, and the fact that the WEAs avoid the highest traffic areas.

However, it is possible that vessels servicing or decommissioning towers or buoys, and vessels, other than a tanker or cargo ship, could collide with a tower, buoy, or other vessels. The impacts to water quality if a diesel fuel spill would occur from these types of collisions are discussed in Section 4.1.1.2.2 of this EA.

Tug Rerouting

Tug and towboat routes may overlap the Virginia WEAs during periods of adverse weather conditions. These adverse weather periods will not coincide survey activities or with constructing or decommissioning meteorological towers/buoys. Survey activities require relatively calm sea conditions in order to successfully collect the necessary data and information. Similarly, construction, installation, and decommissioning of meteorological towers/ buoys also require calm sea conditions. Therefore, it is unlikely that the vessel activities associated with the proposed action would occur during periods of adverse weather when tug/towboat routes may move into or close to the Virginia WEA. Therefore, it is not reasonably foreseeable that vessel traffic associated with the proposed action would conflict with tug/towboat vessels utilizing the areas within the Virginia WEA during adverse weather conditions.

Conclusion

The increase in vessel traffic, and activities from the installation/operation of the meteorological towers and buoys would not measurably impact shipping or navigation. It is unlikely that vessels would collide with meteorological towers/buoys due to USCG requirements relating to marking and lighting of meteorological towers/buoys and the fact that the WEAs avoid the highest traffic areas. An oil spill resulting from a collision or allision between a cargo vessel/tanker and a meteorological tower/buoy is not reasonably foreseeable due to the distance from shore of the activities and the strong likelihood that a meteorological tower would collapse without serious damage to an oil tanker or large ship. In addition, survey activities related to the proposed action require relatively calm seas, therefore, it is unlikely that the vessel activities associated with the proposed action would occur during periods of adverse weather when tug/towboat routes may move into or close to the Virginia WEA.

Proposed Mitigation Measures

The following proposed mitigation measures are intended to reduce or eliminate potential the impacts of site characterization surveys and the installation, operation, and decommissioning of meteorological towers/buoys on navigation and safety. This section proposes that these mitigation measures be incorporated into any future decision to issue a lease or approve a SAP.

The following proposed mitigation measures were developed in consultation with the DOD to eliminate or reduce the potential impacts of the proposed action on military activities:

- Lessees would consult with the appropriate command headquarters prior to any construction or decommissioning activity, regarding the location, density, and planned periods of operation, to minimize potential conflicts with DOD activities.
- Lessees would agree to control its own electromagnetic emissions and those of its agents, employees, invitees, independent contractors, and subcontractors emanating from individual designated defense warning areas in accordance with requirements specified by the appropriate command headquarters to the degree necessary to prevent issues with DOD flight, testing, or operational activities conducted within individual designated warning areas.

The following measures are proposed to reduce the potential impacts of the proposed action on navigational safety. This section includes USCG precautionary recommendations pending completion of the ACPARS in 2012:

- No meteorological towers/buoys would be located within a TSS or within 1 nm of any TSS boundary until further analysis and the ACPARS is completed by the USCG (U.S. Department of Homeland Security, USCG, personal communication, 2011).
- Lessees would site structures to avoid unreasonable interference with major ports and vessel access to use of USCG-designated TSSs.
- Lessee would operate navigation lights and a fog signal with sufficient backup power and redundancy to assure a minimum availability rate of 99.7%. The navigation light should be seen in a 360-degree arc. Due to the presence of a meteorological tower, two lights must be installed, 180-degrees apart, at an elevation specified by the USCG at mean high water, each with an operational range of 3 nm, 90% of the nights. The lights shall display a quick red characteristic and flash synchronously. The fog signal shall have a range of 0.5 nm and shall activate whenever the visibility drops below three nm. The structure shall be color-coded yellow (i.e., Munsell Chip number 2.5Y 8/12) from the water line to the base of the tower.
- Prior to any construction or decommissioning activity, the lessee would provide the following information to the 5th Coast Guard District for publication in the Fifth District Local Notice to Mariners:
    - Start date of construction;
    - Names of vessels/call signs and VHF-FM channels that would be guarded in addition to Channels 16 and 13;
    - Hours of operations; and
    - A Private Aids to Navigation Application for any crown buoys that may be used during construction activity.
- Lessees would comply with all lighting recommendations specified by the FAA for a meteorological tower located within FAA jurisdictional boundaries. Lessees would be required to follow any FAA guidelines for applicable siting and lighting of meteorological towers.

4.2 Alternative B – Removal of Anchorage Ground Offshore Delaware

Description of the Alternative

Ships frequently anchor in the vicinity of TSSs, in unofficial anchorage areas, while waiting to go to port. There is such an anchorage area within the Delaware WEA offshore of Delaware Bay (see Figure 2.1). The USCG requested that BOEMRE exclude from consideration an existing unofficial anchorage ground offshore Delaware, which it is considering designating officially due to navigational safety concerns. The anchorage ground under consideration by the USCG is bounded on its southern border by the southeast TSS approach to Delaware Bay, on its northern border by the charted ordnance dumping ground, and on its eastern border by the 12 nm territorial sea line, and is equivalent to about half of an OCS block in size (see Figure. 2.1). The USCG is scheduled to initiate rulemaking for establishing this and other anchorage grounds offshore of the Mid-Atlantic states by the end of 2011.

Alternative B differs from Alternative A (proposed action) in that it excludes the anchorage ground (equivalent to about a half of an OCS block) from the Delaware WEA. An area slightly smaller (equivalent to about a half of an OCS block less) than the area described under the proposed action would be considered for lease issuance and site characterization and assessment activities. Under Alternative A, any leases issued within the proposed anchorage area would contain NSO stipulations, such that no structures could be placed in the area that would interfere with surface uses. However, under Alternative A, a lessee could still install leasehold interconnection cables and other structures on the seabed beneath the anchorage area. Therefore Alternative A assumes that lessees would survey its entire lease area, including the area within the proposed anchorage area, in light of the fact that it could use that portion of its lease for inner-array interconnection cables and related structures. Under Alternative B, lessees would not acquire a lease for any portion of the anchorage area, and as a result, would not be able to place inner-array interconnection cables there, and therefore, would not need to conduct site characterization surveys there. However, under the status-quo (and under all alternatives) lessees or potential lessees could still survey areas beneath the anchorage or any other area for potential cable routes.

All of the environmental consequences associated with selecting Alternative B would be the same as associated with Alternative A except for the level of impacts associated with site characterization activities. Since the anchorage ground would not be leased, Alternative B would result in a slight reduction (two percent), in site characterization surveys associated with the Delaware WEA compared to the proposed action (reduction of about 220 nm or 50 hours of HRG surveys and about 6-18 bottom samples). Like the proposed action, up to one meteorological buoy is projected in the Delaware WEA (Section 3.1.3 of this EA). However, under Alternative B, that buoy could not be located within the anchorage ground, and therefore could not conflict with use of the anchorage ground.

Table 4.15

Projected Site Characterization and Assessment Activities for Alternative B (Removal of Anchorage Ground Offshore Delaware)

Wind Energy Area (WEA)	Lease-holds	Site Characterization Activities		Site Assessment Activities	
		High Resolution Geophysical (HRG) Surveys (max nm/hours)	Sub-bottom Sampling (min-max)	Meteorological Towers (max)	Meteorological Buoys (max)
New Jersey	7	31,100/6,900	900-2,500	7	14
Delaware	1	9,100/2,000	300-700	0	1
Maryland	2	7,100/1,600	200-600	2	4
Virginia	3	12,600/2,800	400-1,000	3	6
Total	13	59,800/13,300	1,800-4,800	12	25

Effects of the Alternative

Physical Resources

Air Quality: Section 4.1.1.1, which describes the potential impacts of the proposed action on air quality, concluded that, due to the distance from shore, and the negligible increase in emissions associated with the preferred alternative when compared to baseline emissions and existing air quality, neither routine activities nor non-routine events would significantly impact onshore air quality. The reduced level of survey and construction activities under Alternative B would produce slightly fewer emissions within the vicinity of the Delaware WEA than would the preferred alternative. Due to the short duration and relatively low level of emissions associated with routine activities within and associated with the Delaware WEA, potential impacts on ambient air quality from either the proposed action or Alternative B would be negligible to minor.

Water Quality: Section 4.1.1.2, which describes the potential impacts of the proposed action on water quality, concluded that impacts to coastal and marine waters from routine activities associated with the proposed action should be of short duration and remain minimal. Should an oil spill occur in the WEA, minimal impacts would result since a spill from the types of vessels associated with site characterization and assessment activities would be small (see Section 4.1.1.2). If a diesel spill were to occur, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (see Section 3.2.3 of this EA).

Moreover, collisions that could cause such a spill occur infrequently. Under Alternative B, there would be slightly less vessel traffic associated with survey activities, and hence, slightly less chance of a spill. Similarly, under Alternative B, there would be slightly fewer potential discharges of bilge or waste water or solid waste due to slightly less vessel traffic.

Since the potential impacts to water quality under the preferred alternative are anticipated to insignificant, the potential water quality impacts associated with Alternative B is anticipated to be marginally less so.

Biological Resources

Coastal Habitats: Section 4.1.2.1, which describes the potential impacts of the proposed action on coastal habitats, concluded that no significant impacts on coastal habitats would occur from routine activities as a result of the proposed action due to the distance of the WEAs from shore, the use of existing coastal facilities, and the amount of vessel traffic currently and historically traversing coastal areas. Under Alternative B, fewer survey vessel trips would slightly reduce the potential increase of wake-induced erosion (if detectible) and risk of diesel spills, primarily in Delaware coastal waters associated with the proposed action.

Benthic Resources: Section 4.1.2.2, which describes the potential impacts of the proposed action on benthic resources, concluded that the impacts of site characterization surveys, on benthic communities in and around the Delaware WEA would be short-term in duration and negligible in extent. The potential impacts from routine activities on benthic communities would be direct contact by anchors, driven piles, and scour protection that could cause crushing or smothering. Under Alternative B, there would be no potential for bottom-disturbing activities to impact benthic habitats located within the anchorage ground.

Marine Mammals: Section 4.1.2.3, which describes the potential impacts of the proposed action on marine mammals, concluded that the proposed action would minimally or negligibly effect marine mammals and that the proposed alternative would impact marine mammals in an episodic fashion. Specifically, harassment from sound (sonar during surveys and short-duration pile driving) and slight increases in the risk of vessel collisions associated with surveys and construction are the primary activities that could impact marine mammals.

Under Alternative B, the lower level of survey activity would slightly reduce the exposure of marine mammals to noise from surveys and vessel traffic offshore Delaware. The reduced vessel traffic would also slightly lower the risk of vessel collisions with marine mammals.

Sea Turtles: Section 4.1.2.4, which describes the potential impacts of the proposed action on sea turtles, describes how the proposed action may affect sea turtles, specifically leatherback, loggerhead, Kemp's ridley, and green sea turtles. These impacts are expected to be short-term and would result in minimal to negligible harassment depending on the specific activity. Specifically, harassment from noise, minor loss/displacement from forage areas, and to a lesser degree vessel collisions are the primary anticipated impacts to ESA-listed sea turtles.

Under Alternative B, the lower level of survey activity (due to exclusion of the anchorage area) would slightly reduce the potential exposure of sea turtles to noise from surveys and vessel traffic offshore Delaware. The reduced vessel traffic would slightly lower the risk of vessel collisions with sea turtles and reduce the potential for displacement from forage areas. There would be no change in impacts associated with pile driving or construction activities because, like the preferred alternative, Alternative B contemplates the installation of one meteorological tower or two meteorological buoys.

Birds: Section 4.1.2.5, which describes the potential impacts of the proposed action on birds, concluded that, while birds may be affected by vessel discharges and the presence of meteorological towers and buoys, accidental fuel release is unlikely and the risk of collision would be minor due to the small number of meteorological towers proposed, and their distance from shore and each other. Since one meteorological tower or two meteorological buoys are projected within the Delaware WEA under the proposed action and Alternative B, Alternative B would not increase or decrease the potential impacts to birds resulting from these structures. Under Alternative B, the slight reduction in vessel traffic would slightly reduce the number of potential vessel discharges, which would slightly reduce potential impacts to birds in and around the Delaware WEA.

Bats: Section 4.1.2.6, which describes the potential impacts of the proposed action on bats, concluded that, while it is unlikely that bat species would be foraging or migrating through the WEAs, these mammals may on occasion be driven to the project area by prevailing winds and weather. The only potential impact to bats presented by the preferred alternative would be the possibility that bats blown into the project area could possibly collide with a meteorological tower or buoy. Because of the anticipated distance between the anticipated meteorological towers and buoys, there would be no additive effect of constructing all the anticipated meteorological towers or placement of buoys on bats. It is not expected that the preferred alternative would have any measurable impact on bats. Both the proposed action and Alternative B anticipate that one meteorological tower or two meteorological buoys would be constructed within the Delaware WEA although the current holder of the Interim Policy lease in the area could install these structures even if the No Action alternative were selected (see Interim Policy EA (USDOI, MMS, 2009a)). Alternative B would not increase or decrease the potential impacts to bats as described for the proposed action.

Fish and Essential Fish Habitat (EFH): Section 4.1.2.7, which describes the potential impacts of the proposed action on fish and EFH, concluded that the proposed activities and the potential effects of HRG survey noise on marine fish are generally expected to be limited to avoidance around the HRG survey activities, short-term changes in behavior, and limited and temporary loss of habitat from during the installation of meteorological towers and buoys. Thus, potential population-level impact on fish for HRG surveys is not anticipated.

Sub-bottom sampling, construction of meteorological towers, and the installation of meteorological buoys could affect local benthic habitats. The seabed disturbance footprint of sub-bottom sampling would be small; it is expected that this activity would have negligible effects on benthic habitat, and that this disturbance would have a negligible, if detectible, impact on federally-managed fish species that may occur in the Delaware WEA. Impacts related to meteorological towers/buoys installation and decommissioning is expected to be minor and not expected to result in changes in local community assemblage and diversity.

Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. The entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during normal operations. Impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor.

A nature event such as a severe storm may impact meteorological towers or buoys at some point during operation. If unanticipated collisions were to occur, and a vessel's cargo was discharged, the impacts would depend upon that of the type and amount of cargo discharged at the time.

Under Alternative B, the lower level of activity would slightly reduce the exposure of fish to noise from surveys and vessel traffic offshore Delaware. Under Alternative B, there would be no potential for bottom-disturbing or survey activities to impact EFH located within the anchorage ground.

Socioeconomic Conditions

<u>Offshore Archaeological Resources</u>: Section 4.1.3.1, which describes the potential impacts of the proposed action on offshore archaeological resources, concluded that the information generated from the lessee's initial site characterization activities and should provide an adequate picture of the presence of significant and/or unique archaeological resources within the WEAs and along potential cable routes to shore. As a result, the potential for seafloor/bottom-disturbing activities (e.g. anchorages and installation of meteorological towers and buoys) to could cause damage to or loss of significant and/or unique archaeological information would be avoided. Under Alternative B, there would be no potential for bottom-disturbing activities to impact archeological resources located within the anchorage ground.

<u>Recreation</u>: Section 4.1.3.2, which describes the potential impacts of the proposed action on recreation resources, concluded that, due to the distance of the proposed lease areas from shore and that no new coastal infrastructure is proposed, no impacts to coastal recreational resources from meteorological towers or buoys and spills are expected. Section 4.1.3.2 also concluded that the increase in vessel traffic associated with the preferred alternative would not significantly affect recreation in the coastal areas or oceans outside any of the potentially affected states. While impacts could occur from marine trash and debris associated with the preferred alternative, they would unlikely be perceptible to beach users or administrators. Alternative B would not increase or decrease the potential impacts to recreational resources as described for the proposed action.

<u>Demographics</u>: Section 4.1.3.3, which describes the potential impacts of the proposed action on demographics, concluded that, due to the magnitude, dispersed nature and short duration of survey, construction, and decommissioning activities, any benefit to local economies or employment would be minor and short-term. Also these activities are not expected to employ many workers relative to the existing employment numbers. Since the reduction in the level of site characterization surveys associated with Alternative B would be so slight when compared with the preferred alternative, Alternative B is expected to produce slightly less benefit to the economies of or employment within coastal counties of Delaware.

<u>Environmental Justice</u>: Section 4.1.3.4, which describes the potential impacts of the proposed action related to environmental justice issues, concluded that the preferred alternative would have no impacts on the environmental or health-related conditions of minority or low-income people. Only the use of existing coastal facilities has the potential to impact minority or low-income people. However, no expansion of these existing onshore areas is anticipated to support the proposed action or Alternative B, and significant increases in activity at these existing facilities is not anticipated as a result of either the proposed action or Alternative B. As a result,

neither the proposed action nor Alternative B is expected to have disproportionately high or adverse environmental or health effects on minority or low-income people.

Land Use and Coastal Infrastructure: Section 4.1.3.5, which describes the potential impacts of the proposed action on land use and coastal infrastructure, concluded that existing ports or industrial areas are expected to be used, and expansion of these existing facilities is not anticipated to support the proposed action. Since this remains true under Alternative B, no significant impact on land use or coastal infrastructure is expected.

Commercial and Recreational Fishing Activities: Section 4.1.4.6, which describes the potential impacts of the proposed action on commercial and recreational fishing activities, concluded that the increase in vessel traffic, and activities from the installation/operation of the meteorological towers and buoys would not measurably impact commercial or recreational fishing activities, total catch of fish and shellfish, or navigation. Any impacts, such fishing displacement and target species availability, would be of short duration, limited area, and temporary. Under Alternative B, there would be no potential for site characterization surveys and site assessment activities to conflict with commercial and recreational fishing within the anchorage ground, although the anchorage ground is currently highly trafficked by other anchoring vessels.

Other Uses of the OCS: Section 4.1.3.7, which describes the potential impacts of the proposed action on other uses of the OCS, concluded that minor direct impacts on vessel traffic density and patterns would occur from routine activities associated with the proposed action.

Under Alternative B, survey and construction activities that would impact vessel traffic density and patterns would not occur in the anchorage ground. It is assumed the risk of collisions and allisions would be greater in this area, because it already contains a relatively high concentration of vessels. Therefore, Alternative B would provide a slight reduction in the risk of collisions and allisions than would Alternative A.

Summary/Conclusion

Alternative B differs from Alternative A (the proposed action) by not offering the anchorage ground identified by the USCG located at the western tip of the Delaware WEA for lease. An area equivalent to about 18 OCS blocks in the Delaware WEA would be considered for leasing and subsequent site assessment activities under Alternative B. A slight reduction (two percent), in site characterization surveys is projected to take place in the Delaware WEA under Alternative B as compared to the proposed action.

The potential impacts of Alternative B would differ from the proposed action only within the Delaware WEA. Proposed mitigation would still reduce or eliminate impacts to resources located in the remainder of the Delaware WEA as described in the impact analyses sections of the proposed action. Under Alternative B, there would be no potential for bottom-disturbing activities to impact benthic habitats or archeological resources located within the anchorage ground. While there is still the potential for some minor conflicts with other uses of the OCS, including commercial and recreational fishing. There would be no potential for site characterization surveys on potential leases (although there still may be site characterization for potential subsea cable routes) and site assessment activities to conflict within the anchorage ground.

Compared to the proposed action, the reduced level of survey activities under Alternative B would slightly reduce the potential impacts on air and water quality within the vicinity of the Delaware WEA. Reduced vessel traffic would slightly reduce the risk of vessel collisions, therefore slightly reducing the risk of a diesel spill. The lower level of activity would slightly reduce the exposure of marine mammals, sea turtles, and fish to noise from surveys and vessel traffic offshore Delaware. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals and sea turtles. There would be slightly less potential for the loss or displacement of sea turtles from forage areas. While the same existing onshore facilities would likely be used in support of the site characterization surveys and site assessment activities in the remainder of the WEAs, about 20 less survey trips would slightly reduce the potential for wake-induced erosion and risk of diesel spills in coastal waters, mainly in Delaware.

