Appendix F. Planned Activities Scenario

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F.1. Planned Activities Scenario

This appendix describes the other ongoing or planned activities that could occur within the geographic analysis area for each resource and contribute to baseline conditions and trends for resources considered in this EIS. The *Projects* here are the construction, O&M, and conceptual decommissioning of the EW 1 and EW 2 wind energy projects within BOEM's Renewable Energy Lease Area OCS-A 0512, located on the OCS approximately 14 miles south of Long Island, New York and 19.5 miles east of Long Branch, New Jersey.

The geographic analysis area varies for each resource as described in the individual resource sections of Chapter 3. BOEM anticipates that impacts could occur during Project construction starting in 2023 and throughout a 35-year operational term for EW 1 and EW 2.[1] The geographic analysis area is defined by the anticipated geographic extent of impacts for each resource. For the mobile resources—bats, birds, finfish, and invertebrates; marine mammals; and sea turtles—the species potentially affected are those that occur within the area of impact of the Proposed Action. The geographic analysis area for these mobile resources is the general range of the species. The purpose is to capture the cumulative impacts on each of those resources that would be affected by the Proposed Action as well as the impacts that would still occur under the No Action Alternative.

In this appendix, distances in miles are in statute miles (miles used in the traditional sense) or nm (miles used specifically for marine navigation). This appendix uses statute miles more commonly and refers to them simply as *miles*, whereas nm is referred to by name.

F.2. Ongoing and Planned Activities

This section includes a list and description of ongoing and planned activities that could contribute baseline conditions and trends within the geographic analysis area for each resource topic analyzed in this EIS. Projects or actions that are considered speculative per the definition provided in 43 CFR 46.30[2] are noted in subsequent tables but excluded from the cumulative impact analysis in Chapter 3.

Ongoing and planned activities described in this section consist of 11 types of actions: (1) other offshore wind energy development activities; (2) undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); (3) tidal energy projects; (4) dredging and port improvement projects; (5) marine minerals use and ocean-dredged material disposal; (6) military use; (7) marine transportation; (8) fisheries use, management, and monitoring surveys; (9) global climate change; (10) oil and gas activities; and (11) onshore development activities.

BOEM analyzed the possible extent of future other offshore wind energy development activities on the Atlantic OCS to determine reasonably foreseeable cumulative effects measured by installed power capacity. Table F2-1 in Attachment 2 presents the current status of projects. The methodology for

[1] Empire's lease with BOEM (Lease OCS-A 0512) will have an operations term of 25 years that commences on the date of COP approval. Empire would need to request an extension of its operations term from BOEM in order to operate the proposed Projects for 35 years. For the purposes of maximum-case scenario and to ensure NEPA coverage if BOEM grants such an extension, the Draft EIS analyzes a 35-year operations term.

[2] 43 CFR 46.30 – Reasonably foreseeable future actions include those federal and non-federal activities not yet undertaken, but sufficiently likely to occur, that a responsible official of ordinary prudence would take such activities into account in reaching a decision. The federal and non-federal activities that BOEM must take into account in the analysis of cumulative impacts include, but are not limited to, activities for which there are existing decisions, funding, or proposals identified by BOEM. Reasonably foreseeable future actions do not include those actions that are highly speculative or indefinite.

developing the scenario is the same as for the Vineyard Wind 1 project and details of the scenario development are described in the Vineyard Wind 1 Final EIS (BOEM 2021a).

F.2.1 Offshore Wind Energy Development Activities

F.2.1.1. Site Characterization Studies

A lessee is required to provide the results of site characterization activities with its site assessment plan (SAP) or COP. For the purposes of the cumulative impact analysis, BOEM makes the following assumptions for survey and sampling activities to characterize a maximum-case scenario:

- Site characterization would occur on all existing leases and potential export cable routes.
- Site characterization would likely take place in the first 3 years following execution of a lease, based on the fact that a lessee would likely want to generate data for its COP at the earliest possible opportunity.
- Lessees would likely survey most or all of the proposed Lease Area during the 5-year site assessment term to collect required geophysical information for siting of a meteorological tower, two buoys, and commercial facilities (wind turbines). The surveys may be completed in phases, with the meteorological tower and buoy areas likely to be surveyed first.
- Lessee would not use air guns, which are typically used for deep-penetration two-dimensional or three-dimensional exploratory seismic surveys to determine the location, extent, and properties of oil and gas resources (BOEM 2016).

Table F-1 describes the typical site characterization surveys, the types of equipment and method used, and which resources the survey information would inform.