Under Alternative B, on-lease survey and construction activities that could impact vessel traffic density and patterns would not occur in the anchorage ground. It is assumed that the risk of collisions and allisions would be greater in this area, because it has higher concentrations of vessels. Therefore, Alternative B would provide a slight reduction in the risk of collisions and allisions than would result from selecting Alternative A.

4.3 Alternative C – Removal of Category B Areas Offshore Maryland

Description of the Alternative

As described in Section 1.3.4 of this EA, since the publication of the NOI, the USCG classified the area of the Maryland WEA into three categories (see Figure 1.3):

- Category A – areas that USCG believes should not be developed due to existing and anticipated increase in vessel traffic density (equivalent to about 18.5 OCS blocks);
- Category B – areas that USCG believes requires further study (equivalent to almost 10 OCS blocks); and
- Category C – areas in which the USCG believes that wind energy development would pose minimal or no detrimental impact on navigational safety (equivalent to about 2.5 whole OCS blocks).

Based on the USCG's recommendations and BOEMRE's own preliminary analysis of vessel traffic data, BOEMRE has removed the Category A blocks from the Maryland WEA in all alternatives because of existing, and possible future increase in, vessel traffic density (see Figure 1.3).

The USCG will provide BOEMRE with additional navigational safety recommendations once it has completed the Atlantic Coast Port Access Route Study (PARS). The goal of the PARS is to enhance navigational safety by examining existing shipping routes and waterway uses, and, to the extent practicable, reconcile the right of navigation within designated port access routes with other reasonable waterway uses such as the leasing of OCS blocks for commercial renewable energy activities (see 76 FR 27788 (May 11, 2011)).

Alternative C differs from Alternative A (the proposed action) by excluding the Category B Areas from consideration for commercial leasing. Portions of nine OCS blocks (equivalent to about 2.5 whole OCS blocks) in the Maryland WEA would remain to be considered for leasing and subsequent site assessment activities under Alternative C. Based simply on the amount of reduction in the WEA, there would be about an 82 percent reduction in site characterization surveys offshore Maryland, and 10 percent reduction to overall site characterization surveys associated with all WEAs contemplated in the proposed action. Due to the reduction in area, it is anticipated that number of potential leases in the WEA offshore Maryland would be reduced from two to one. Therefore, under Alternative C, one fewer meteorological tower or two fewer meteorological buoys would be constructed as compared to Alternative A (see Section 3.1.3 of this EA, for reasonably foreseeable scenario for meteorological towers and buoys).

Table 4.16

Projected Site Characterization and Assessment Activities for Alternative C (Removal of Category B Areas Offshore Maryland)

Wind Energy Area (WEA)	Lease-holds	Site Characterization Activities		Site Assessment Activities	
		High Resolution Geophysical (HRG) Surveys (max nm/hours)	Sub-bottom Sampling (min-max)	Meteorological Towers (max)	Meteorological Buoys (max)
New Jersey	7	31,100/6,900	900-2,500	7	14
Delaware	1	9,300/2,100	300-700	0	1
Maryland	1	1,300/300	100	1	2
Virginia	3	12,600/2,800	400-1,000	3	6
Total	12	54,200/12,100	1,600-4,400	11	23

Effects of the Alternative

Physical Resources

Air Quality: Section 4.1.1.1, which describes the potential impacts of the proposed action on air quality, concluded that due to the distance from shore, neither routine activities nor non-routine events within the WEAs would impact onshore air quality. Similarly, Section 4.1.1.1, concludes that the amount of additional vessel traffic associated with the preferred alternative would not significantly affect onshore air quality in any of the potentially affected state. The reduced level of survey and construction activities under Alternative C would reduce emissions associated with surveys and site assessment in and around the Maryland WEA. Due to the short duration or low level of emissions from routine activities, the potential impacts on ambient air quality from the proposed action and Alternative C, if detectible, would be negligible to minor.

Water Quality: Section 4.1.1.2, which describes the potential impacts of the proposed action on water quality, concluded that impacts to coastal and marine waters from routine activities associated with the proposed action, if detectible, would be of short duration and remain minimal. If a diesel spill were to occur, it would be expected to dissipate very rapidly in the water column, then evaporate and biodegrade within a few days (see Section 3.2.3). Since collisions occur infrequently, the potential impacts to water quality associated with the preferred alternative are not expected to be significant. Under Alternative C, there would be a substantial decrease of vessel activity associated with the Maryland WEA, and as a result, there would be reduced risk of a collision or oil spill, primarily in and around Maryland, associated with surveys and site assessment activities. Similarly, discharges of bilge, wastewater, and waste from vessels associated with the Maryland WEA would be reduced.

Under Alternative C, the reduced level of bottom-disturbing activities associated with surveys and construction would reduce the potential impacts to water quality within the vicinity of the Maryland WEA.

Biological Resources

Coastal Habitats: Section 4.1.2.1, which describes the potential impacts of the proposed action on coastal habitats, concluded that no direct impacts on coastal habitats would occur from routine activities as a result of the proposed action due to the distance of the WEAs from shore and the use of heavily-trafficked vessel routes and existing port facilities. Indirect impacts from routine activities may occur from wake erosion and associated added sediment caused by increased vessel traffic in support of the proposed action, but in light of the amount of existing vessel traffic in waterways and in light of the minimal increase in traffic in any single waterway associated with the proposed action, these impacts would be negligible if detectible. Under Alternative C, fewer survey, construction, and support vessel trips would occur in and around the Maryland WEA than contemplated in the preferred alternative. This would reduce whatever increase of wake-induced erosion and risk of diesel spills in coastal waters, and reduce the amount of potential vessel discharge in and around the Maryland WEA. As a result, Alternative C would likely lead to fewer impacts to the Coastal habitat, primarily in Maryland, than would the preferred alternative.

Benthic Resources: Section 4.1.2.2, which describes the potential impacts of the proposed action on benthic resources, concluded that impacts of site characterization, and the construction, operation, and removal of meteorological towers and buoys on benthic communities would be short-term in duration and negligible in extent. The primary potential impacts of the preferred alternative on benthic communities would be associated with the construction, operation, and decommissioning of meteorological towers, or the installation of meteorological buoys. Impacts would be caused by contact via anchors, driven piles, and scour protection that could cause crushing or smothering.

Potential impacts from non-routine events, such as a diesel spill, are also anticipated to be negligible, because a diesel spill is unlikely and would likely be restricted to the sea surface and would dissipate rapidly if a spill were to occur.

Under Alternative C, there would be no potential for bottom-disturbing activities within the excluded blocks, and therefore, no potential to impact benthic habitats located there.

Marine Mammals: Section 4.1.2.3, which describes the potential impacts of the proposed action on marine mammals, concluded that the proposed action would minimally or negligibly effect marine mammals and that the proposed alternative would impact marine mammals in an episodic fashion. Specifically, harassment from sound (sonar during surveys and short-duration pile driving) and slight increases in the risk of vessel collisions associated with surveys and construction are the primary activities that could impact marine mammals.

Under Alternative C, the lower level of site characterization and site assessment activity would reduce the potential exposure of marine mammals to noise from surveys, vessel traffic, and pile driving offshore Maryland. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals to the same proportion that vessel traffic would be reduced from that anticipated in connection with the preferred alternative.

Sea Turtles: Section 4.1.2.4, which describes the potential impacts of the proposed action on sea turtles, describes how the proposed action may affect sea turtles, specifically leatherback, loggerhead, Kemp's ridley, and green sea turtles. These impacts are expected to be short-term and would result in minimal to negligible harassment depending on the specific activity at issue. Specifically, harassment from noise associated with pile driving and sonar surveys, minor displacement from forage areas during construction, decommissioning, and survey activities, and to a lesser degree, vessel collisions, are the primary anticipated impacts to ESA-listed sea turtles. These minor impacts would be minimized by the terms of a lessee's IHA permit, which would very likely require exclusion zones during HRG surveys, boring activity, and pile driving.

Under Alternative C, the lower level of activity would substantially reduce the exposure of sea turtles in the area of the Maryland WEA to noise from surveys, vessel traffic, and pile driving offshore Maryland. The reduced vessel traffic would lower the risk of vessel collisions with sea turtles and reduce displacement from forage areas.

Birds: Section 4.1.2.5, which describes the potential impacts of the proposed action on birds, concludes that, while birds may be affected by vessel discharges and the presence of meteorological towers and buoys, accidental fuel release is unlikely and the risk of collision with structures would be minor due to the small number of meteorological towers proposed, and their distance from shore and each other.

Since Alternative C contemplates one meteorological tower or two meteorological buoys within the WEA as opposed to the two meteorological towers or four meteorological buoys contemplated by the preferred alternative, Alternative C presents half the risk that birds will collide with structures within the Maryland WEA.

Bats: Section 4.1.2.6, which describes the potential impacts of the proposed action on bats, concluded that, while it is unlikely that bat species would be foraging or migrating through the WEAs, these mammals may on occasion be driven to the project area by prevailing winds and weather. The only potential impact to bats presented by the preferred alternative would be the possibility that bats blown into the project area could possibly collide with a meteorological tower or buoy. Because of the anticipated distance between the anticipated meteorological towers and buoys, there would be no additive effect of constructing all the anticipated meteorological towers or placement of buoys on bats. It is not expected that the preferred alternative would have any measurable impact on bats. The current holder of the Interim Policy lease in the area could install a meteorological tower structure even if the No Action alternative were selected (see Interim Policy EA (USDOI, MMS, 2009a)). Since Alternative C contemplates one meteorological tower or two meteorological buoys within the WEA as opposed to the two meteorological towers or four meteorological buoys contemplated by the preferred alternative, Alternative C presents half the risk that birds will collide with structures within the Maryland WEA.

Fish and Essential Fish Habitat (EFH): Section 4.1.2.7, which describes the potential impacts of the proposed action on fish and EFH, concluded that the proposed activities and the potential effects of HRG survey noise on marine fish are generally expected to be limited to avoidance around the HRG survey activities, short-term changes in behavior, and limited and temporary loss of habitat from during the installation of meteorological towers and buoys. Thus, potential population-level impact on fish for HRG surveys is not anticipated.

Sub-bottom sampling, construction of meteorological towers, and the installation of meteorological buoys could affect local benthic habitats. The seabed disturbance footprint of sub-bottom sampling would be small; it is expected that this activity would have negligible effects on benthic habitat, and that this disturbance would have a negligible, if detectible, impact on federally-managed fish species that may occur in the Delaware WEA. Impacts related to meteorological towers/buoys installation and decommissioning is expected to be minor and not expected to result in changes in local community assemblage and diversity.

Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. The entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during normal operations. Impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor.

A nature event such as a severe storm may impact meteorological towers or buoys at some point during operation. If unanticipated collisions were to occur, and a vessel's cargo was discharged, the impacts would depend upon that of the type and amount of cargo discharged at the time.

Under Alternative C, the lower level of activity would reduce the exposure of fish to noise from surveys and vessel traffic by approximately 82 percent. There would be no potential for bottom disturbing activities to impact EFH located within the excluded blocks under Alternative C, although the current holder of the Interim Policy lease in the area could install a meteorological tower structure even if the No Action alternative were selected (see Interim Policy EA (USDOI, MMS, 2009a)). Proposed mitigation measures would reduce or eliminate the low level of potential impacts to fish and EFH located in the leased portion of the Maryland WEA.

Socioeconomic Conditions

<u>Offshore Archaeological Resources</u>: Section 4.1.3.1, which describes the potential impacts of the proposed action on offshore archaeological resources, concluded that the information generated from the lessee's initial site characterization activities and should provide an adequate picture of the presence of significant and/or unique archaeological resources within the WEAs and along potential cable routes to shore. As a result, the potential for seafloor/bottom-disturbing activities (e.g. anchorages and installation of meteorological towers and buoys) to cause damage to or loss of significant and/or unique archaeological information would be avoided. Under Alternative C, there would be no potential for bottom-disturbing activities to impact archeological resources located within the excluded blocks. Existing and proposed mitigations would reduce or eliminate impacts to archeological resources located in the remainder of the Maryland WEA.

<u>Recreational Activities</u>: Section 4.1.3.2, which describes the potential impacts of the proposed action on recreational resources, concluded that, due to the distance of the proposed lease areas from shore and the fact that that no new coastal infrastructure is proposed, no impacts to coastal

recreational resources from meteorological towers or buoys and spills within the WEAs are expected. Section 4.1.3.2 also concluded that the increase in vessel traffic associated with the preferred alternative would not significantly affect recreation in the coastal areas or oceans outside any of the potentially affected states. While impacts could occur from marine trash and debris associated with the preferred alternative, they would unlikely be perceptible to beach users or administrators.

The excluded blocks under Alternative C are located so far offshore that a meteorological tower located within those blocks would not be visible from shore in any case. Not leasing in this area would present no different impact, insofar as structures are concerned, than does the preferred alternative on recreational resources. However, under Alternative C, vessel traffic and survey activities would be reduced by approximately 82 percent. As a result, assuming that vessel traffic associated with the Maryland WEA would traverse Maryland coastal and harbor-related waters, Alternative C would reduce the risk that vessel traffic and discharges could impact recreational resources within Maryland.

Demographics: Section 4.1.3.3, which describes the potential impacts of the proposed action on demographics, concluded that, due to the magnitude, dispersed nature, and short duration of survey, construction, and decommissioning activities, any benefit to local economies or employment would be minor and short-term. Also these activities are not expected to employ many workers relative to the existing employment numbers. Due to the reduced level of site characterization surveys and site assessment activities offshore Maryland as compared with the preferred alternative, Alternative C is expected to produce about 82 percent fewer positive impacts on the population and employment of coastal counties of Maryland, assuming that the activities in the Maryland WEA would be supported by facilities in Maryland.

Environmental Justice: Section 4.1.3.4, which describes the potential impacts of the proposed action related to environmental justice issues, concluded that the preferred alternative would have no impacts on the environmental or health-related conditions of minority or low-income populations. Only the use of existing coastal facilities has the potential to impact minority or low-income populations. However, no expansion of these existing onshore areas is anticipated to support the proposed action or Alternative C, and significant increases in activity at these existing facilities is not anticipated as a result of either the proposed action or Alternative C. As a result, neither the proposed action nor Alternative C is expected to have disproportionately high or adverse environmental or health effects on minority or low-income populations.

Land Use and Coastal Infrastructure: Section 4.1.3.5, which describes the potential impacts of the proposed action on land use and coastal infrastructure, concluded that existing ports or industrial areas are expected to be used, and that expansion of these existing facilities is not anticipated to support the proposed action. This assumption also applies to Alternative C. Assuming that Maryland coastal infrastructure would be used to support activities in the WEA offshore Maryland, the selection of Alternative C would reduce the need for Maryland's coastal infrastructure for survey vessels by approximately 82 percent. As a result, Alternative C would have even less impact on land use or coastal infrastructure in Maryland than would the preferred alternative.

Commercial and Recreational Fishing Activities: Section 4.1.4.6, which describes the potential impacts of the proposed action on commercial and recreational fishing activities, concluded that the increase in vessel traffic, and activities from the installation/operation of the meteorological towers and buoys would not measurably impact commercial or recreational fishing activities, total catch of fish and shellfish, or navigation. Any impacts, such fishing displacement and target species availability, would be of short duration, limited in area, and temporary. Proposed mitigation measures (notifying fisherman of construction and decommissioning activities, and verification and evidence of site clearance) would further reduce or eliminate any potential minor impacts on fisheries.

Under Alterative C, there would be no potential for site characterization surveys and site assessment activities to conflict with commercial or recreational fishing within the excluded blocks. Compared to the preferred alternative, Alternative C would reduce the potential for fishing-use conflict within and around the WEA offshore Maryland by approximately 82 percent for survey activities.

Other Uses of the OCS: Section 4.1.3.7, which describes the potential impacts of the proposed action on other uses of the OCS, concluded that minor direct impacts on vessel traffic density and patterns would occur from routine activities associated with the proposed action.

Under Alternative C, survey and construction activities that would impact vessel traffic density and patterns would not occur in the anchorage ground. It is assumed the risk of collisions and allisions would be greater in this area, because it already contains a relatively high concentration of vessels. Therefore, Alternative C would provide a slight reduction in the risk of collisions and allisions than would Alternative A.

Under Alternative C, survey and construction activities that would impact vessel traffic density and patterns would not occur in the excluded blocks, which comprise approximately 82 percent of the WEA offshore Maryland. The reduced level of vessel traffic would proportionately reduce the risk of collisions, while one less meteorological tower would reduce the risk of allision within the Maryland WEA. Therefore, Alternative C would provide a reduction in the overall risk of collisions and allisions from that anticipated under Alternative A.

Summary/Conclusion

The potential impacts of Alternative C would only differ from the proposed action within and around the Maryland WEA. Existing and proposed mitigation measures would still reduce or eliminate potential impacts to resources located in the remainder of the Maryland WEA. There would be no potential for bottom-disturbing activities to impact benthic habitats or archeological resources located within the excluded blocks. While there is still the potential for conflicts with other uses of the OCS, including commercial and recreational fishing, there would be no potential for site characterization surveys and site assessment activities to conflict within the excluded blocks, and the reduction in overall vessel traffic (approximately 82 percent) associated with the Maryland WEA under Alternative C would commensurately reduce the potential for vessel-related conflicts in Maryland harbor and coastal areas.

Compared to the proposed action, the reduced level of survey and construction activities under Alternative C would similarly reduce the impacts on air and water quality in Maryland port and coastal areas and within the vicinity of the Maryland WEA. Reduced vessel traffic and one less structure would reduce the risk of vessel collisions and allisions, reducing the risk of a diesel spill. The lower level of activity would reduce the exposure of marine mammals, sea turtles and fish to noise from surveys, vessel traffic, and pile driving offshore Maryland. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals and sea turtles. There would be less potential loss/displacement of sea turtles from forage areas.

Under Alternative C, one less meteorological tower is projected to be constructed, than is projected in the proposed action, which would reduce the already small risk of bird or bat collisions. While the same existing onshore facilities would be used in support of the site characterization surveys and site assessment in the remainder of the WEAs, fewer survey, construction and support vessel trips would reduce the potential for the increase of wake-induced erosion and risk of diesel spills in coastal waters, mainly in Maryland. Accordingly, Alternative C is expected to produce slightly fewer positive impacts on the population and employment of coastal counties of Maryland.

Under Alternative C, survey and construction activities that would impact vessel traffic density and patterns would not occur in the excluded blocks. The reduced level of vessel traffic would reduce the risk of collisions, while one less meteorological tower would reduce the risk of allision within the Maryland WEA by half. Therefore, Alternative C would provide a lower risk of collisions and allisions than would Alternative A.

4.4 Alternative D – Seasonal Prohibition to Protect the North Atlantic Right Whale

Description of the Alternative

The North Atlantic right whale is among the most endangered whales in the world. Current estimates of the North Atlantic right whale population are between 350-400 individuals. Two primary human-induced threats have been identified – collisions with vessels (ship strikes), and entanglement with fishing gear. To reduce the likelihood of ship strikes from vessels engaged in site characterization and site assessment activities, Alternative D would limit vessel activity by excluding surveys and the construction and decommissioning of meteorological towers and buoys during peak migration periods of right whales to and from the summer feeding grounds in New England and winter calving grounds offshore Georgia and Florida. The period of exclusion would be between November and April, when the whales would be potentially present in the largest numbers, and would apply to all four Mid-Atlantic WEAs. Vessel traffic associated with periodic maintenance trips to installed meteorological towers and buoys would not be restricted under this alternative.

Effects of the Alternative

Since proposed site characterization surveys and site assessment activities would still occur-under Alternative D, this alternative would not decrease or increase total potential impacts to air quality, water quality, coastal habitats, and benthic habitats from that described in Alternative A. Socioeconomic impacts would also be similar to those described in Alternative A. Migratory marine mammals other than right whales would likely benefit from an exclusion period. Impacts to other resources are discussed below.

<u>Air Quality</u>: Section 4.1.1.1, which describes the potential impacts of the proposed action on air quality, concluded that due to the distance from shore, neither routine activities nor non-routine events within the WEAs would impact onshore air quality. Similarly, Section 4.1.1.1, concludes that the amount of additional vessel traffic associated with the preferred alternative would not significantly affect onshore air quality in any of the potentially affected state.

Under Alternative D, the total annual impacts to air quality would be unchanged from that described under Alternative A. However, Alternative D would be narrowing the window of time to complete construction and site characterization activities. The work window would only be restricted by a few months as normal operations under Alternative A have existing restrictions from poor working conditions that occur in the winter months and during active portions of the Atlantic hurricane season. Thus it is not anticipated that Alternative D would have greater or lesser impacts on air quality than would Alternative A.

Water Quality: Section 4.1.1.2, which describes the potential impacts of the proposed action on water quality, concluded that impacts to coastal and marine waters from routine activities associated with the proposed action, if detectible, would be of short duration and remain minimal. Should an oil spill occur, the localized impact on water quality would be negligible, diesel is light and would become dispersed, evaporate, and biodegrade within a few days. Since collisions occur infrequently, the potential impacts to water quality associated with the preferred alternative are not expected to be significant. Similar to impacts to air quality, under Alternative D the total annual impacts to water quality would be unchanged from that described under Alternative A. However, Alternative D would be narrowing the window of time to complete construction and site characterization activities. The work window would only be restricted by a few months as normal operations under Alternative A have existing restrictions from poor working conditions that occur in the winter months and during active portions of the Atlantic hurricane season. Thus it is not anticipated that Alternative D would have greater or lesser impacts than would Alternative A.

Coastal Habitats: Section 4.1.2.1, which describes the potential impacts of the proposed action on coastal habitats, concluded that no direct impacts on coastal habitats would occur from routine activities as a result of the proposed action due to the distance of the WEAs from shore and the use of heavily-trafficked vessel routes and existing port facilities. Indirect impacts from routine activities may occur from wake erosion and associated added sediment caused by increased vessel traffic in support of the proposed action, but in light of the amount of existing vessel traffic in waterways and in light of the minimal increase in traffic in any single waterway associated with the proposed action, these impacts would be negligible, if detectible.

Under Alternative D, the total traffic to and from coastal areas (i.e. ports) would remain unchanged from that described in Alternative A. However, one would be restricting the period during which certain activities would take place. In the case of coastal habitats, restricting activities to the summer could have a positive effect in that one would expect wake-effect erosion to be less in the growing season for wetland habitats near ports. However, as previously mentioned, winter activity is generally expected to be negligible due to unfavorable weather conditions. Thus, overall one could expect a slight positive to neutral difference in effects to coastal habitats when compared to Alternative A.

Marine Mammals: Alternative D would reduce the likelihood of strikes associated with vessels that are engaged in site characterization and site assessment activities during the winter. Alternative D would also reduce the likelihood that marine mammals would suffer potential acoustic disturbances from vessel operation, HRG survey activity, and meteorological tower construction during winter. It is not anticipated that this alternative would greatly impair lessee activities, as it is expected that most survey and construction activities would occur in the summer when the weather is most favorable. Other cetacean species such as fin, minke, and humpback whales, as well as the short-beaked common dolphin and the harbor porpoise would also benefit from a winter seasonal prohibition in the Mid-Atlantic WEAs.

Although winter is when it is believed that peak migration occurs, there are occurrences of right whales in the Mid-Atlantic during the spring, summer, and fall (May-October). Sightings and acoustic monitoring data from the New Jersey Baseline Study (Section 4.1.2.3 of this EA) shows the occurrence of marine mammals in all four seasons from the passive acoustic monitoring data and sightings of marine mammals concentrated between March and June. Thus, it is clear that right whales could occur in all seasons in at least the New Jersey WEA. Enough uncertainty exists regarding the spatial and temporal extent of the migratory corridor for right whales that it appears unlikely that the seasonal exclusion would provide the necessary protections to fully eliminate the chances of a right whale being exposed to harassing or disturbing levels of noise and/or vessel traffic. So, although there would be overall benefits to Alternative D in comparison to Alternative A with regard to right whales, it is less clear if the level of benefit would be greater than that of requiring the proposed mitigation measures in the context of Alternative A. Since BOEMRE is assuming that the mitigation measures discussed in Section 4.1.2.3.2 and Appendix C (particularly the exclusion zone), or something substantially similar would be required by NMFS in any case, it is unlikely that Alternative D would present substantially different consequences to right whales and marine mammals that would Alternative A.

Sea Turtles: The winter prohibition would narrow the window of activity in and around the WEAs, concentrating activities that would have been performed in the winter into spring, summer, and fall. Sea turtle occurrence in the Mid-Atlantic WEAs is greatest in the summer season. Thus sea turtles would not benefit from the winter prohibition. To the contrary, under Alternative D, the likelihood that the proposed activities would impact sea turtles would likely increase, as whatever work would have been done in the winter would simply be added in the spring, fall, and summer. BOEMRE does not anticipate that much survey work would be conducted during the winter as allowed for under Alternative A. However, due to potential displacement of limited winter activities to the summer, potential for impacts to sea turtles would increase somewhat from that anticipated under the Alternative A.

Birds: It is not expected that Alternative D would significantly increase the potential impacts the piping plovers or roseate terns. They are present in the Mid-Atlantic from April to September. By early April, both species have migrated north back to their breeding grounds in the Mid-Atlantic and New England where they remain close to shore to feed and provision for their offspring. At the end of the breeding season (August-September), individuals aggregate near shore before migrating southward the South Atlantic and Caribbean by mid-September. Since these birds migrate south of the Mid-Atlantic WEAs for the winter, a winter prohibition would not benefit them. Since most their activity is restricted to nearshore waters, the concentration of activity in the summer months is not expected to increase impacts relative to Alternative A. Thus the total impacts to birds relative Alternative A is anticipated to be neutral.

Bats: Section 4.1.2.6, which describes the potential impacts of the proposed action on bats, concluded that, while it is unlikely that bat species would be foraging or migrating through the

WEAs, these mammals may on occasion be driven to the project area by prevailing winds and weather. The only potential impact to bats presented by the preferred alternative would be the possibility that bats blown into the project area could possibly collide with a meteorological tower or buoy. It is not expected that the preferred alternative would have any measurable impact on bats. Since bat impacts do not have a seasonal component related to construction and survey activity it is not expected to impact bats in any case, BOEMRE does not anticipate that that there would be any difference in the impacts to bats between Alternative D and Alternative A.

Benthic Resources: Although Alternative D would not increase or decrease the potential impacts to benthic geological features, the impacts to submerged aquatic vegetation (SAV) may vary due to their seasonal life cycle. In general, SAV such as macroalgae and seagrasses are most productive during the spring and summer. In the case of macroalgae, they bloom in the spring and are persistent throughout the summer becoming dormant in the winter. Seagrass, primarily *Zostera marina*, flower in the spring and release their seeds between May and August. The seeds germinate in the fall. Concentrating bottom-disturbing activity in late Spring, Summer, and Fall may increase potential impacts during the reproductive phase. Additionally, these impacts are further reduced due to best management practices to avoid disturbance to seagrass beds. Some benthic invertebrates are also dormant in winter. These species may be more vulnerable to bottom disturbances during the winter, as they may be immobilized in the sediment. In the spring, summer, and fall, motile invertebrates have the capability to leave a disturbed area, thus gaining some benefit from a seasonal prohibition. Impacts to benthic invertebrates as a whole are not expected to be significantly different from those anticipated under Alternative A if activities are concentrated in the spring, summer, and fall months. As a whole, impacts to benthic resources is not expected to differ greatly from that in Alternative A even with the slightly negative effects to SAV and slightly positive effects to benthic invertebrates.

Fish and Essential Fish Habitat (EFH): Section 4.1.2.7, which describes the potential impacts of the proposed action on fish and EFH, concluded that the proposed activities and the potential effects of HRG survey noise on marine fish are generally expected to be limited to avoidance around the HRG survey activities, short-term changes in behavior, and limited and temporary loss of habitat from during the installation of meteorological towers and buoys. Thus, potential population-level impact on fish for HRG surveys is not anticipated.

Sub-bottom sampling, construction of meteorological towers, and the installation of meteorological buoys could affect local benthic habitats. The seabed disturbance footprint of sub-bottom sampling would be small; it is expected that this activity would have negligible effects on benthic habitat, and that this disturbance would have a negligible, if detectible, impact on federally-managed fish species that may occur in the Delaware WEA. Impacts related to meteorological towers/buoys installation and decommissioning is expected to be minor and not expected to result in changes in local community assemblage and diversity.

Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. The entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during normal operations. Impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor.

A natural event such as a severe storm may impact meteorological towers or buoys at some point during operation. If unanticipated collisions were to occur, and a vessel's cargo was discharged, the impacts would depend upon that of the type and amount of cargo discharged at the time.

The impacts to fish and EFH are expected to differ from Alternative A in the case of migratory fish such as tunas, bluefish, and herrings. Impacts to the biological benthic resources are discussed in the preceding section. Migratory fish tend to be warm water migrants along the Atlantic coast. This means they will be moving into the Mid-Atlantic bight in the late spring through early summer. Thus they would not benefit from a winter prohibition on activity as they would likely be located in warmer southern waters including the Gulf of Mexico and the Caribbean during the winter prohibition period. One might expect a slightly negative impact on these migratory species, as activity would be restricted to periods when they are present in the Mid-Atlantic. However, since these species are fast swimmers they are expected to quickly flee an area that is being disturbed through site characterization surveys and construction/installation of meteorological platforms. So although the chance of exposure to disturbing impacts to migratory fish are greater under Alternative D than Alternative A, the actual impacts to these species is not expected to differ significantly from those associated with Alternative A.

Socioeconomic Conditions

<u>Recreational Resources</u>: Section 4.1.3.2, which describes the potential impacts of the proposed action on recreational resources, concluded that, due to the distance of the proposed lease areas from shore and the fact that that no new coastal infrastructure is proposed, no impacts to coastal recreational resources from meteorological towers or buoys and spills within the WEAs are expected. Section 4.1.3.2 also concluded that the increase in vessel traffic associated with the preferred alternative would not significantly affect recreation in the coastal areas or oceans outside any of the potentially affected states. While impacts could occur from marine trash and debris associated with the preferred alternative, they would unlikely be perceptible to beach users or administrators.

Although Alternative D would restrict activity to the period when people would be recreating along the Mid-Atlantic coast, the impacts are not expected to differ from those under Alternative A. This is primarily due the fact that any noticeable increase in vessel traffic would likely be restricted to industrial port areas, where there is less recreating. Thus, the impacts to recreational resources under Alternative D are not expected to be greater or less than the impacts expected under Alternative A.

<u>Demographics</u>: Section 4.1.3.3, which describes the potential impacts of the proposed action on demographics, concluded that, due to the magnitude, dispersed nature, and short duration of survey, construction, and decommissioning activities, any benefit to local economies or employment would be minor and short-term. Also these activities are not expected to employ many workers relative to the existing employment numbers.

There is no perceptible seasonal component to affected demographic groups from site characterization surveys and construction/installation of meteorological towers/buoys. Thus, the impacts to demographics from Alternative D do not differ from those discussed in Alternative A.

Environmental Justice: Section 4.1.3.4, which describes the potential impacts of the proposed action related to environmental justice issues, concluded that the preferred alternative would have no impacts on the environmental or health-related conditions of minority or low-income populations. Only the use of existing coastal facilities has the potential to impact minority or low-income populations. However, no expansion of these existing onshore areas is anticipated to support the proposed action or Alternative D, and significant increases in activity at these existing facilities is not anticipated as a result of either the proposed action or Alternative D. As a result, neither the proposed action nor Alternative D is expected to have disproportionately high or adverse environmental or health effects on minority or low-income populations.

Land Use and Coastal Infrastructure: Section 4.1.3.5, which describes the potential impacts of the proposed action on land use and coastal infrastructure, concluded that existing ports or industrial areas are expected to be used, and that expansion of these existing facilities is not anticipated to support the proposed action. This assumption also applies to Alternative D. It is not expected that land use and coastal infrastructure (i.e., ports) would be differentially affected by a seasonal restriction on certain activities. Although there would be a concentration if activity in the spring, summer, and fall, it is expected that the ports and other infrastructure would be able to accommodate this activity. Thus, the impacts to land use and coastal infrastructure from Alternative D do not differ from those discussed in Alternative A.

Commercial and Recreational Fishing Activities: Section 4.1.4.6, which describes the potential impacts of the proposed action on commercial and recreational fishing activities, concluded that the increase in vessel traffic, and activities from the installation/operation of the meteorological towers and buoys would not measurably impact commercial or recreational fishing activities, total catch of fish and shellfish, or navigation. Any impacts, such fishing displacement and target species availability, would be of short duration, limited in area, and temporary. Proposed mitigation measures (notifying fisherman of construction and decommissioning activities, and verification and evidence of site clearance) would further reduce or eliminate any potential minor impacts on fisheries.

Although commercial and recreational fishing occur year-round, the bulk of activity occurs in the summer months. Thus, although a winter prohibition may slightly benefit some winter fisheries, most fishing activity would not accrue any benefit from Alternative D. The concentration of activity to the spring, summer, and fall may slightly increase the vessel traffic in areas fished and transited by commercial and recreational fishing vessels. However, as explained under Alternative A, these impacts are expected to be of short duration within a limited area. Thus the overall impacts from Alternative D in comparison to Alternative A are not expected to be significantly different.

Other Uses of the OCS: Section 4.1.3.7, which describes the potential impacts of the proposed action on other uses of the OCS, concluded that minor direct impacts on vessel traffic density and patterns would occur from routine activities associated with the proposed action.

Under Alternative D impacts to other uses of the OCS are not expected to differ from that described in Alternative A. Military and marine transportation uses of the OCS occur year-round. Restricting site characterization surveys and construction/installation of meteorological towers/buoys to the spring, summer, and fall would not alter the impacts that are given in

Alternative A as the activities are not heavily influence by seasonality and slight increases or decreases of activities therein.

Summary/Conclusion

Alternative D would reduce the risk of vessel strikes to North Atlantic right whales and other marine mammals in and around the WEAs. Other resources that have a seasonal component that might be affected by site characterization surveys and/or meteorological tower/buoy construction/installation may have slightly positive to slightly negative impacts depending on the specific resource. As a whole, it is not anticipated that the impacts are significantly different between Alternative A and Alternative D for resources other than the North Atlantic right whale, and other cetacean species such as fin, minke, and humpback whales, as well as the short-beaked common dolphin and the harbor porpoise.

Another consideration in analyzing Alternative D is whether or not mitigation measures and likely NMFS requirements -- observer requirements and exclusion zones -- currently proposed under the Alternative A would be lessened or removed as a result of the seasonal prohibition. As detailed above, right whales could occur in all seasons in at least the New Jersey WEA, necessitating observers and monitoring exclusion zones for vessel and construction activity outside of the estimated peak Mid-Atlantic migration period. Enough uncertainty exists regarding the spatial and temporal extent of the migratory corridor for right whales, and the predicted impact to this species under Alternative A is sufficiently minor, that it appears unlikely that the seasonal exclusion in Alternative D would provide substantially more protection for right whales than would the selection of Alternative A.

4.5 Alternative E – Removal of Inclement Weather Diversion Area Offshore Virginia

Description of the Alternative

In response to the NOI to prepare this EA, the American Waterways Operators (AWO) raised concerns regarding navigational safety in inclement weather and requested that BOEMRE exclude eight whole OCS blocks (6013, 6014, 6063, 6064, 6113, 6114, 6163, and 6164) from leasing consideration in the Virginia WEA (see Figure 2.2).

The AWO letter states:

> Under inclement weather conditions, vessel traffic plans require north and south bound tugboats, barges, and ATBs to divert westward approximately 24 NM from Virginia Beach, through the proposed area of interest, between OCS lease blocks 6013, 6014, 6063, 6064, 6113, 6114, 6163, and 6164. This area provides tugboats and barges with safer operating conditions, enough depth for tow-wires to sag 50 to 75 ft, and provides ATBs with enough depth for under-keel clearance. Towing vessels would be forced to divert further west, away from the proposed area, in order to safely navigate around wind turbines. Diverting west, tugboats and barges would have to shorten their tow-wires and decrease speeds, placing crewmembers, vessels, and cargo at additional risk, along with decreased maneuverability as they navigate through the shoals south of the Chesapeake Light Tower. To avoid navigating through such hostile environments, vessels would have to be delayed while captains plot alternative bad weather diversion routes.

Under Alternative E, these areas would be excluded from leasing. As a result, an area equivalent to a little over 18 OCS blocks in the Virginia WEA would remain, and would be considered for leasing and subsequent site assessment activities under Alternative E. Based simply on the reduction of the potential lease area, there would be a 33 percent reduction in site characterization surveys within the Virginia WEA (about 7% reduction in overall site characterization surveys potentially occurring in all WEAs). Additionally, one fewer meteorological towers and/or two fewer meteorological buoys would be constructed, a reduction of one-third from that anticipated under the Preferred Alternative. *See* Chapter 3 of this EA, which discusses reasonably foreseeable site assessment scenarios.

Table 4.17

Projected Site Characterization and Assessment Activities for Alternative E (Removal of Inclement Weather Diversion Area Offshore Virginia)

Wind Energy Area (WEA)	Lease-holds	Site Characterization Activities		Site Assessment Activities	
		High Resolution Geophysical (HRG) Surveys (max nm/hours)	Sub-bottom Sampling (min-max)	Meteorological Towers (max)	Meteorological Buoys (max)
New Jersey	7	31,100/6,900	900-2,500	7	14
Delaware	1	9,300/2,100	300-700	0	1
Maryland	2	7,100/1,600	200-600	2	4
Virginia	2	8,400/1,900	300-700	2	4
Total	12	55,900/12,400	1,700-4,500	11	23

Effects of the Alternative

Physical Resources

Air Quality: Section 4.1.1.1, which describes the potential impacts of the proposed action on air quality, concluded that due to the distance from shore, neither routine activities nor non-routine events within the WEAs would impact onshore air quality. Similarly, Section 4.1.1.1, concludes that the amount of additional vessel traffic associated with the preferred alternative would not significantly affect onshore air quality in any of the potentially affected state.
The reduced level of survey and construction activities under Alternative E would reduce emissions within the vicinity of Virginia and the Virginia WEA associated with site characterization and site assessment by 33 percent. Due to the short duration or low level of emissions from routine activities, potential impacts on ambient air quality from the proposed action and Alternative F would remain negligible, if detectible.

Water Quality: Section 4.1.1.2, which describes the potential impacts of the proposed action on water quality, concluded that impacts to coastal and marine waters from routine activities associated with the proposed action, if detectible, would be of short duration and remain minimal. Should an oil spill occur, the localized impact on water quality would be negligible, as diesel is light and would become dispersed, evaporate, and biodegrade within a few days. Since collisions occur infrequently, the potential impacts to water quality associated with the preferred alternative are not expected to be significant. Under Alternative E, the reduced level of bottom disturbing activities associated with surveys and construction would reduce impacts to water quality within the vicinity of the Virginia WEA. Approximately 7 percent fewer of total survey, construction and support vessel trips would similarly reduce the risk of diesel spills in coastal waters, mainly in Virginia, and would also reduce the amount of bilge and other vessel discharges into harbor and coastal waters, as well as the waters above the WEA offshore Virginia.

Biological Resources

Coastal Habitats: Section 4.1.2.1, which describes the potential impacts of the proposed action on coastal habitats, concluded that no direct impacts on coastal habitats would occur from routine activities as a result of the proposed action due to the distance of the WEAs from shore and the use of heavily-trafficked vessel routes and existing port facilities. Indirect impacts from routine activities may occur from wake erosion and associated added sediment caused by increased vessel traffic in support of the proposed action, but in light of the amount of existing vessel traffic in waterways and in light of the minimal increase in traffic in any single waterway associated with the proposed action, these impacts would be negligible if detectible. Under Alternative E, fewer survey, construction, and support vessel trips would occur in and around the Virginia WEA than contemplated in the Preferred Alternative. This would reduce whatever increase of wake-induced erosion and risk of diesel spills in coastal waters, and reduce the amount of potential vessel discharge in and around the Virginia WEA. As a result, Alternative E would lead to fewer impacts to the Coastal habitat, primarily in Virginia, than would the preferred alternative.