Table F-1 Site Characterization Survey Assumptions

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

Source: BOEM 2016.

F.2.1.2. Site Assessment Activities

After SAP approval, a lessee can evaluate the meteorological conditions, such as wind resources, with the approved installation of meteorological towers and buoys. Meteorological buoys have become the preferred meteorological and oceanographic (metocean) data collection platform for developers, and BOEM expects that most future site assessments will use buoys instead of towers (BOEM 2021d). The

installation and operation of meteorological buoys involves substantially less activity and a much smaller footprint than the construction and operation of a meteorological tower. Site assessment activities have been approved or are in the process of being approved for multiple lease areas consisting of one to three meteorological buoys per SAP (Table F2-1 in Attachment 2). Site assessment would likely take place starting within 1 to 2 years of lease execution, because preparation of an SAP (and subsequent BOEM review) takes time. This cumulative analysis considers these site assessment activities.

F.2.1.3. Construction and Operation of Offshore Wind Facilities

Table F2-1 in Attachment 2 lists all offshore wind development activities that BOEM considers reasonably foreseeable by lease areas and projects.

F.2.2 Commercial Fisheries Cumulative Fishery Effects Analysis

Table F-2 depicts future construction of offshore wind projects from Maine to North Carolina that are currently in various stages of planning within BOEM's offshore leases. Projected construction dates for each offshore wind project are listed in Table F2-1 in Attachment 2, and each project will require a NEPA process with an EIS or environmental assessment prior to approval.

Table F-2 summarizes (1) the incremental number of construction locations that are projected to be active in each region during each year between 2021 and 2030; (2) the number of operational turbines in each region at the beginning of each year between 2021 and 2030; and (3) the total number of active construction locations and operational turbines across the Atlantic OCS by year.

BOEM assumes proposed offshore wind projects will include the same or similar components as the proposed Projects: wind turbines, offshore and onshore cable systems, OSS, onshore O&M facilities, and onshore interconnection facilities. BOEM further assumes that other potential offshore wind projects will employ the same or similar construction, O&M, and conceptual decommissioning activities as the proposed Projects. However, future offshore wind projects would be subject to evolving economic, environmental, and regulatory conditions. Lease areas may be split into multiple projects, expanded, or removed, and development within a particular lease area may occur in phases over long periods of time. Research currently being conducted in combination with data gathered regarding physical, biological, socioeconomic, and cultural resources during development of initial offshore wind projects in the United States could affect the design and implementation of future projects, as could advancements in technology. For the analysis of ongoing and planned activities, all proposed projects included in Table F2-1 in Attachment 2 are analyzed in Chapter 3 of this EIS.

Table F-2 Future Offshore Wind Project Construction Schedule (dates shown as of October 24, 2022)

Project/Region	Number of Foundations										
	Before 2021	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030 and Beyond**
Aqua venuis (state waters)	-	-	-	*2*	-	-	-	-	-	-	-
Total Other State Waters Projects	-	-	-	*2*	-	-	-	-	-	-	-
Estimated Other State Waters Construction	**-**	**-**	**-**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	0
Estimated O&M total	**-**		**--**	**0**	**2**	**2**	**2**	**2**	**2**	**2**	2
Existing and Ongoing Projects											
Block Island (state waters)	*5*	-	-	-	-	-	-	-	-	-	-
Vineyard Wind 1 part of OCS-A 0501	-	-	-	*63*	-	-	-	-	-	-	-
South Fork, OCS-A 0517	-	-	-	*13*	-	-	-	-	-	-	-
CVOW, OCS-A 0497	*2*	-	-	-	-	-	-	-	-	-	-
Estimated Existing and Ongoing Project Construction	**7**	**0**	**0**	**76**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M total	**0**	**7**	**7**	**7**	**83**	**83**	**83**	**83**	**83**	**83**	**83**
Planned Projects											
Massachusetts/Rhode Island Region											
Sunrise, OCS-A 0487	-	-	-	-	95	-	-	-	-	-	-
Revolution, part of OCS-A 0486	-	-	-	102	-	-	-	-	-	-	-
New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	-	-	-	-	64			-	-	-	-
New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	-	-	-	-	82		-	-	-	-	-
Mayflower OCS-A 0521	-	-	-		-	149	-	-	-	-	-
Beacon Wind 1, part of OCS-A 0520	-	-	-		79	-	-	-	-	-	-
Beacon Wind 2, part of OCS-A 0520	-	-	-	-	-	78	-	-	-	-	-
Bay State Wind, part of OCS-A 0500	-	-	-	-	-	112					
OCS-A 0500 remainder	-	-	-	-	-	232					
OCS-A 0487 remainder	-	-	-	-	-						
Liberty Wind, part of OCS-A 0522	-	-	-	-	-						