Benthic Resources: Section 4.1.2.2, which describes the potential impacts of the proposed action on benthic resources, concluded that impacts of site characterization, and the construction, operation, and removal of meteorological towers and buoys on benthic communities would be short-term in duration and negligible in extent. The primary potential impacts of the preferred alternative on benthic communities would be associated with the construction, operation, and decommissioning of meteorological towers, or the installation of meteorological buoys. Impacts would be caused by contact via anchors, driven piles, and scour protection that could cause crushing or smothering.

Potential impacts from non-routine events, such as a diesel spill, are also anticipated to be negligible, because a diesel spill is unlikely and would likely be restricted to the sea surface and would dissipate rapidly if a spill were to occur.

Under Alternative E, there would be no potential for bottom-disturbing activities within the excluded blocks, and therefore, no potential to impact benthic habitats located there.

Marine Mammals: Section 4.1.2.3, which describes the potential impacts of the proposed action on marine mammals, concluded that the proposed action would minimally or negligibly effect marine mammals and that the proposed alternative would impact marine mammals in an episodic fashion. Specifically, harassment from sound (sonar during surveys and short-duration pile driving) and slight increases in the risk of vessel collisions associated with surveys and construction are the primary activities that could impact marine mammals.

Under Alternative E, the lower level of site characterization and site assessment activity would reduce the potential exposure of marine mammals to noise from surveys, vessel traffic, and pile driving offshore Virginia. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals to the same proportion that vessel traffic would be reduced from that anticipated in connection with the preferred alternative.

Sea Turtles: Section 4.1.2.4, which describes the potential impacts of the proposed action on sea turtles, describes how the proposed action may affect sea turtles, specifically leatherback, loggerhead, Kemp's ridley, and green sea turtles. These impacts are expected to be short-term and would result in minimal to negligible harassment depending on the specific activity at issue. Specifically, harassment from noise associated with pile driving and sonar surveys, minor displacement from forage areas during construction, decommissioning, and survey activities, and to a lesser degree, vessel collisions, are the primary anticipated impacts to ESA-listed sea turtles. These minor impacts would be minimized by the terms of a lessee's IHA permit, which would very likely require exclusion zones during HRG surveys, boring activity, and pile driving.

Under Alternative E, the lower level of activity would reduce the exposure of sea turtles in the area of the Virginia WEA to noise from surveys, vessel traffic, and pile driving offshore Virginia. The reduced vessel traffic would lower the risk of vessel collisions with sea turtles and reduce the potential for displacement from forage areas offshore Virginia.

Birds: Section 4.1.2.5, which describes the potential impacts of the proposed action on birds, concludes that, while birds may be affected by vessel discharges and the presence of meteorological towers and buoys, accidental fuel release is unlikely and the risk of collision with structures would be minor due to the small number of meteorological towers proposed, and their distance from shore and each other.

Under Alternative E one less meteorological tower is projected to be constructed as a result of not leasing the eight blocks of the Virginia WEA, which would reduce the overall risk of bird collisions. Since Alternative E contemplates two meteorological towers or four meteorological buoys within the WEA as opposed to the three meteorological towers or six meteorological buoys contemplated by the preferred alternative, Alternative E presents one-third the risk that birds will collide with structures within the Virginia WEA.

Bats: Section 4.1.2.6, which describes the potential impacts of the proposed action on bats, concluded that, while it is unlikely that bat species would be foraging or migrating through the WEAs, these mammals may on occasion be driven to the project area by prevailing winds and weather. The only potential impact to bats presented by the preferred alternative would be the possibility that bats blown into the project area could possibly collide with a meteorological tower or buoy. Because of the anticipated distance between the anticipated meteorological towers and buoys, there would be no additive effect of constructing all the anticipated meteorological towers or placement of buoys on bats. It is not expected that the preferred alternative would have any measurable impact on bats. The current holder of the Interim Policy lease in the area could install a meteorological tower structure even if the No Action alternative were selected (see Interim Policy EA (USDOI, MMS, 2009a)). Since Alternative C contemplates one meteorological tower or two meteorological buoys within the WEA as opposed to the two meteorological towers or four meteorological buoys contemplated by the preferred alternative, Alternative C presents half the risk that birds will collide with structures within the Maryland WEA.

Under Alternative E one less meteorological tower or two fewer meteorological buoys are projected to be constructed as a result of not leasing the eight blocks of the Virginia WEA, which would reduce any potential impacts to bats by one-third.

Fish and Essential Fish Habitat (EFH): Section 4.1.2.7, which describes the potential impacts of the proposed action on fish and EFH, concluded that the proposed activities and the potential effects of HRG survey noise on marine fish are generally expected to be limited to avoidance around the HRG survey activities, short-term changes in behavior, and limited and temporary loss of habitat from during the installation of meteorological towers and buoys. Thus, potential population-level impact on fish for HRG surveys is not anticipated.

Sub-bottom sampling, construction of meteorological towers, and the installation of meteorological buoys could affect local benthic habitats. The seabed disturbance footprint of sub-bottom sampling would be small; it is expected that this activity would have negligible effects on benthic habitat, and that this disturbance would have a negligible, if detectible, impact on federally-managed fish species that may occur in the Delaware WEA. Impacts related to meteorological towers/buoys installation and decommissioning is expected to be minor and not expected to result in changes in local community assemblage and diversity.

Fish could be exposed to operational discharges or accidental fuel releases from construction sites and construction vessels and to accidentally released solid debris. The entanglement in or ingestion of OCS-related trash and debris by fish would not be expected during normal operations. Impacts to fish and their habitat from the discharge of waste materials or the accidental release of fuels are expected to be minor.

A nature event such as a severe storm may impact meteorological towers or buoys at some point during operation. If unanticipated collisions were to occur, and a vessel's cargo was discharged, the impacts would depend upon that of the type and amount of cargo discharged at the time.

Under Alternative E, the lower level of activity would reduce the exposure of fish to noise from surveys and vessel traffic and potential discharges by approximately seven percent offshore Virginia, and pile driving offshore Virginia by one-third. There would be no potential for bottom disturbing activities to impact EFH located within the excluded blocks under Alternative E. Proposed mitigation measures would reduce or eliminate the low level of potential impacts to fish and EFH located in the leased portion of the Virginia WEA.

Socioeconomic Conditions

Offshore Archaeological Resources: Section 4.1.3.1, which describes the potential impacts of the proposed action on offshore archaeological resources, concluded that the information generated from the lessee's initial site characterization activities and should provide an adequate picture of the presence of significant and/or unique archaeological resources within the WEAs and along potential cable routes to shore. As a result, the potential for seafloor/bottom-disturbing activities (e.g. anchorages and installation of meteorological towers and buoys) to cause damage to or loss of significant and/or unique archaeological information would be avoided. Under Alternative E, there would be no potential for bottom-disturbing activities to impact archeological resources located within the excluded blocks. Existing and proposed mitigations would reduce or eliminate impacts to archeological resources located in the remainder of the Virginia WEA.

Recreational Activities: Section 4.1.3.2, which describes the potential impacts of the proposed action on recreational resources, concluded that, due to the distance of the proposed lease areas from shore and the fact that that no new coastal infrastructure is proposed, no impacts to coastal recreational resources from meteorological towers or buoys and spills within the WEAs are expected. Section 4.1.3.2 also concluded that the increase in vessel traffic associated with the preferred alternative would not significantly affect recreation in the coastal areas or oceans outside any of the potentially affected states. While impacts could occur from marine trash and debris associated with the preferred alternative, they would unlikely be perceptible to beach users or administrators.

The excluded blocks under Alternative E are located so far offshore that a meteorological tower located within those blocks would not be visible from shore in any case. Not leasing in this area would present no different impact, insofar as structures are concerned, than does the preferred alternative on recreational resources. Under Alternative E, vessel traffic and survey activities would be reduced by approximately seven percent. As a result, assuming that vessel traffic associated with the Virginia WEA would traverse Virginia coastal and harbor-related waters, Alternative E would slightly reduce the risk that vessel traffic and discharges could impact recreational activities within Virginia.

Demographics: Section 4.1.3.3, which describes the potential impacts of the proposed action on demographics, concluded that, due to the magnitude, dispersed nature, and short duration of survey, construction, and decommissioning activities, any benefit to local economies or employment would be minor and short-term. Also these activities are not expected to employ many workers relative to the existing employment numbers. Due to the reduced level of site characterization surveys and site assessment activities offshore Virginia as compared with the preferred alternative, Alternative E is expected to produce slightly fewer positive impacts on the population and employment of coastal counties of Virginia, assuming that the activities in the Virginia WEA would be supported by facilities in Virginia.

Environmental Justice: Section 4.1.3.4, which describes the potential impacts of the proposed action related to environmental justice issues, concluded that the preferred alternative would have no impacts on the environmental or health-related conditions of minority or low-income populations. Only the use of existing coastal facilities has the potential to impact minority or low-income populations. However, no expansion of these existing onshore areas is anticipated to support the proposed action or Alternative E, and significant increases in activity at these existing facilities is not anticipated as a result of either the proposed action or Alternative E. As a result, neither the proposed action nor Alternative E is expected to have disproportionately high or adverse environmental or health effects on minority or low-income populations.

Land Use and Coastal Infrastructure: Section 4.1.3.5, which describes the potential impacts of the proposed action on land use and coastal infrastructure, concluded that existing ports or industrial areas are expected to be used, and that expansion of these existing facilities is not anticipated to support the proposed action. This assumption also applies to Alternative E. Assuming that Virginia coastal infrastructure would be used to support activities in the WEA offshore Virginia, the selection of Alternative E would reduce the need for Virginia's coastal infrastructure for survey vessels by approximately seven percent, and for the fabrication and/or staging of towers or buoys by one-third. As a result, Alternative E would have less impact on land use or coastal infrastructure in Maryland than would the preferred alternative.

Commercial and Recreational Fishing Activities: Section 4.1.4.6, which describes the potential impacts of the proposed action on commercial and recreational fishing activities, concluded that the increase in vessel traffic, and activities from the installation/operation of the meteorological towers and buoys would not measurably impact commercial or recreational fishing activities, total catch of fish and shellfish, or navigation. Any impacts, such fishing displacement and target species availability, would be of short duration, limited in area, and temporary. Proposed mitigation measures (notifying fisherman of construction and decommissioning activities, and verification and evidence of site clearance) would further reduce or eliminate any potential minor impacts on fisheries.

Under Alterative E, there would be no potential for site characterization surveys and site assessment activities to conflict with commercial fishing within the excluded blocks. Compared to the preferred alternative, Alternative E may reduce the potential for fishing-use conflict within and around the WEA offshore Virginia. However, due to the distance from shore of the excluded blocks, recreational fishing is unlikely to take place there. As a result, Alternative E would not likely benefit or otherwise affect recreational fishing in any manner other than that described in the Preferred Alternative.

Other Uses of the OCS: Section 4.1.3.7, which describes the potential impacts of the proposed action on other uses of the OCS, concluded direct impacts on vessel traffic density and patterns would occur from routine activities as a result of the proposed action. Assuming the TSS approaches to Delaware and Chesapeake Bays would be used by most commercial shipping vessels and existing mitigation measures are followed, an increased risk of collision or allision would not occur as a result of the proposed action. Direct impacts to the navigation and safety from site characterization surveys and installation, operations and decommissioning of meteorological towers/buoys offshore New Jersey, Delaware, Maryland, and Virginia would be mitigated by the proposed mitigation measures.

Under Alternative E, survey and construction activities that would impact vessel traffic density and patterns would not occur in the excluded blocks. The reduced level of vessel traffic would reduce the risk collisions, while one less meteorological tower would reduce the risk of allisions within the Virginia WEA. Therefore, Alternative E would provide a greater reduction in the overall risk of collisions and allisions than would result from selecting Alternative A.

Summary/Conclusion

The potential impacts of Alternative E would differ from the proposed action only within the Virginia WEA. Existing and proposed mitigations would still reduce or eliminate impacts to resources located in the remainder of the Virginia WEA. There would be no potential for bottom disturbing activities to impact benthic habitats or archeological resources located within the excluded blocks. While there is still the potential for conflicts with other uses of the OCS in the remaining areas in the Virginia WEA, there would be no potential for conflict within the excluded blocks.

Compared to the proposed action, the reduced level of survey and construction activities under Alternative E would reduce the impacts on air and water quality within the vicinity of the Virginia WEA. Reduced vessel traffic and fewer structures would reduce the risk of vessel collisions and allisions, reducing the risk of a diesel spill. The lower level of activity would reduce the exposure of marine mammals, sea turtles, and fish to noise from surveys, vessel traffic, and pile driving in and around the WEA. The reduced vessel traffic would also lower the risk of vessel collisions with marine mammals and sea turtles. There would be less loss/displacement of sea turtles from forage areas under Alternative E. One less meteorological tower is projected to be constructed as a result of not leasing the eight blocks of the Virginia WEA, which would reduce the overall risk of bird collisions. While the same existing onshore facilities would be used in support of the site characterization surveys and site assessment in the remainder of the Virginia WEA, fewer survey, construction and support vessel trips would reduce the increase of wake induced erosion and risk of diesel spills in coastal waters and ports, mainly in Virginia. Alternative E is expected to produce slightly fewer positive impacts on the population and employment of coastal counties of Virginia.

Under Alternative E, survey and construction activities that would impact vessel traffic density and patterns would not occur in the excluded blocks. In inclement weather, Alternative E would provide a greater reduction in the risk of collisions and allisions than would result from simply reducing the level of activity alone.

4.7 Alternative F – No Action

Description of the Alternative

The NEPA requires the analysis of a No Action Alternative. Under the No Action Alternative, no commercial or research leases to develop wind energy would be issued and there would be no approval of additional site assessment activities within the WEAs offshore New Jersey, Delaware, Maryland and Virginia at this time. Site assessment activities authorized under the four Interim Policy leases offshore New Jersey and Delaware (see Section 1.6) could still occur. While site characterization surveys are not under BOEMRE's jurisdiction and could still be conducted, it is not likely that these activities would occur without a commercial energy lease.

Effects of the Alternative

Any potential environmental and socioeconomic impacts, described in Section 4.1 of this EA, from these activities would not occur or would be postponed. Opportunities for the collection of meteorological, oceanographic and biological data offshore Maryland and Virginia would also not occur or would be postponed. Opportunities for the collection of meteorological, oceanographic and biological data offshore New Jersey and Delaware would be limited to the four existing Interim Policy leases.

Summary/Conclusion

Any potential environmental and socioeconomic impacts, described in Section 4.1 of this EA, from these activities would not occur or would be postponed. Opportunities for the collection of meteorological, oceanographic and biological data offshore Maryland and Virginia would also not be presented to potential applicants, or would be postponed. Opportunities for the collection of meteorological, oceanographic, and biological data offshore New Jersey and Delaware would be limited to the four existing Interim Policy leases.

Under the no action alternative, the collection of data necessary to successfully determine the feasibility of all of the proposed lease areas for commercial wind energy development from a dedicated data collection facility would not occur and site characterization surveys would not likely occur. Therefore, the no action alternative does not satisfy the purpose and need for this action.

4.8 Cumulative Environmental and Socioeconomic Impacts

Cumulative impacts are the impacts on the environment that results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency, industry, or person undertakes the other actions. *See* 40 CFR 1508.7. Chapter 7.6.2 of the Programmatic EIS discusses generic impacts of cumulative activities to individual environmental and socioeconomic resources. The following section discusses the cumulative impacts to the following areas over the five and one-half year life of the proposed action:

- Onshore areas that would support activities associated with the proposed action;
- Offshore waters from the shoreline to the WEAs where vessels traffic associated with the proposed action would transit and surveys of potential cable corridors would occur, and;
- The WEAs where the majority of surveys would occur, and where construction, operation and decommissioning of the meteorological towers and buoys would take.

Past, present, and reasonably foreseeable future actions considered in this analysis include:

- Onshore development;
- Existing port and waterway usage;
- Maritime traffic; and
- Other site characterization and assessment activities.

Onshore

As discussed in Section 4.1.3.5, there are nine major ports and 28 smaller ports in New Jersey, Delaware, Maryland, and Virginia that could support the proposed action. These existing sites would be used as fabrication sites, staging areas, and crew/cargo launch sites for the installation, operations and decommission of meteorological towers and buoys, and to conduct site characterization surveys. Some of the major ports are among the busiest in the nation, and all would be accessed by already heavily used waterways.

As discussed in Section 4.1.2.1, while New Jersey, Delaware, Maryland, and Virginia have a complex range of diverse coastal habitats consisting of barrier islands, sand spits, beaches, dunes, tidal and non-tidal wetlands, mudflats, and estuaries, much of the Atlantic shoreline in these states has been altered in some degree, and most of the coastal habitats have been impacted by human activities. Much of this alteration has been from development, agriculture, maritime activities, beach replenishment, or shore protection activities such as jetties (USDOI, MMS, 2007a).

New Jersey, Delaware and Maryland

Due to their proximity to three of the WEAs, it is anticipated that the coastal areas of New Jersey, Delaware and Maryland would host the majority of the activity associated with the WEAs offshore those states.

As discussed in Section 4.1.2.1, while New Jersey, Delaware, and Maryland have a complex range of diverse coastal habitats consisting of barrier islands, sand spits, beaches, dunes, tidal and non-tidal wetlands, mudflats, and estuaries, much of the Atlantic shoreline in these states has been altered in some degree, and most of the coastal habitats have been impacted by human activities. For example, New Jersey is considered the most developed and densely populated shoreline in the country (Richard Stockton College, Coastal Research Center, 2011).

Several of the ports that would support the proposed action would be access by Delaware Bay and Delaware River. Delaware Bay is important ecologically and commercially to the region. The Delaware estuary wetlands, which include the Delaware Bay area, provide critical habitat for 35 percent of the region's threatened and endangered species (Adkins, 2008). The Delaware Bay is also home to the world's largest freshwater port with over 3,000 commercial vessel arrivals annually (Marriott and Frantz, 2007). The Port of Wilmington is the busiest terminal, handling over 400 vessels per year, on the Delaware River, which passes through the urban and industrialized areas (Port of Wilmington, 2011).

As discussed in Section 4.1.3.3 of this EA, New Jersey, Delaware and Maryland, like the rest of the Atlantic region, is comprised of heterogeneous sociocultural and economic systems. In 2008, the shore adjacent counties of these three states had populations of over 8 million, nearly a quarter of a million establishments, over 3.6 million jobs, and nearly $185 billion in wages.

Virginia

Due to their proximity to the Virginia WEA, it is anticipated that the coastal areas of Virginia would host the majority of the activity associated with the WEA offshore Virginia.

While the Chesapeake Bay, which includes coastlines for both Maryland and Virginia, is the world's third largest estuary, it is also an important commercial waterway and near many large commercial, industrial, and urban areas. There are numerous large and small ports located along the Chesapeake Bay in Virginia, especially the large port in the Hampton Roads area, which could be used to support activities associated with the proposed action. As discussed in Section 4.1.2.1, growing commercial, industrial, recreational and urban activities threaten the Chesapeake Bay and its living resources.

As discussed in Section 4.1.3.5 of this EA, Virginia, like the rest of the Atlantic region, is comprised of heterogeneous sociocultural and economic systems. In 2008, the counties of Virginia adjacent to the shoreline had populations of about 2.2 million, over 60,000 establishments, over 1.1 million jobs, and about $53.5 billion in wages.

Incremental Contribution of the Proposed Action

Over 12,000 round trips are anticipated from site characterization and assessment activities associated with the proposed action over a five and one-half year period. These trips would be divided among nine major and 28 smaller existing ports in Delaware, New Jersey, Maryland, and Virginia. Due to proximity, it is assumed the majority of traffic associated with site characterization and assessment of the Virginia WEA (about 2,800 round trips) would be supported by the 3 major and 9 smaller ports in Virginia. If all ports are used equally, this would average about 45 round trips per year to each of the Virginia ports. Based simply on the number of ports in each state, traffic associated with site characterization and assessment of the WEAs offshore New Jersey (about 6,400 round trips), Delaware (about 1,200 round trips) and Maryland (about 1,700 round trips) would be divided as follows: over half of the traffic supported by 3 major and 11 smaller ports in New Jersey; and the remainder of the traffic split between 3 major and 8 smaller ports in Delaware and Maryland. If all ports are used equally, this would average about 60 round trips per year to each of the ports in New Jersey, Delaware and Maryland.

Since the proposed action would be supported by several existing sites located in already heavily impacted areas, and would add a relatively minor amount of additional vessel traffic, the incremental impacts to coastal habitats and the economy from onshore activities associated with the proposed action would be negligible, if detectable.

Offshore

Of the cumulative activities that would occur offshore New Jersey, Delaware, Maryland and Virginia during the five and one-half year life of the proposed action, the major impact-producing activity is vessel traffic. For example, one of the primary human-induced threats identified for the North Atlantic right whale, among the most endangered whales in the world, is collisions with vessels (ship strikes).

All of the WEAs are located at or near the entrances to major ports and traditional coastwise routes. Like the inland waterways that would support the proposed action, offshore waters from the shoreline to the seaward extent of the WEAs are also heavily trafficked by commercial, private, or military vessels (see Section 4.1.3.7). This is evident by the number of ports located in New Jersey, Delaware, Maryland and Virginia (see Section 4.1.3.5). Millions of military, commercial and recreational vessel trips are projected to occur during the five and one-half year life of the proposed action (USDOI, MMS, 2007a).

As discussed in Section 4.1.3.7, BOEMRE received an unsolicited ROW grant application from AWC for an approximately 700 statute mile (600 nm) subsea backbone transmission system in state and federal waters offshore New York, New Jersey, Delaware, Maryland and Virginia. Site characterization surveys would be the same as the surveys of potential cable routes to shore under the proposed action. Using the same assumptions presented in Section 3.1.1.1, the AWC proposal could result in up to 3,000 nm of additional HRG surveys and 600 bottom samples, adding an additional 900 vessel trips to the cumulative vessel traffic.

While there are no meteorological towers or buoys located within any of the WEAs, there are several meteorological, oceanographic, and navigational buoys located between the WEAs and between the WEAs and shore. There are also four existing interim leases that would allow meteorological towers and buoys to be installed in two of the WEAs.

New Jersey WEA

As discussed in Section 4.1.3.7, the New Jersey WEA is located within an already highly trafficked area. There are TSSs located to the north and south of the New Jersey WEA. All of the New Jersey WEA is located within military warning areas. Additional vessel traffic would result from surveying the AWC transmission system, which is proposed to pass through the New Jersey WEA. An additional 6,400 round trips (about 1,200 annually) are projected to occur as a result of proposed action activities within the New Jersey WEA.

While there are currently no meteorological towers or buoys located within the New Jersey WEA, there are several meteorological, oceanographic, and navigational buoys located offshore New Jersey. In addition to the 7 meteorological towers or 14 buoys anticipated under the proposed action, meteorological towers and buoys may also be installed within the New Jersey WEA under three existing Interim Policy leases. Two of these lessees have indicated they would likely install buoys rather than meteorological towers. The third lessee still has the option of installing a meteorological tower and/or buoy.

Delaware WEA

As discussed in Section 4.1.3.7, the Delaware WEA is located within an already highly trafficked area. All of the Delaware WEA is located within military warning areas. The

Delaware WEA rests between the incoming and outgoing shipping routes for Delaware Bay. Additional vessel traffic would result from surveying the AWC transmission system, which is proposed to pass through the Delaware WEA. An additional 1,100 round trips (about 200 annually) are projected to occur as a result of proposed action activities within the Delaware WEA.

While there currently no meteorological towers or buoys located within the Delaware WEA, there are several meteorological, oceanographic, and navigational buoys located offshore Delaware. In addition to the one meteorological buoy anticipated under the proposed action, a meteorological tower and/or buoy may be installed offshore Delaware under an existing Interim Policy lease.

Maryland WEA

As discussed in Section 4.1.3.7, the Maryland WEA is located within an already highly trafficked area. All of the Delaware WEA is located within military warning areas. The Maryland WEA is also located at the end of a TSS. Additional vessel traffic would result from surveying the AWC transmission system, which is proposed to pass through the Maryland WEA. An additional 1,700 round trips (about 300 annually) are projected to occur as a result of proposed action activities within the Maryland WEA.

While there are currently no meteorological towers or buoys located within the Maryland WEA, there are several meteorological, oceanographic, and navigational buoys located offshore Maryland. No Interim Policy leases have been or will be issued within the Maryland WEA. The only meteorological towers and buoys projected to be installed within the Maryland WEA would be two meteorological towers and four buoys anticipated under the proposed action.

Virginia WEA

As discussed in Section 4.1.3.7, the Virginia WEA is located within an already highly trafficked area. A TSS is located directly west of the Virginia WEA. The southern half of the Virginia WEA is located within military warning areas. Additional vessel traffic would result from surveying the AWC transmission system, which is proposed to would pass through the Virginia WEA. An additional 2,800 round trips (about 500 annually) are projected to occur as a result of proposed action activities within the Virginia WEA.

While there are currently no meteorological towers or buoys located within the Virginia WEA, there are several meteorological, oceanographic, and navigational buoys located offshore Virginia. In addition, the Chesapeake Light is located 13 nm offshore Virginia Beach, west of the Virginia WEA. This fixed structure collects oceanographic and meteorological data for NOAA's National Data Buoy Center. No Interim Policy leases have been or will be issued within the Virginia WEA. The only meteorological towers and buoys projected to be installed within the Virginia WEA would be the three meteorological towers and six buoys anticipated under the proposed action.

Incremental Contribution of the Proposed Action

While over 12,000 round trips are anticipated from site characterization and assessment activities associated with the proposed action over a five and one-half year period, this is relatively minor when compared to existing vessel traffic and considering these trips would be divided among nine major and 28 smaller existing ports in Delaware, New Jersey, Maryland, and Virginia (see section Sections 4.1.3.5 and 4.1.3.7 of this EA). The additional vessel traffic generated by the proposed action would likely be undetectable compared to the millions of military, commercial and recreational vessel trips projected to occur during the same five and one-half year period (USDOI, MMS, 2007a).

While there are several meteorological, oceanographic, and navigational buoys installed in vicinity of the WEAs, there are currently no meteorological towers or buoys installed within the New Jersey, Delaware, Maryland and Virginia WEAs. A total of 14 meteorological towers are projected to be installed within the WEAs as a result of the proposed action (12) and the Interim Policy leases (2). A total of 27 meteorological buoys are projected to be installed within the WEAs as a result of the proposed action (25) and the Interim Policy leases (2). The cumulative impacts from installation, operation and decommissioning of these meteorological towers and buoys would be primarily a result of the proposed action and would likely be negligible to minor on all environmental resources and socioeconomic conditions as described in Section 4.1. Due to the distance between structures and the impacts associated with installing, maintaining, and decommissioning these structures, overlapping or additive impacts are not anticipated to be significant.

Conclusion

The hallmark of the affected environment is one of past, present, and foreseeable human-induced impacts impact over an extended period of time. The incremental contribution of the proposed action to other past, present, and reasonably foreseeable actions which affect the environment would be negligible, if detectible. Moreover, the proposed action would facilitate for the collection of meteorological, oceanographic, and biological data for the environments offshore New Jersey, Delaware, Maryland and Virginia.

5 CONSULTATION AND COORDINATION

BOEMRE conducted early coordination with appropriate Federal and State agencies and other concerned parties to discuss and coordinate the development and refinement of WEAs under the Secretary's "Smart from the Start" initiative (see Sections 1.1.1 and 1.5 of this EA). Formal consultations and cooperating agency exchanges are detailed below. In addition, BOEMRE regularly coordinated with the Federal and State agencies noted on an informal basis through dialogue, teleconferences, and in-person meetings. Key agencies included NMFS, USFWS, DOD, FAA, National Aeronautics and Space Administration (NASA), USACE, USCG, USEPA, Delaware Department of Natural Resources and Environmental Control (DNREC), the New Jersey Department of Environmental Protection (NJDEP), and the Commonwealth of Virginia Department of Mines, Minerals and Energy (DMME).

5.1 Public Involvement

5.1.1 Notice of Intent

On February 9, 2011, BOEMRE announced in the *Federal Register* the NOI to prepare this EA for the proposed action (76 FR 7226). The NOI solicited public input on issues and alternatives to be considered and analyzed in the EA. BOEMRE accepted comments until March 11, 2011. A total of 38 comments were received during the 30-day comment period. Issues identified to be analyzed included analysis of conflicts with vessel traffic; avoidance of artificial reefs; and analysis of noise impact, collision risk, and the cumulative impacts of G&G surveys. Two specific alternatives to reduce conflicts with existing vessel traffic were identified for Virginia. One was addressed by removing the block in question from the proposed action and the other was analyzed as an alternative. The comments can be viewed at regulations.gov by searching for docket id BOEM-2010-0077.

5.1.2 Notice of Availability

In response to comments received on the NOI, BOEMRE is making this Draft EA available for public review and comment. Comments on the Draft EA will be solicited for 30 days following the publication of the Notice of Availability in the *Federal Register*.

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 is one that has jurisdiction by law or special expertise with respect to any environmental issue and which participates in the NEPA process upon the request of the lead agency. The NOI included an invitation to other Federal agencies and State, tribal, and local governments to consider becoming cooperating agencies in the preparation of this EA. Three cooperating agencies were identified and all three participated in the development and review of this EA. The agencies' jurisdiction and/or expertise are described below.

Section 4(e) of OCSLA extends the USACE's authority to prevent the obstruction to navigation in the navigable waters of the U.S. to OCS facilities. This includes the proposed site assessment activities (construction of meteorological towers and buoys) addressed in this EA. BOEMRE invited the USACE in a letter dated February 18, 2011 to participate as a cooperating agency on this EA. That invitation was accepted by the USACE's North Atlantic Division in a letter to BOEMRE dated February 22, 2011. The USACE is also a co-consulting agency on Section 106, EFH and ESA consultations for this proposed action.

Also, on February 18, 2011 BOEMRE sent a letter, inviting the USCG to participate as a cooperating agency. BOEMRE requested USCG's assistance in the preparation of the EA due to its jurisdiction and expertise with port usage vessel traffic, lighting requirements/mitigation measures for meteorological towers and buoys, and spill risk and response.

As part of the comments received on the NOI the Commonwealth of Virginia Department of Mines, Minerals and Energy (DMME) requested to participate as a cooperating agency in the preparation of this EA. Due to DMME's expertise in environmental conditions and issues associated with the areas offshore Virginia and Virginia's port usage, on March 30, 2011, BOEMRE invited the DMME to participate as a cooperating agency on the EA. The DMME accepted the invitation on April 1, 2011.

5.3 Consultations

5.3.1 Endangered Species Act

As required by Section 7 of the ESA, BOEMRE and co-consulting agency USACE are consulting with NMFS and USFWS on assessing the potential impacts of the proposed action on endangered/threatened species and designated critical habitat under their jurisdiction. In letters dated March 24, 2011, BOEMRE requested informal consultations with NMFS and USFWS. The March 24, 2011 biological assessment (BA), prepared by BOEMRE for the consultations, concluded the proposed action was likely to affect but not adversely affect ESA-listed sea turtles, marine mammals, bats, birds, and fish (USDOI, BOEMRE, 2011c). In a letter dated June 20, 2011, USFWS concurred with BOEMRE's determination that the proposed action would not adversely affect ESA-listed birds (Roseate tern and piping plover). However, its determination, USFWS requested that BOEMRE include the ESA-listed cahow or Bermuda petrel (*Pterodroma cohow*) in the BA as new data indicated the possibility that the species may seasonally occur in the vicinity of the Virginia WEA. In light of this new information, BOEMRE will make determinations regarding potential impacts to the cahow which will be submitted to the USFWS for concurrence and included in the Final EA. It is expected that the ESA-consultation with NMFS will be concluded prior to availability of the Final EA. The results of the NMFS consultation and any additional consultation with USFWS will be incorporated in the Final EA.

Those entities applying to BOEMRE for leases would be responsible for applying for other applicable permits, such as an incidental harassment authorization under the MMPA. Information regarding NMFS permitting can be found at http://www.nmfs.noaa.gov/pr/permits/.

5.3.2 Magnuson Fishery Conservation and Management Act

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act, Federal agencies are required to consult with NMFS on any action that may result in adverse effects to EFH. The NMFS regulations implementing the EFH provisions of the Magnuson-Stevens Fisheries Conservation and Management Act can be found at 50 CFR 600. Certain OCS activities authorized by BOEMRE may result in adverse effects to EFH, and therefore, require EFH consultation.

Concurrent with publication of this Draft EA, BOEMRE, along with co-consulting agency USACE, has requested initiation of consultation with the NMFS, as required by the Magnuson Fishery Conservation and Management Act, on the effects of the following on fish and EFH: (1) issuing leases; (2) site characterization activities that lessees may undertake on those leases (e.g., geophysical, geotechnical, archaeological and biological surveys); and (3) the subsequent approval of site assessment activities on the leaseholds (e.g., installation and operation of meteorological towers and buoys) in the WEAs offshore New Jersey, Delaware, Maryland, and Virginia. While BOEMRE does not anticipate that this consultation would result in any significant new environmental information, the results of this consultation will be incorporated into any Final EA addressing the impacts of the proposed action.

5.3.3 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) requires that Federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of the State's federally approved coastal management program (15 CFR 930 Subpart C). If an activity will have direct, indirect, or cumulative effects, the activity is subject to Federal consistency. A consistency review was performed and a Regional Consistency Determination (CD) was prepared for the affected States. To prepare the Regional CD, BOEMRE reviewed each State's Coastal Management Plan (CMP) and analyzed the potential impacts as outlined in this EA as they pertain to the enforceable policies of each CMP. Based on the analyses, BOEMRE makes an assessment of consistency. If a State concurs, BOEMRE can hold lease sales, issue non-competitive leases, and approve subsequent SAPs on those leaseholds offshore that State. If the State objects, it must do the following under the CZMA: (1) indicate how the BOEMRE proposal is inconsistent with their CMP and suggest alternative measures to bring the BOEMRE proposal into consistency with their CMP; or (2) describe the need for additional information that would allow a determination of consistency. Unlike the consistency process for specific OCS plans, there is no procedure for administrative appeal to the Secretary of Commerce for a Federal CD for presale activities. Either BOEMRE or the State may request mediation. Mediation is voluntary, and the DOC would serve as the mediator. Whether there is mediation or not, the final CD is made by DOI and it is the final administrative action for the prelease consistency process.

Under 15 CFR 930.36(e):

> a Federal agency may provide states with CDs for Federal agency activities that are national or regional in scope and that affect any coastal use or resource of more than one State. Many States share common coastal management issues and have similar enforceable policies. The Federal agency's regional consistency determination should, at a minimum, address the common denominator of these policies and thereby addresses different States' policies with one discussion and determination.

BOEMRE has determined that New Jersey, Delaware, Maryland and Virginia all share common coastal management issues, and have similar enforceable policies as identified by their respective CMPs. Due to the proximity of the WEAs to each other (at least in the cases of the New Jersey, Delaware, and Maryland WEAs), the similarity of the proposed activities for all of the four WEAs, and similar nature of impacts on environmental and socioeconomic resources and uses within each state, BOEMRE has prepared a single Regional CD under 15 CFR 930.36(e) for the proposed action.

This single Regional CD was sent out along with the Draft EA to New Jersey, Delaware, Maryland, and Virginia for their review. This Draft EA provides the comprehensive data and information required under 30 CFR 939.39 to support BOEMRE's consistency determination. BOEMRE has determined that the activities described in this EA are consistent to the maximum extent practicable with the enforceable policies of the CMPs of New Jersey, Delaware, Maryland, and Virginia. The affected States have 60 days to review the Regional CD and the Draft EA (which provides the supporting information required under 30 CFR 930.39(a)); the State agency has 14 days of receiving this information to identify missing information required by 930.39(a).

5.3.4 National Historic Preservation Act

In accordance with the National Historic Preservation Act (NHPA) (16 U.S.C. 470) Federal agencies are required to consider the effect of their undertakings on historic properties. The implementing regulations for Section 106 of the NHPA (16 U.S.C. 470f), issued by the Advisory Council on Historic Preservation (16 CFR 800), specify the required review process. BOEMRE and co-consulting agency USACE initiated a request for consultation with the State Historic Preservation Officers (SHPOs) and affected federally-recognized Tribes on March 11, 2011, via formal letters. During this time, affected state-recognized tribes were also solicited for information and concerns related to the proposed undertaking. The parties contacted include:

State Historic Preservation Officers

- Delaware SHPO
- New Jersey SHPO
- Maryland SHPO
- Virginia SHPO

Federally-recognized Tribes

- The Delaware Nation
- Eastern Chickahominy Tribe
- The Eastern Shawnee Tribe
- Mashpee Wampanoag Tribe
- The Oneida Indian Nation
- Stockbridge-Munsee Community of Mohican Indians

State-recognized Tribes

- Cheroenhaka (Nottoway) Indian Tribe
- Chickahominy Tribe
- Lenape Indian Tribe of Delaware
- Mattaponi Tribe
- Monacan Indian Nation
- Nansemond Tribe
- Nanticoke Indian Association, Inc.
- Nottoway Indian Tribe
- Pamunkey Tribe
- Patawomeck Indian Tribe

- Powhatan Renape Nation
- Rampanough Mountain Indians
- Rappahannock Tribe
- Upper Mattaponi Tribe

A timeline of 30 days was provided for response. At the time of the publication of this Draft EA, four responses have been received.

The Maryland SHPO stated that it would require further consultation as leases are issued and site assessment plans are development offshore of Maryland.

The Delaware SHPO “concurs with the findings that development of the WEAS [sic] will have the potential to affect historic properties.” Additionally, Delaware also recommends that “given the environmental context of this undertaking, this office … recommends that an underwater survey be conducted to determine submerged archaeological and shipwreck sites” within the area of potential effect (APE). Delaware considers the APE to include all the proposed lease areas along with any proposed corridor for the transmission cable that will carry the power to shore. Based on information developed for a maritime archaeological context report submitted to BOEMRE, Delaware further states that “one may expect to find a wide variety of coastal and ocean going vessels from the wooden ships of the 17^{th}-century to 20^{th}-century submarines.” Additionally, “it is possible, that submerged Native American sites survive intact in the project area. A core sampling protocol integrated within the planned geophysical surveys may be the most cost effective method to identify these sites.”

Two responses were received from state-recognized tribes. The Chickahominy Indian, Eastern Division Tribe in Virginia responded that it has “no specific knowledge of any sites that have traditional religious and cultural significance, nor have concern that any site object eligible for inclusion on the National Register of Historic places within the area that would be affected by the proposed undertaking.” The Nanticoke Lenni-Lenape Tribal Nation of New Jersey responded that “the area delineated on the map involve the traditional offshore areas of our tribe.” BOEMRE will continue outreach to the Nanticoke Lenni-Lenape Tribal Nation and other tribes that may be affected by the proposed undertaking, and will continue to consult on relevant issues to ensure that their concerns are taken into consideration before leasing decisions are made.