Project/Region	Number of Foundations										
	Before 2021	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030 and Beyond**
Estimated annual Massachusetts/Rhode Island construction	**0**	**0**	**0**	**102**	**320**	**571**	**0**	**0**	**0**	**0**	**0**
Estimated O&M total	**0**	**0**	**0**	**0**	**102**	**422**	**993**	**993**	**993**	**993**	**993**
New York/New Jersey Region											
Ocean Wind 1, OCS-A 0498	-	-	-	-	101	-	-	-	-	-	-
Atlantic Shores South, OCS-A 0499	-	-	-	-	-	11	200		-	-	-
Ocean Wind 2, part of OCS-A 0532	-	-	-	-	-	-	113				
Empire Wind 1, part of OCS-A 0512	-	-	-	58				-	-	-	-
Empire Wind 2, part of OCS-A 0512	-	-	-	91					-	-	-
Atlantic Shores North, OCS-A 0549	-	-	-	-	-	-	160				
OW Ocean Winds East LLC, OCS-A 0537	-	-	-	-	-	-	102				
Attentive Energy LLC, OCS-A 0538	-	-	-	-	-	-	104				
Bight Wind Holdings, LLC, OCS-A 0539	-	-	-	-	-	-	148				
Atlantic Shores Offshore Wind Bight, LLC, OCS-A 0541	-	-	-	-	-	-	95				
Invenergy Wind Offshore LLC, OCS-A 0542	-	-	-	-	-	-	99				
Vineyard Mid-Atlantic LLC, OCS-A 0544	-	-	-	-	-	-	104				
Estimated annual New York/New Jersey construction	**0**	**0**	**0**	**149**	**101**	**11**	**1,125**	**0**	**0**	**0**	**0**
Estimated O&M total	**0**	**0**	**0**	**0**	**149**	**250**	**261**	**1,386**	**1,386**	**1,386**	**1,386**
Delaware/Maryland Region											
Skipjack, OCS-A 0519	-	-	-	-	17	-	-	-	-	-	-
US Wind, OCS-A 0490	-	-	-	-	126	-	-	-	-	-	-
GSOE I, OCS-A 0482	-	-	-	93							
OCS-A 0519 remainder	-	-	-								
Estimated annual Delaware/Maryland construction	**0**	**0**	**0**	**93**	**143**	**0**	**0**	**0**	**0**	**0**	**0**
Estimated O&M total	**0**	**0**	**0**	**0**	**93**	**236**	**236**	**236**	**236**	**236**	**236**
Virginia/North Carolina Region											
CVOW-C, OCS-A 0483	-	-	-	208					-	-	-

Project/Region	Number of Foundations										
	Before 2021	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030 and Beyond**
Kitty Hawk North, OCS-A 0508	-	-	-	-	70						
Kitty Hawk South, OCS-A 0508	-	-	-	-	-	-	-	123			
Estimated annual Virginia/North Carolina construction:	**0**	**0**	**0**	**208**	**70**	**0**	**0**	**123**	**0**	**0**	**0**
Estimated O&M total	**0**	**0**	**0**	**0**	**208**	**278**	**278**	**278**	**401**	**401**	**401**
Total											
Estimated annual total construction	**7**	**0**	**0**	**630**	**634**	**582**	**1,125**	**123**	**0**	**0**	**0**
Estimated O&M total	**7**	**7**	**7**	**7**	**637**	**1,271**	**1,853**	**2,978**	**3,101**	**3,101**	**3,101**

CVOW = Coastal Virginia Offshore Wind

F.2.3 Incorporation by Reference of Cumulative Impacts Study and the Analyses Therein

BOEM has completed a study of IPFs on the North Atlantic OCS to consider in an offshore wind development cumulative impacts scenario (BOEM 2019). That study is incorporated in this document by reference. The study identifies cause-and-effect relationships between renewable energy projects and resources potentially affected by such projects. It further classifies those relationships into a manageable number of IPFs through which renewable energy projects could affect resources. It also identifies the types of actions and activities to be considered in a cumulative impact scenario. The study identifies actions and activities that may affect the same physical, biological, economic, or cultural resources as renewable energy projects and states that such actions and activities may have the same IPFs as offshore wind projects.