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APPENDIX A
Benthic Habitat Figures

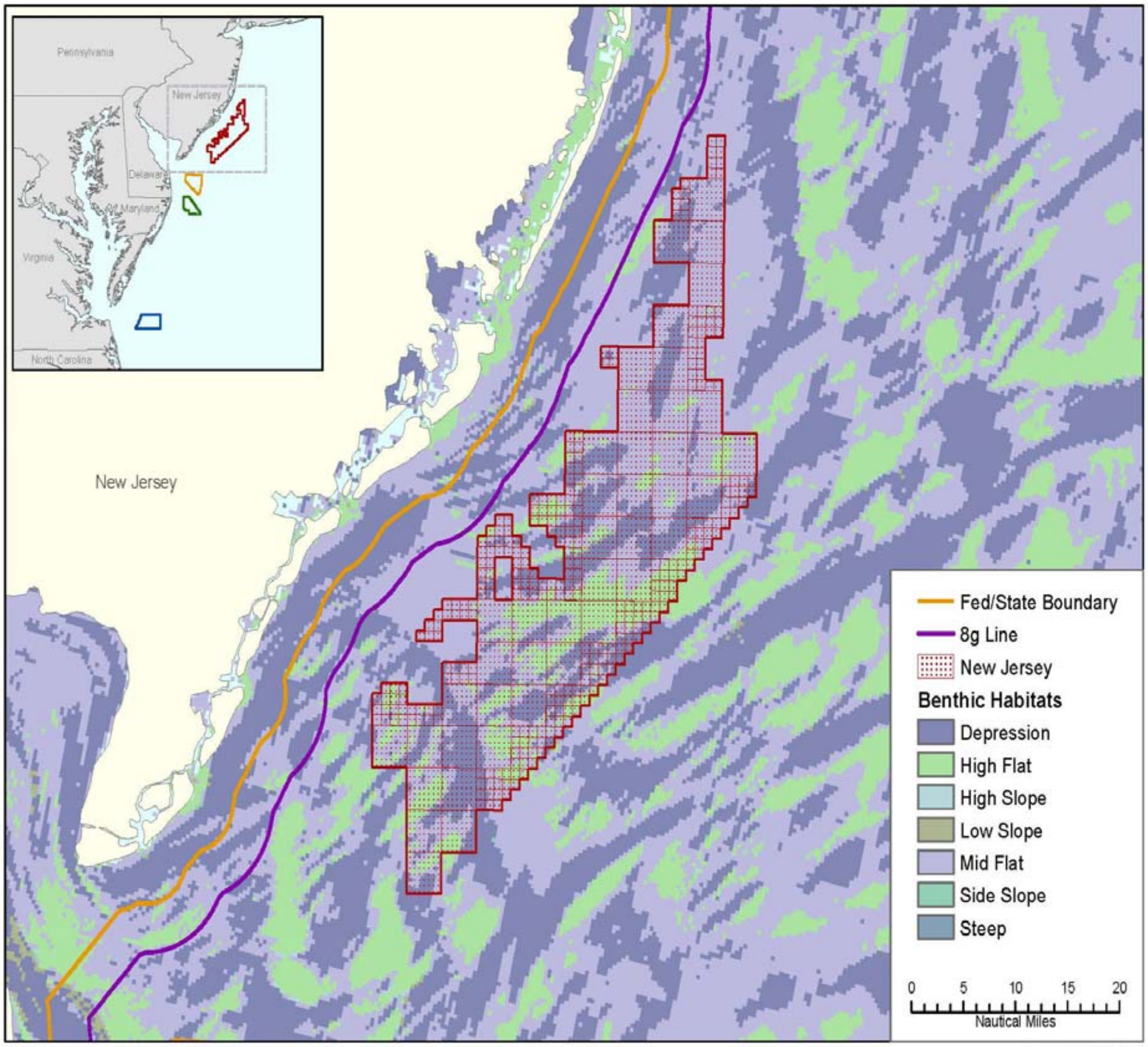


Figure A.1. Benthic habitat types within the New Jersey WEA.
(Source: TNC 2011).

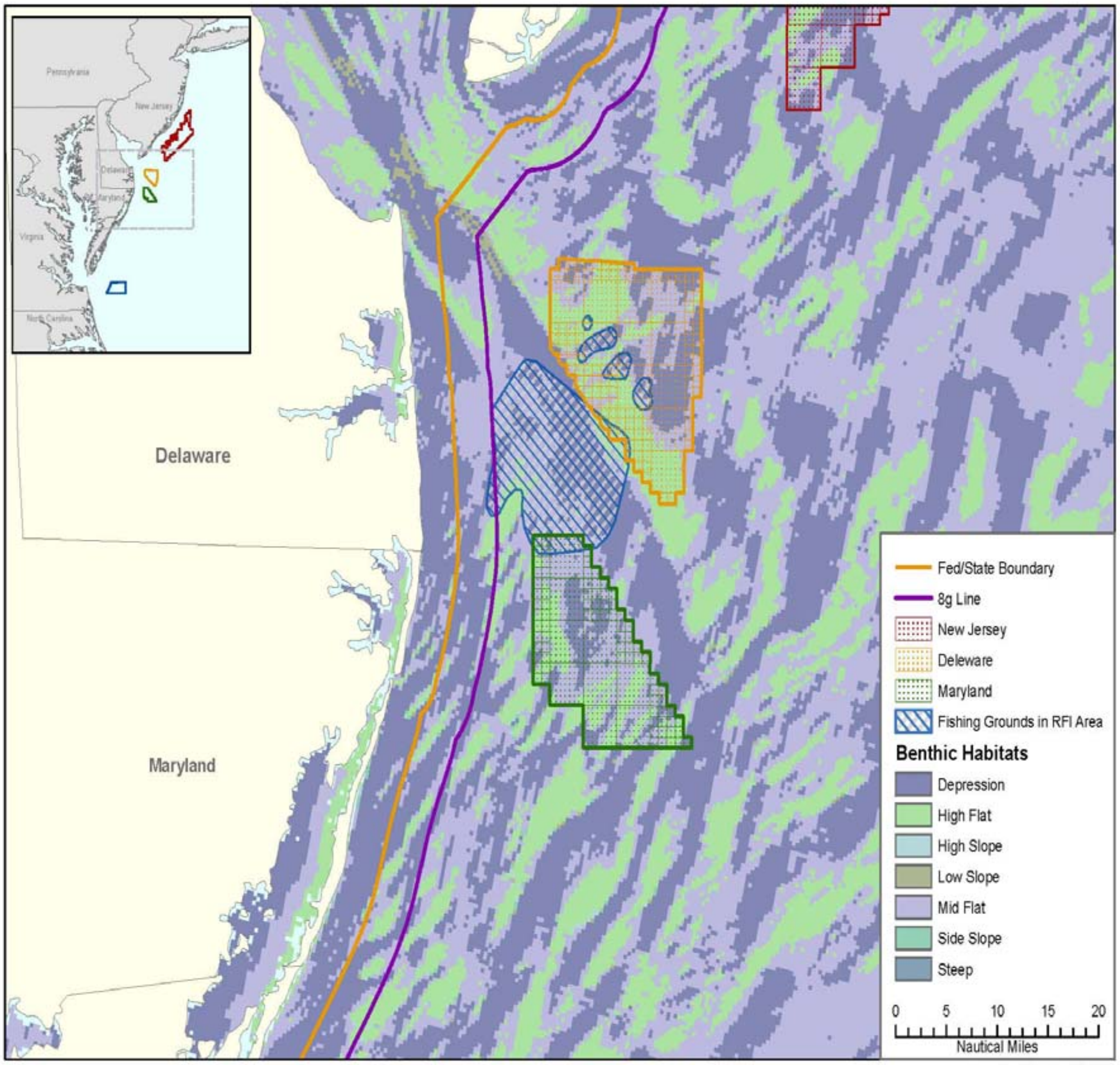


Figure A.2. Benthic habitat types within the Delaware and Maryland WEAs.
(Source: TNC 2011)

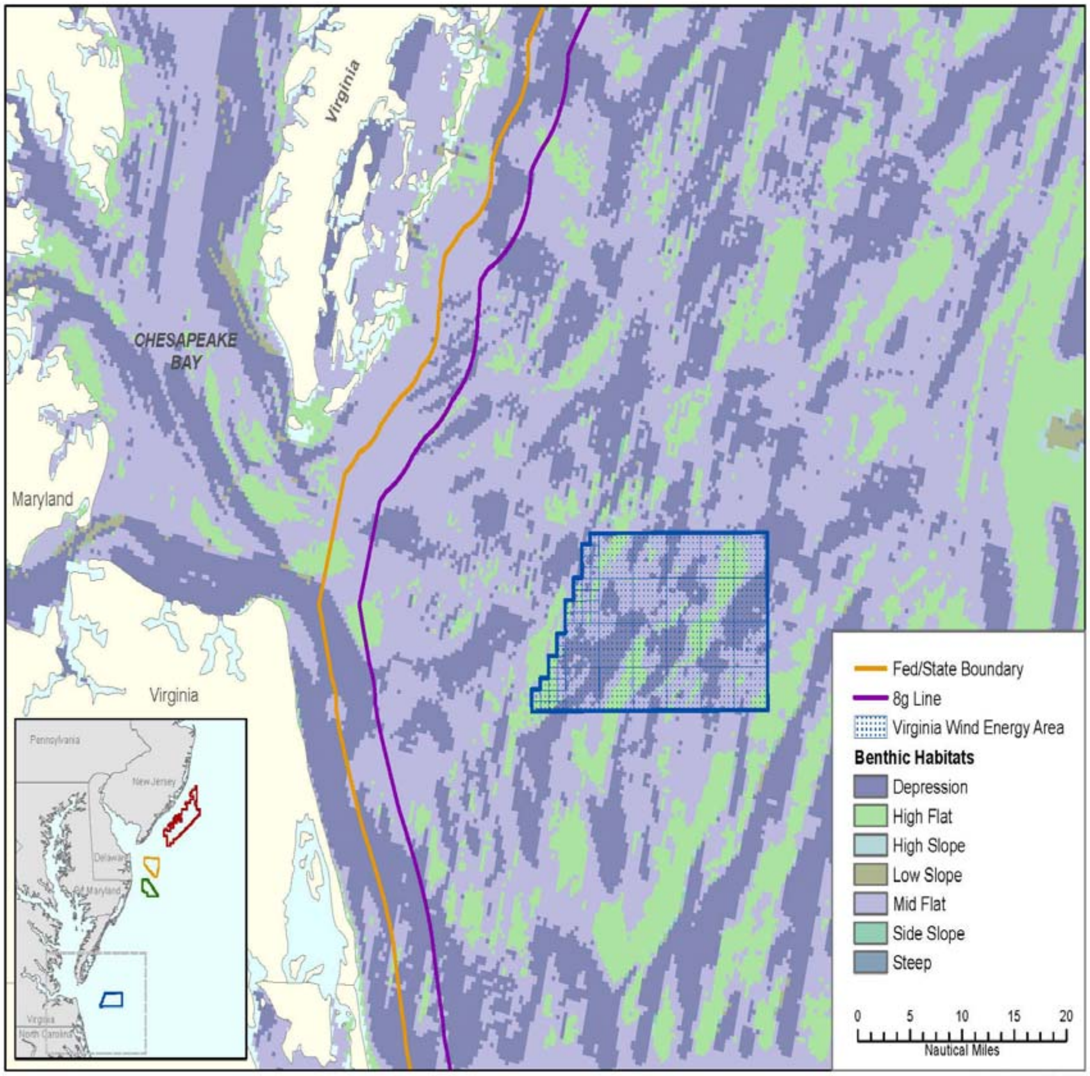
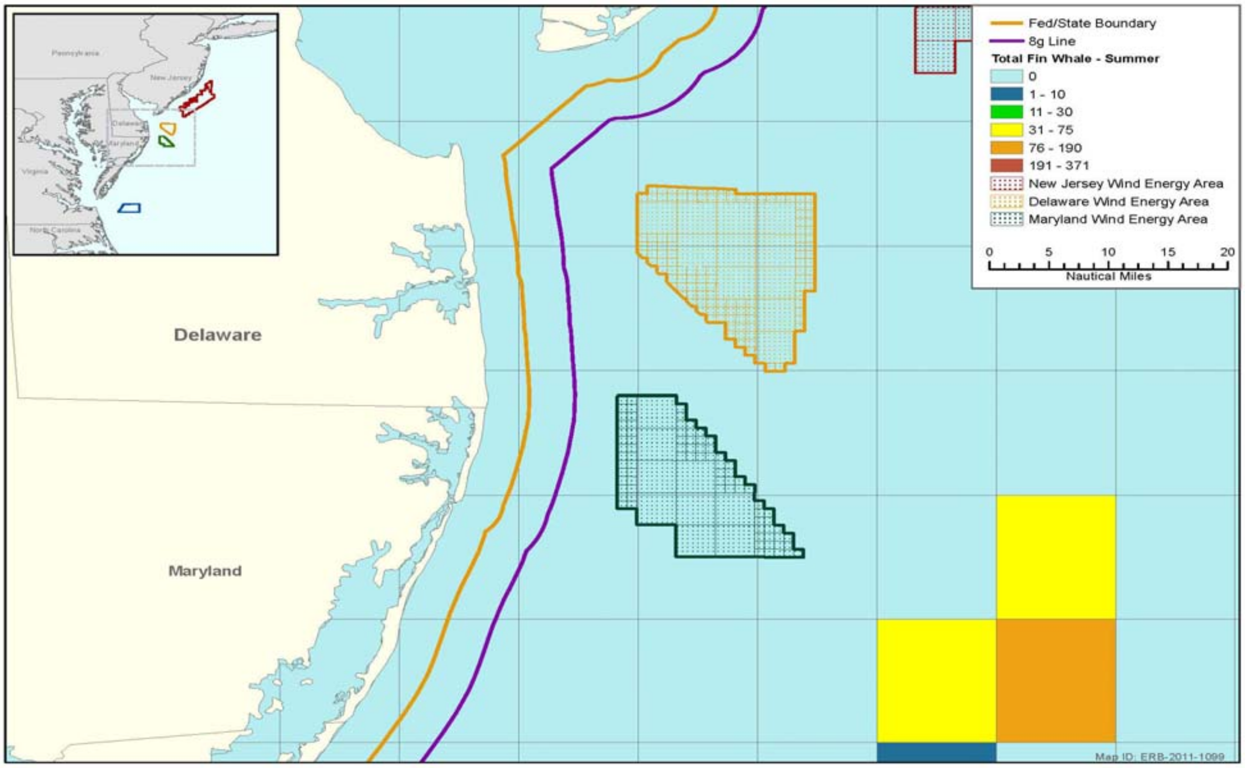
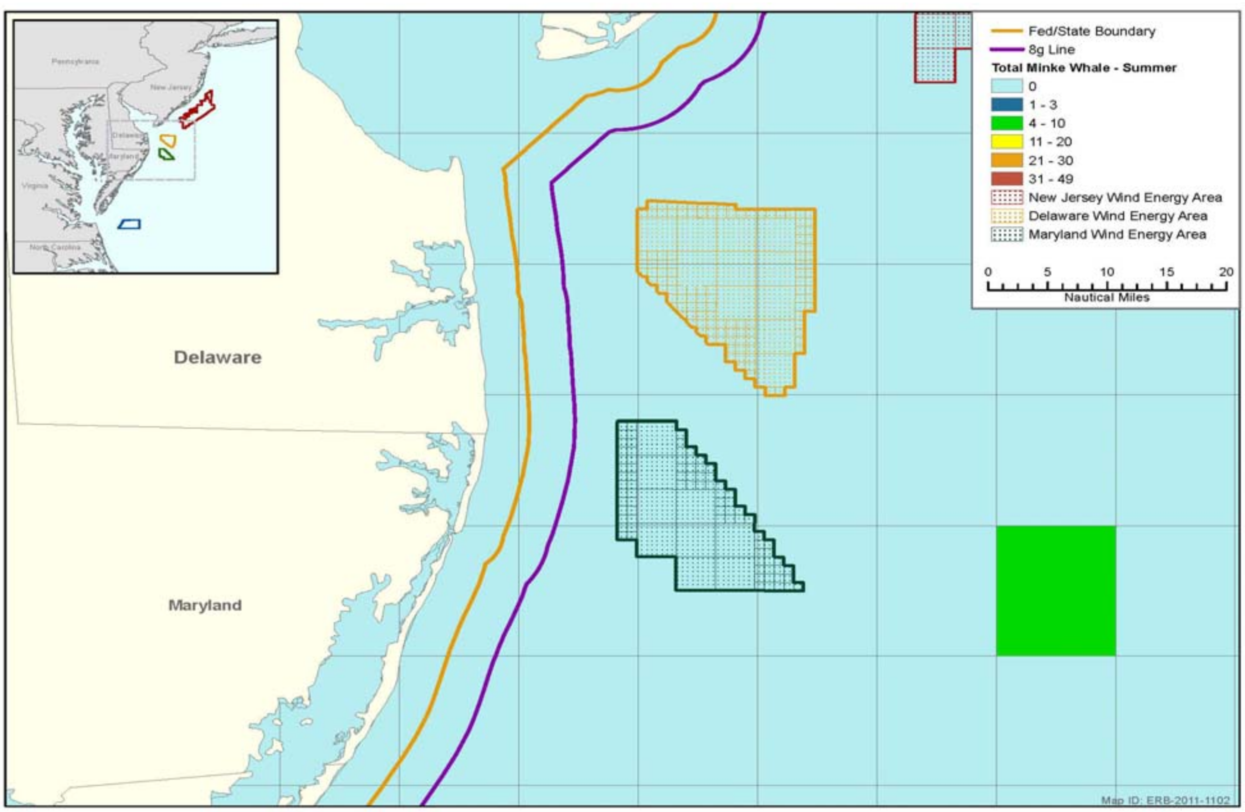


Figure A.3. Benthic habitat types within the Virginia WEA.
(Source: TNC 2011)

APPENDIX B

Marine Mammal Sightings Data Figures


Fed/State Boundary
8g Line
Total Fin Whale - Summer
0
1 - 10
11 - 30
31 - 75
76 - 190
191 - 371
New Jersey Wind Energy Area
Delaware Wind Energy Area
Maryland Wind Energy Area
0 5 10 15 20
Nautical Miles
Delaware
Maryland
Map ID: ERB-2011-1099


Fed/State Boundary
8g Line
Total Minke Whale - Summer
0
1 - 3
4 - 10
11 - 20
21 - 30
31 - 49
New Jersey Wind Energy Area
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Maryland
Map ID: ERB-2011-1102

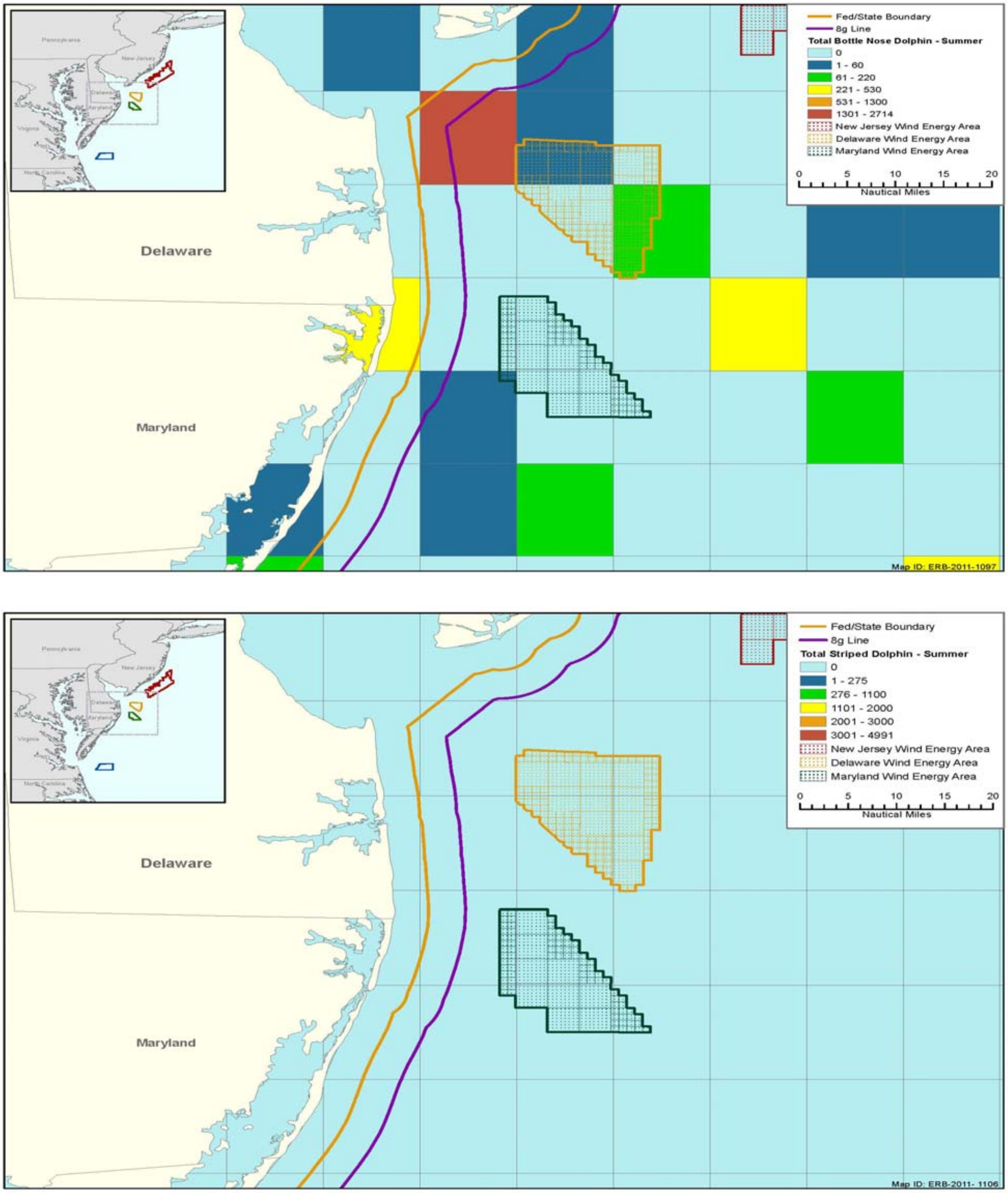
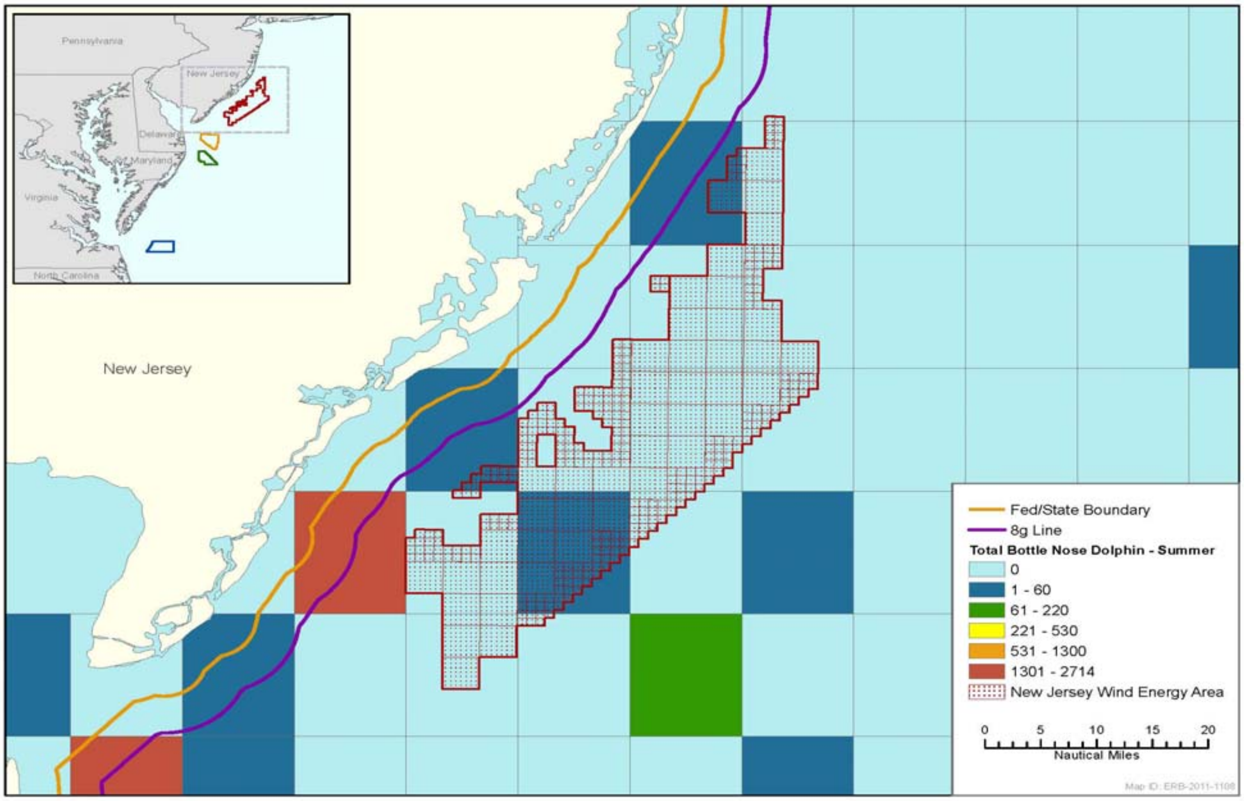


Figure B.1. Maryland and Delaware WEA Cetacean Sighting Per Unit of Effort.
(Source: TNC, 2011).



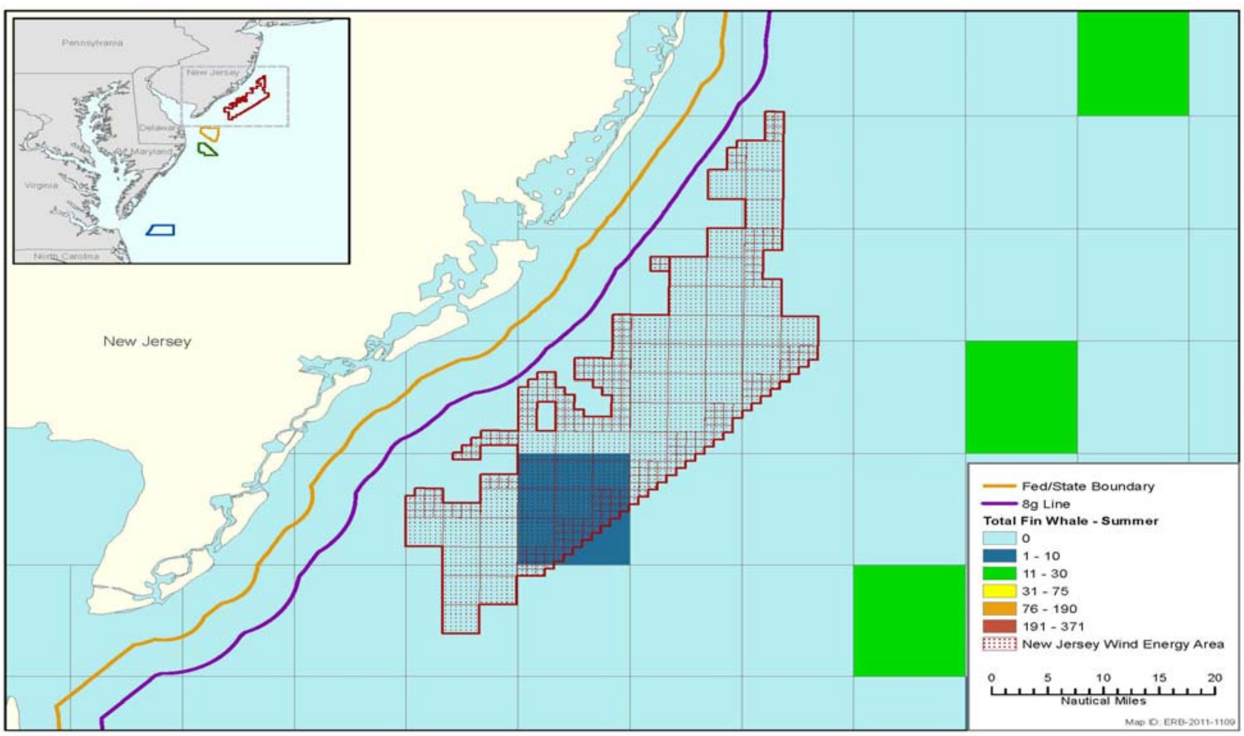


Figure B.2. New Jersey WEA Cetacean Sightings Per Unit of Effort.
(Source: TNC, 2011)

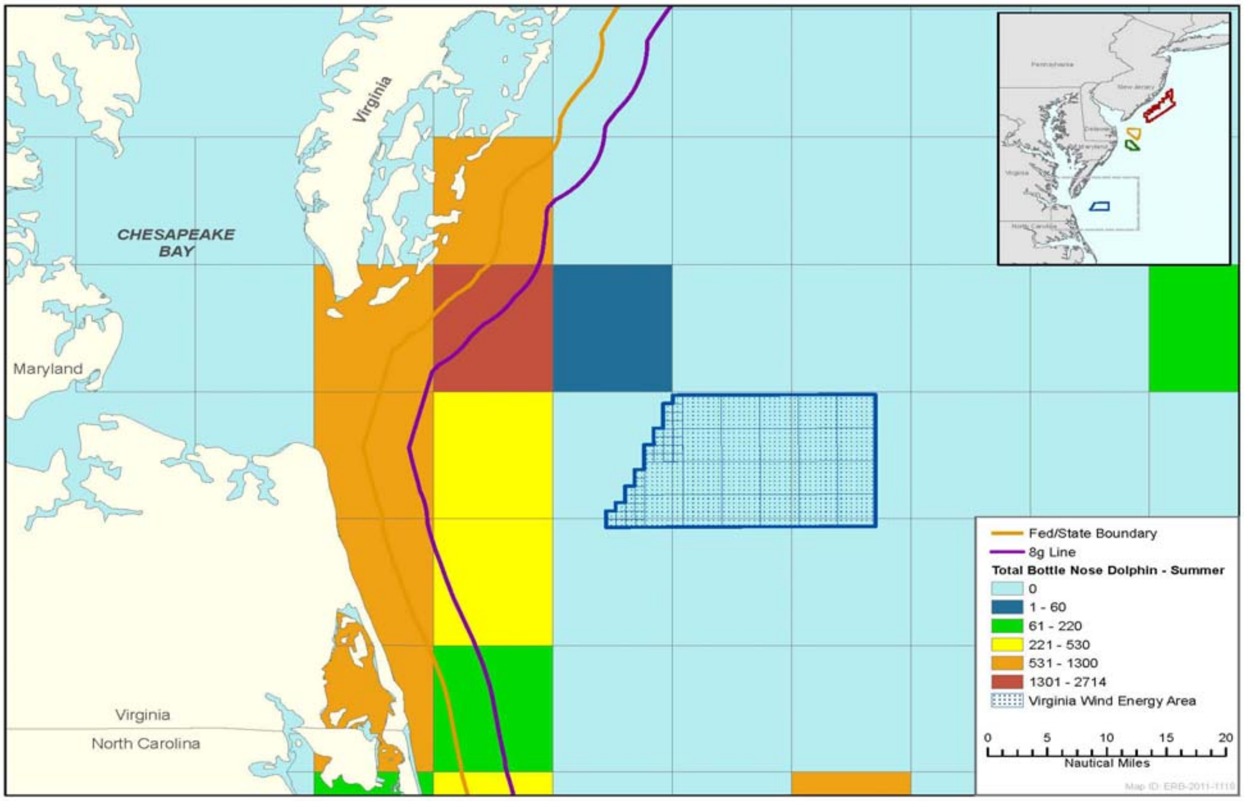


Figure B.3.   Virginia WEA Bottlenose Dolphin Sightings Per Unit of Effort.
(Source: TNC 2011)

APPENDIX C
Proposed Mitigation Measures for ESA Listed Marine Mammals and Sea Turtles

C.1. Measures for ESA-Listed Marine Mammals and Sea Turtles

This section outlines BOEMRE's proposed mitigation, monitoring, and reporting measures that would minimize or eliminate potential impacts to ESA-listed species of whales and sea turtles. Additional mitigation, monitoring or reporting measures, including those that may be developed during the Federal ESA Section 7 consultation process, may be included in any lease or BOEMRE approval. These measures would also serve to reduce potential impacts to ESA-listed marine fish and non-ESA listed marine mammals, sea turtles, and marine fish. They are divided into three sections: (1) those required during all phases of the site characterization and site assessment on a lease; (2) those required during pre-construction site characterization; and (3) those required during construction. These measures and those that may be ultimately be required through the ESA consultation process would be included as stipulations in BOEMRE leases and/or SAP approvals.

C.1.1 Proposed Mitigation for All Phases of the Site Characterization and Site Assessment on a Lease

The proposed action would temporarily increase the number of vessels and vessel traffic within the WEAs and in the route between the WEAs and port facilities.

The following measures are meant to reduce the potential for vessel harassment or collision with listed marine mammals or sea turtles regardless of what activity that vessel is engaged in:

- All vessels and aircraft whose operations are authorized under or regulated by the terms of a BOEMRE-issued renewable energy lease would be required to abide by the NOAA Fisheries Northeast Regional Viewing Guidelines, as updated through the life of the project (http://www.nmfs.noaa.gov/pr/pdfs/education/viewing_northeast.pdf).
- Vessel operators and crews must maintain a vigilant watch for marine mammals and sea turtles and slow down or stop their vessel to avoid striking protected species.
    - When whales are sighted, maintain a distance of 100 yards (91 m) or greater from the whale. If the whale is believed to be a North Atlantic right whale, the lessee must maintain a minimum distance of 500 yards (457 m) from the animal (50 CFR 2224.103).
    - When sea turtles or small cetaceans are sighted, the lessee must maintain a distance of 50 yards (45 meters) or greater whenever possible.
    - When cetaceans are sighted while a vessel is underway, the lessee must remain parallel to the animal's course whenever possible. The lessee must avoid excessive speed or abrupt changes in direction until the cetacean has left the area.
- All vessel operators must comply with vessel strike reduction measures for North Atlantic right whales implemented by NMFS, including Special Management Areas (SMAs) and Dynamic Management Areas (DMAs). Compliance documents are located at: http://www.nero.noaa.gov/shipstrike/.
- Because of noise concerns, FAA Circular 91-36D encourages pilots making flights near noise-sensitive areas to fly at altitudes higher than minimum altitudes near noise-sensitive areas (http://www.fs.fed.us/r10/tongass/districts/admiralty/packcreek/AC91-36d.pdf). The lessee must avoid noise-sensitive areas, unless doing so would be impractical or unsafe. Pilots operating noise producing aircraft over noise-sensitive areas must fly not less than 2,000 ft above ground level, weather permitting, unless doing so would be

impractical or unsafe. Departure from or arrival to an airport, climb after take-off, and descent for landing must be made so as to avoid prolonged flight at low altitudes near noise-sensitive areas. In addition, guidelines and regulations issued by National Marine Fisheries Service (NMFS) include provisions specifying that pilots maintain an altitude of at least 1,000 ft within sight of marine mammals.

- All vessel and aircraft (where applicable) operators must be briefed to ensure they are familiar with the above requirements.
- All vessel operators, employees and contractors actively engaged in offshore operations must be briefed on marine trash and debris awareness elimination as described in the BOEMRE Gulf of Mexico Region's NTL No. 2007-G03 (http://www.gomr.mms.gov/homepg/regulate/regs/ntls/2007NTLs/07-g03.pdf), except that BOEMRE will not require the applicant to undergo formal training or post placards. The lessee must ensure that its 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 applicant may use for this awareness training.

C.1.2. Proposed Mitigation for Pre-Construction Site Characterization Surveys

Chapters 3 and 4 of this EA describe the pre-construction high-resolution site surveys and sub-bottom sampling the lessee would likely undertake. These field investigations would be conducted prior to construction (see Section 3.1.2 of this EA for this justifying this assumption).

The following mitigation are proposed for all high-resolution geophysical survey work.

- *Establishment of Exclusion Zone*: A 500 m (1640 ft) radius exclusion zone for listed marine mammals and sea turtles shall be established around the seismic survey source vessel in order to reduce the potential for serious injury or mortality of these species.
- *Visual Monitoring of Exclusion Zone*: Monitoring of the zones shall be conducted by a qualified NMFS-approved observer. Visual observations will be made using binoculars or other suitable equipment during daylight hours. Data on all observations will be recorded based on standard marine mammal observer collection data. This will include: dates and locations of construction operations; time of observation, location and weather; details of marine mammal sightings (e.g., species, numbers, behavior); and details of any observed taking (behavioral disturbances or injury/mortality). Any significant observations concerning impacts on listed marine mammals or sea turtles will be transmitted to NMFS and BOEMRE within 48 hours. Any observed takes of listed marine mammals or sea turtles resulting in injury or mortality will be immediately (within 24 hours) reported to NMFS and BOEMRE.

  Visual monitoring will begin no less than 60 minutes prior to the beginning of ramp-up and continue until seismic operations cease or sighting conditions do not allow observation of the sea surface (e.g., fog, rain, darkness). If a marine mammal or sea turtle is observed, the observer should note and monitor the position (including lat./long. of vessel and relative bearing and estimated distance to the animal) until the animal dives or moves out of visual range of the observer. The lessee must continue to observe for additional animals that may surface in the area, as often there are numerous animals that may surface at varying time intervals. At any time a whale is observed within an estimated 500 m (1,640 ft) of the sound source array ("exclusion zone"), whether due to the whale's movement, the vessel's movement, or because the whale surfaced inside the exclusion zone, the observer will call for the immediate shut-down of the seismic operation. The vessel operator must comply immediately with such a call by an on-watch visual observer. Any disagreement or discussion should occur only after shut-down. When no marine mammals or sea turtles are sighted for at least a 60-minute period, ramp-up of the sound source may begin. Ramp-up cannot begin unless conditions allow the sea surface to be visually inspected for marine mammals and sea turtles for 60 minutes prior to commencement of ramp-up. Thus, ramp-up cannot begin after dark or in conditions that prohibit visual inspection (fog, rain, etc.) of the exclusion zone. Any shut-down due to a whale(s) sighting within the exclusion zone must be followed by a 60-minute all-clear period and then a standard, full ramp-up. Any shut-down for other reasons, including, but not limited to, mechanical or electronic failure, resulting in the cessation of the sound source for a period greater than 20 minutes, must also be followed by full ramp-up procedures. In recognition of occasional, short periods of the cessation of survey equipment for a variety of reasons, periods of silence not exceeding 20 minutes in duration will not require ramp-up for the resumption of seismic operations if: (1) visual surveys are continued diligently throughout the silent period (requiring daylight and reasonable sighting conditions), and (2) no whales, other marine mammals, or sea turtles are observed in the exclusion zone. If whales, other marine mammals, or sea turtles are observed in the exclusion zone during the short silent period, resumption of seismic survey operations must be preceded by ramp-up.

- *Implementation of Ramp-Up*: A "ramp-up" (if allowable depending on specific sound source) will be required at the beginning of each seismic survey in order to allow marine mammals and sea turtles to vacate the area prior to the commencement of activities. Seismic surveys may not commence (i.e., ramp up) at night time or when the exclusion zone cannot be effectively monitored (i.e., reduced visibility).
- *Shut Down*: Continuous (day and night) seismic survey operations will be allowed if sufficient lighting is provided to monitor the 500m exclusion zone. If sufficient lighting is not available, survey activity must be limited to daylight hours. If a listed marine mammal or sea turtle is spotted within or transiting towards the exclusion zone surrounding the sub-bottom profiler and the survey vessel, an immediate shutdown of the equipment will be required. Subsequent restart of the profiler may only occur following clearance of the exclusion zone and the implementation of ramp up procedures (if applicable).
- *Compliance with Equipment Noise Standards*: All seismic surveying equipment must comply as much as possible with applicable equipment noise standards of the U.S. Environmental Protection Agency.
- *Reporting for Seismic Surveys Activities*: The following reports must be submitted during the conduct of seismic surveys:
    - A report must be provided to BOEMRE and NMFS within 90 days of the commencement of seismic survey activities that includes a summary of the seismic surveying and monitoring activities and an estimate of the number of listed marine mammals and sea turtles that may have been taken as a result of seismic survey activities. The report will include information, such as: dates and locations of operations, details of listed marine mammal or sea turtle sightings

(dates, times, locations, activities, associated seismic activities), and estimates of the amount and nature of listed marine mammal or sea turtle takings.

- Any observed injury or mortality to a listed marine mammal or sea turtle must be reported to NMFS and BOEMRE immediately (within 24 hours). Any observations concerning impacts on listed marine mammals or sea turtles will be transmitted to NMFS and BOEMRE within 48 hours.

The following mitigation measures are proposed for all sub-bottom sampling work.

- *Establishment of Exclusion Zone*: A 200-m radius exclusion zone for listed marine mammals and sea turtles must be established around any vessel conducting the sub-bottom sampling in order to reduce the potential for serious injury or mortality of these species.
- *Visual Monitoring of Exclusion Zone*: The exclusion zone around the vessel must be monitored for the presence of listed marine mammals or sea turtles using the protocol detailed above for HRG survey work absent ramp-up procedures.