The BOEM (2019) study identifies the relationships between IPFs associated with specific ongoing and planned activities in the North Atlantic OCS to consider in a NEPA cumulative impacts scenario. These IPFs and their relationships were utilized in the EIS analysis of cumulative impacts, and the application of which IPF applied to which resource was decided by BOEM.

As discussed in the BOEM (2019) study, reasonably foreseeable activities other than offshore wind projects may also affect the same resources as the proposed Projects or other offshore wind projects, possibly via the same IPFs or via IPFs through which offshore wind projects do not contribute. This appendix lists reasonably foreseeable non-offshore wind activities that may contribute to the cumulative impacts of the proposed Projects.

F.2.4 Undersea Transmission Lines, Gas Pipelines, and Other Submarine Cables

There are numerous charted cables within the Lease Area and along the submarine export cable routes. The current status of many of these cables is poorly documented in the public domain, including on NOAA charts. There are currently six NOAA-charted submarine cables that cross through the Lease Area, with an additional three uncharted cables identified within the Lease Area during geophysical survey activities. Through coordination, it is understood that none of the charted cables within the Lease Area are currently in use. In-service cables along the offshore export cable corridor include one bundle of two 345-kV HVAC transmission lines, two 138-kV HVAC transmission cable bundles, Neptune Regional Transmission system, and FLAG Atlantic South telecommunications cable. At least six transmission cables are planned to be installed in the region. The New York Telephone Cable between Fort Hamilton and Fort Wadsworth was identified in the geographic analysis area during a USACE Freedom of Information Act request but was not found during survey campaigns (Empire 2023).

There are no charted pipelines in the Lease Area, and none were identified during geophysical survey activities. In-service pipelines along the submarine export cable route include the Transco Lower New York Bay Lateral gas pipeline, one gas pipeline buried in the northern New York Harbor utility corridor, two gas pipelines and one petroleum product pipeline buried in the southern New York Harbor utility corridor, and the deeply tunneled replacement Brooklyn-Staten Island water siphon. Two retired and partially dismantled Brooklyn-Staten Island water siphons are along the submarine export cable route as well as the planned Transco Raritan Bay Loop gas pipeline (Empire 2023).

The offshore wind projects listed in Table F2-1 in Attachment 2 that have a COP under review are presumed to include at least one cable route.

F.2.5 Tidal Energy Projects

The Roosevelt Island Tidal Energy Project is in the East Channel of the East River, a tidal strait connecting Long Island Sound with the Atlantic Ocean in New York Harbor. In 2005, Verdant Power petitioned the Federal Energy Regulatory Commission (FERC) for permission for the first U.S. commercial license for tidal power. In 2012, FERC issued a 10-year license to install up to 1 MW of power (30 turbines/10 TriFrames) at the Roosevelt Island Tidal Energy Project (FERC 2012; Verdant Power 2018). See the South Fork Wind Farm and South Fork Export Cable Project Final EIS (BOEM 2021b) for descriptions of other tidal projects that are more distant from the Projects in Maine and Massachusetts.

F.2.6 Dredging and Port Improvement Projects

The following dredging projects have been proposed or studied at or near ports that may be used by the Projects in New York and Texas, and are either in operation or are considered reasonably foreseeable:

- USACE has proposed maintenance dredging of the critical shoal areas immediately offshore of the SBMT and the approach to the Gowanus Creek Federal Navigation Channel. Approximately 850,000 cubic yards of material would be removed. This project is anticipated to occur in the summer/fall of 2021 (USACE 2021a).
- Planned activities for Howland Hook include dredging and deepening of the Arthur Kill Channel near the old Goethals Bridge. This channel work is planned for 2022 or 2023 and is associated with two already completed channel maintenance projects in the Arthur Kill Channel (USACE 2021b).
- USACE has proposed maintenance dredging of portions of the Newark Bay, New Jersey Federal navigation channel, including the removal of material from the Port Elizabeth Channel. Maintenance dredging and associated upland placement activities are planned to occur between July 2021 and February 2022 (USACE 2021c).
- USACE is planning or currently conducting numerous navigation projects in and around the Port of Corpus Christi. These include jetty repairs along the Corpus Christi Ship Channel near Port Aransas on Mustang Island; new work dredging within the Corpus Christi Ship Channel along the Lower Bay Reach near Pelican Island and Port Aransas (11.5 million cubic yards); new work dredging within the Corpus Christi Ship Channel along the Upper Bay Reach in Corpus Christi Bay (18 million cubic yards); dike improvements at a spoils containment area adjacent to La Quinta Channel; new work dredging along the Corpus Christi Ship Channel within the Inner Harbor area of Corpus Christi Bay (7 million cubic yards); maintenance dredging within the La Quinta Channel (1 million cubic yards); and maintenance dredging within an approximately 10-mile segment of the Intercoastal Waterway in Corpus Christi Bay (USACE 2022a).
- The Port of Corpus Christi Authority is proposing to deepen portions of the Corpus Christi Ship Channel starting near the southeastern side of Harbor Island, traversing east through the Aransas Pass, and extending into the Gulf of Mexico for an approximate distance of 13.8 miles (USACE 2022b). The project would deepen the ship channel beyond the current authorized channel depths of -54 feet and -56 feet MLLW to maximum depths of -79 feet and -81 feet MLLW to accommodate transit of fully loaded Very Large Crude Carriers through the Corpus Christi Ship Channel. An estimated 42 million cubic yards of new work dredged material would be generated by the channel deepening. Additionally, the proposed project includes:
    - Extending the existing terminus of the authorized channel an additional 29,000 feet into the Gulf of Mexico to reach -80 MLLW;
    - Expanding the existing Inner Basin at Harbor Island as necessary to accommodate Very Large Crude Carrier turning, including construction of a flare transition from the Corpus Christi Ship Channel with Aransas to meet the turning basin expansion;