C.1.3 Proposed Mitigation for Construction of Meteorological Towers and Installation of Meteorological Buoys

Acoustic harassment from construction activities presents the greatest potential for disturbance.

BOEMRE proposes the following mitigation measures which are meant to reduce or eliminate the potential for adverse impacts on listed marine mammals or sea turtles during the construction of meteorological towers and installation of meteorological buoys.

Requirements for Pile Driving:

- *Establishment of Exclusion Zone*: A preliminary 7 km radius exclusion zone for listed marine mammals and sea turtles must be established around each pile driving site in order to reduce the potential for impacts to these species. The 7 km exclusion zone is based upon the field of ensonification at the 160dB level. The 7 km exclusion zone must be monitored from two locations. One observer must be based at or near the sound source and responsible for monitoring the 180 dB field of ensonification out to 1000m from the sound source. An additional observer must be located on a separate vessel navigating approximately 4-5 km around the pile hammer monitoring 360° out to 7km from the sound source. If multiple piles are being driven, the field verification method may be used to modify the exclusion zone. Any new exclusion zone radius must be based on the most conservative measurement (i.e., the largest safety zone configuration), include an additional 'buffer' area extending out of the 160 dB zone. This zone must be used for all subsequent pile driving and be periodically re-evaluated based on the regular sound monitoring described in the Field Verification of Exclusion Zone section described below.
- *Field Verification of Exclusion Zone*: Field verification of the exclusion zone must take place during pile driving of the first pile if the meteorological tower design includes multiple piles. The results of the measurements from the first pile must be used to establish a new exclusion zone which may be greater than or less than the 7 km default exclusion zone depending on the results of the field tests. Acoustic measurements must take place during the driving of the last half (deepest pile segment) for any given open-

water pile. Two reference locations must be established at a distance of 500 m and 5 km from the pile driving. Sound measurements must be taken at the reference locations at two depths (a depth at mid-water and a depth at approximately 1m above the seafloor). Sound pressure levels must be measured and reported in the field in dB re 1 μPa rms (impulse). An infrared range finder may be used to determine distance from the pile to the reference location.

- *Visual Monitoring of Exclusion Zone*: Monitoring of the zones must be conducted by a qualified NMFS-approved observer. Visual observations must be made using binoculars or other suitable equipment during daylight hours. Data on all observations must be recorded based on standard marine mammal observer collection data. This must include: dates and locations of construction operations; time of observation, location and weather; details of marine mammal sightings (e.g., species, numbers, behavior); and details of any observed taking (behavioral disturbances or injury/mortality). Any observations concerning impacts on listed marine mammals or sea turtles must be transmitted to NMFS and BOEMRE within 48 hours. Any observed takes of listed marine mammals or sea turtles resulting in injury or mortality will be immediately (within 24 hours) reported to NMFS and BOEMRE.

  Visual monitoring must begin no less than 60 minutes prior to the beginning of soft start and continue until pile driving operations cease or sighting conditions do not allow observation of the sea surface (e.g., fog, rain, darkness). If a marine mammal or sea turtle is observed, the observer 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 lessee must continue to observe for additional animals that may surface in the area, as often there are numerous animals that may surface at varying time intervals.

  At any time a whale is observed within the exclusion zone, whether due to the whale's movement, the vessel's movement, or because the whale surfaced inside the exclusion zone, the observer must notify the Resident Engineer (or other mutually agreed upon individual). BOEMRE recognizes that once the pile driving of a segment begins it cannot be stopped until that segment has reached its predetermined depth. If pile driving stops and then resumes, it would potentially have to occur for a longer time and at increased energy levels. This would simply amplify impacts to listed marine mammals and sea turtles, as they would endure potentially higher SPLs for longer periods of time. If listed marine mammals or sea turtles enter the zone after pile driving of a segment has begun, pile driving may continue and observers must monitor and record listed marine mammal and sea turtle numbers and behavior. However, if pile driving of a segment ceases for 30 minutes or more and a listed marine mammal or sea turtle is sighted within the designated zone prior to commencement of pile driving, the observer(s) must notify the Resident Engineer (or other mutually agree upon individual) that an additional 60 minute visual and acoustic observation period will be completed, as described above, before restarting pile driving activities. In addition, pile driving may not begin during night hours or when the safety radius can not be adequately monitored (i.e., obscured by fog, inclement weather, poor lighting conditions) unless the applicant implements an alternative monitoring method that is agreed to by BOEMRE and NMFS. However, if a soft start has been initiated before dark or the onset of inclement weather, the pile driving of that segment may continue through these periods. Once that pile has been driven, the pile driving of the next segment cannot begin until the exclusion zone can be visually or otherwise monitored.

- *Implementation of Soft Start*: A "soft start" must be implemented at the beginning of each pile installation in order to provide additional protection to listed 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 soft start requires an initial set of 3 strikes from the impact hammer at 40-percent energy with a one minute waiting period between subsequent 3-strike sets. If listed marine mammals or sea turtles are sighted within the exclusion zone prior to pile-driving, or during the soft start, the Resident Engineer (or other mutually agreed upon individual) must delay pile-driving until the animal has moved outside the exclusion zone.
- *Compliance with Equipment Noise Standards*: All construction equipment must comply as much as possible with applicable equipment noise standards of the U.S. Environmental Protection Agency, and all construction equipment must have noise control devices no less effective than those provided on the original equipment.
- *Reporting for Construction Activities*: The following reports must be submitted during construction:
    - Data on all observations must be recorded based on standard marine mammal observer collection data. This must include: dates and locations of construction operations; time of observation, location and weather; details of marine mammal sightings (e.g., species, numbers, behavior); and details of any observed taking (behavioral disturbances or injury/mortality). Any observations concerning impacts on listed marine mammals or sea turtles will be transmitted to NMFS and BOEMRE within 48 hours. Any observed takes of listed marine mammals or sea turtles resulting in injury or mortality will be immediately (within 24 hours) reported to NMFS and BOEMRE.
    - A final technical report within 120 days after completion of the pile driving and construction activities must be provided to BOEMRE and NMFS which provides full documentation of methods and monitoring protocols, summarizes the data recorded during monitoring, estimates the number of listed marine mammals and sea turtles that may have been taken during construction activities, and provides an interpretation of the results and effectiveness of all monitoring tasks.

APPENDIX D

Sea Turtle Sightings Data Figures

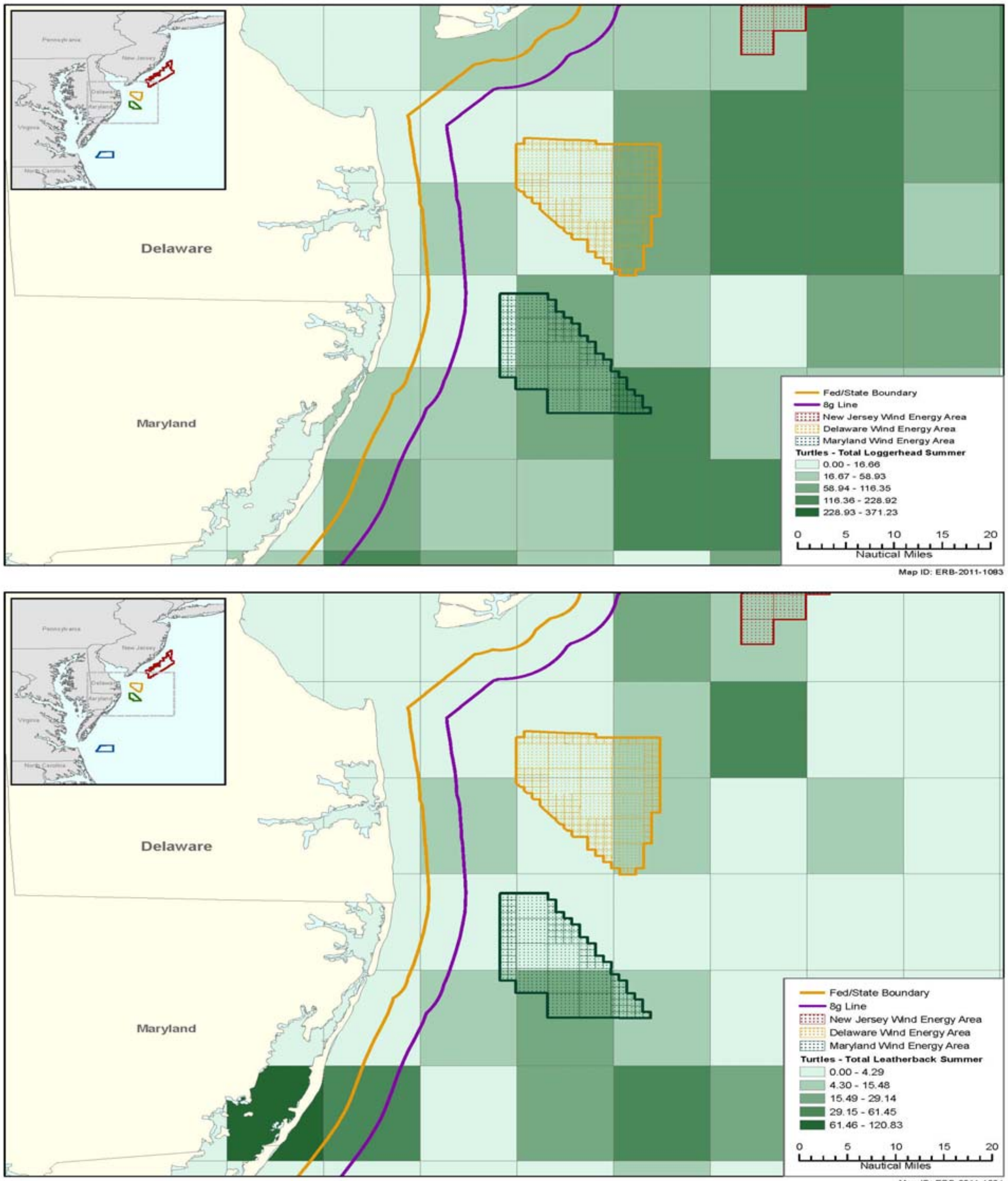


Figure D.1. Delaware and Maryland WEA Sea Turtle Sightings Per Unit of Effort.
(Source: TNC, 2011)

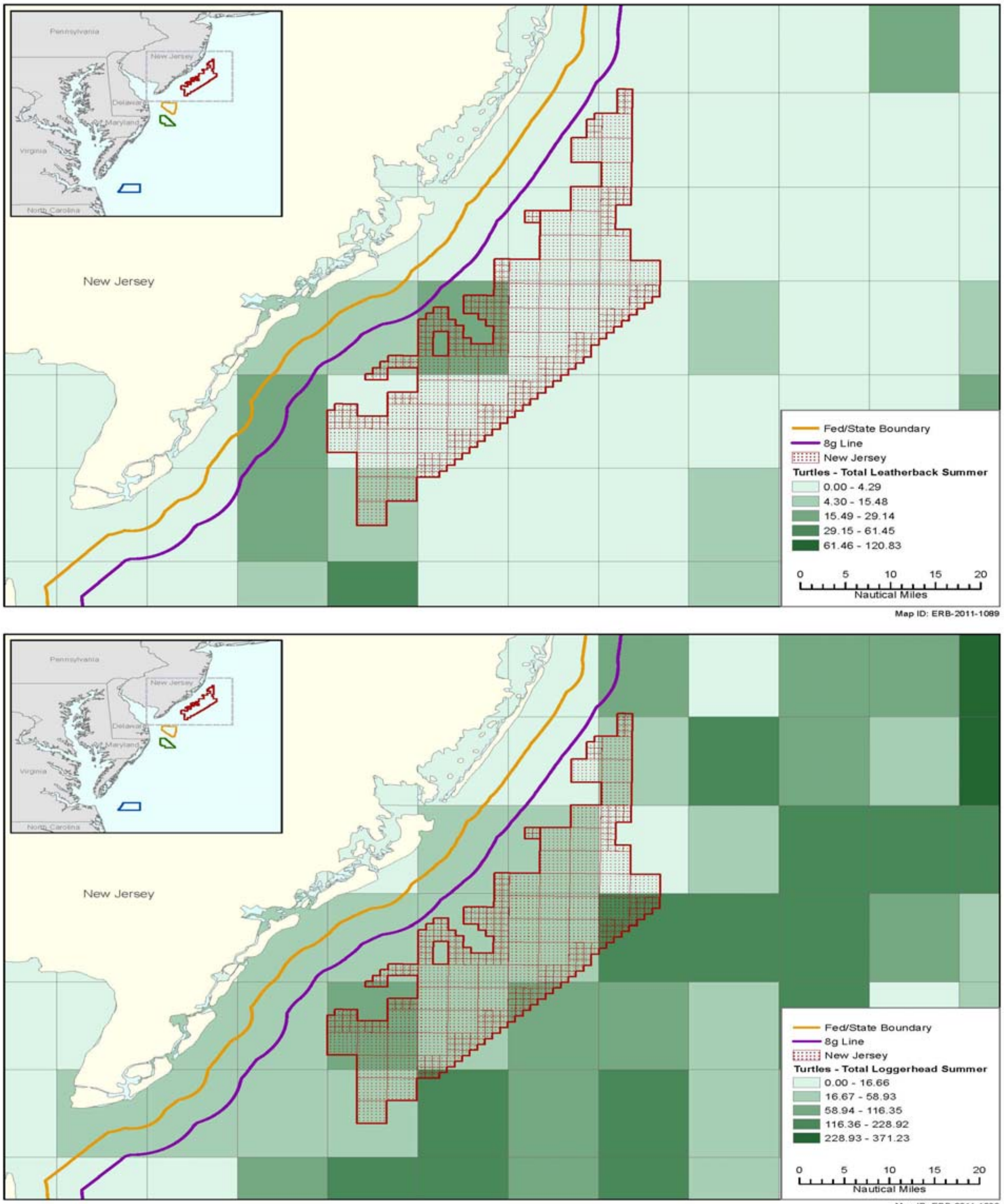
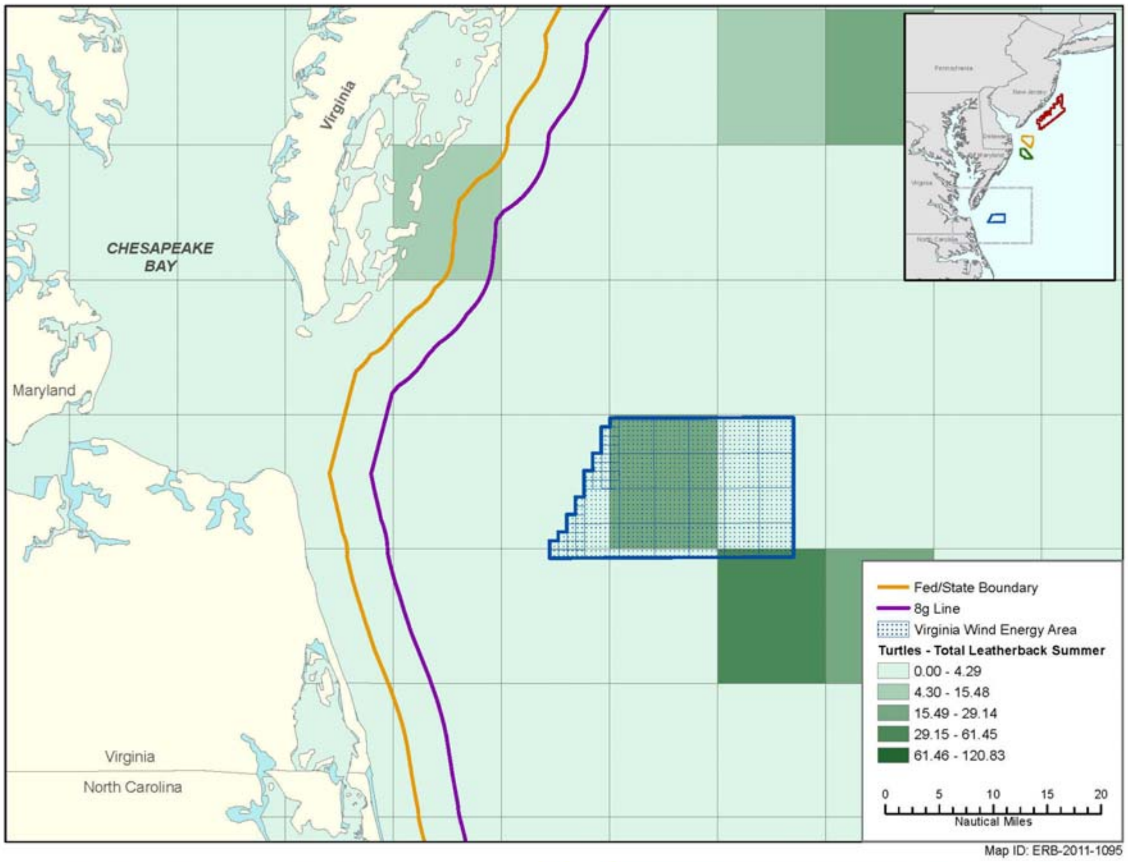


Figure D.2. New Jersey WEA Sea Turtle Sightings Per Unit of Effort.
(Source: TNC, 2011).



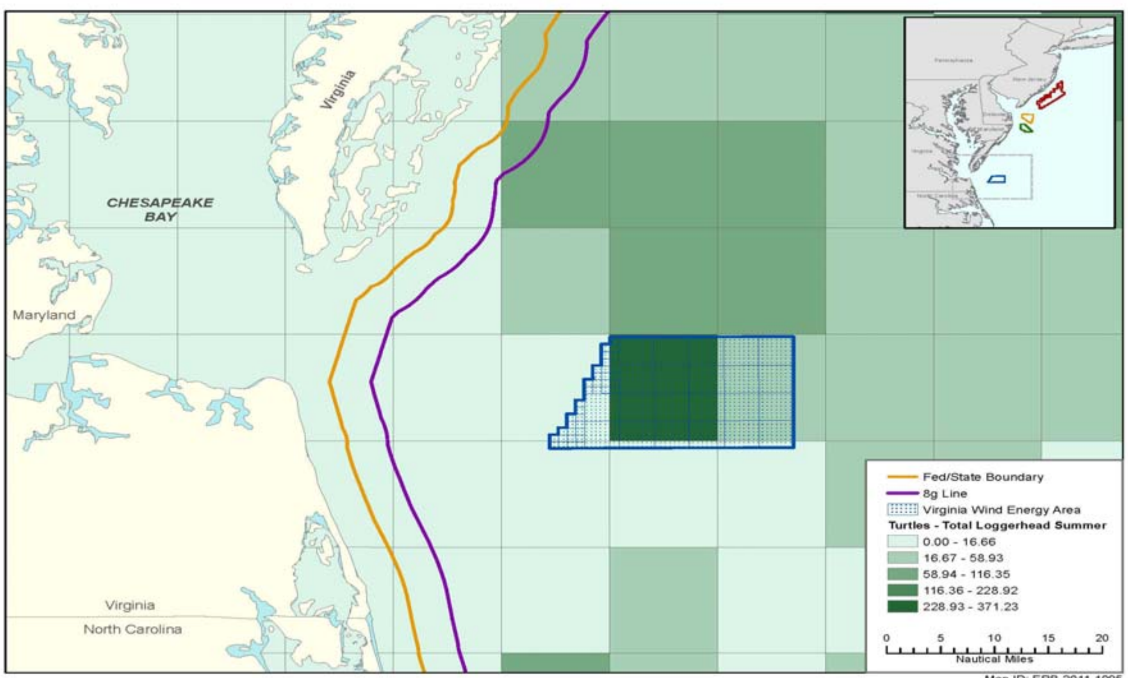


Figure D.3. Virginia WEA Sea Turtle Sightings Per Unit of Effort.
(Source: TNC, 2011)

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 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 territories under U.S. administration.

The Bureau of Ocean Energy Management, Regulation and Enforcement Mission

As a bureau of the Department of the Interior, the Bureau of Ocean Energy Management, Regulation and Enforcement's (BOEMRE's) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS).

The BOEMRE strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending BOEMRE's assistance and expertise to economic development and environmental protection.