- Potential placement of the new work dredged material into waters of the United States for beneficial use sites in and around Corpus Christi and Redfish Bays;
- Potential placement of dredged material on San Jose Island for dune restoration;
- Potential placement of dredged material feeder berms for beach to provide restoration along San Jose and Mustang Islands; and
- Transport of new work dredged material to the Corpus Christi New Work Ocean Dredged Material Disposal Site.

F.2.7 Marine Minerals Use and Ocean Dredged Material Disposal

A sand resource area is off the coast of Lido Beach near Jones Inlet. The state sand resource area includes eight smaller sand borrow areas that were recently used for beach renourishment. Within federal waters, the geographic analysis area includes four federal sand resource areas; however, there are no active OCS lease areas for marine minerals within the geographic analysis area (BOEM 2018). The entire extent of the delineated sand borrow area is suitable for renourishment material (Empire 2023). USEPA, Region 2 is responsible for designating and managing ocean disposal sites for materials offshore in the region of the Projects. Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended (33 USC 1413) authorizes USACE to issue permits for the transportation of dredged material for the purpose of disposal within ocean waters. Co-located with the sand resource area described above is an available dredge disposal site known as the Jones Inlet Dredged Material Disposal Site (Empire 2023 citing Marine Cadastre 2019).

F.2.8 Military Use

The Offshore Narragansett Bay Range Complex primarily consists of surface sea spaces and subsurface space off the coasts of Massachusetts, Rhode Island, and New York. As part of the range complex, the Narragansett Bay Operating Area extends from the shoreline seaward to approximately 180 nm (333 kilometers) from land at its farthest point. The complex is controlled by the Fleet Area Control and Surveillance Facility at Virginia Capes Naval Air Station Oceana. The Navy installations primarily operating in this complex are in New London, Connecticut, and Newport, Rhode Island.

The Narragansett Bay Warning Area is in the western portion of the Offshore Narragansett Bay Range Complex and is designated for operations where limitations may be imposed on aircraft not participating in operations. The Narragansett Bay Warning Area is actively used for U.S. Navy subsurface and surface training and testing activities and to prepare submarines and their crews for formal voyages. Additionally, this Warning Area is used to support special-use airspace, flight testing, surface-to-air gunnery exercises using conventional ordnance, Antisubmarine Warfare exercises, and air-intercept training (Empire 2023 citing Globalsecurity.org 2018).

Three danger zones/restricted areas as defined as a “water area (or areas) used for target practice, bombing, rocket firing or other especially hazardous operations, normally for the armed forces” are in the vicinity of the study area. The danger zones/restricted areas in the area are at the mouth of the New York Harbor, at the Naval Weapons Station Earle in Sandy Hook Bay, and around the Navy Homeport Pier on Staten Island (Empire 2023).

There are two Weapons Training Areas operated by USCG offshore New York and New Jersey within the geographic analysis area. These training areas are used for proficiency training in law enforcement operations (BOEM 2016) and for small caliber weapons training, generally from small vessels that transit during the day to the training area.

F.2.9 Marine Transportation

Marine transportation in the region is diverse and sourced from many ports and private harbors. Commercial vessel traffic in the region includes research, tug/barge, tankers (such as those used for liquid petroleum), cargo, cruise ships, smaller passenger vessels, and commercial fishing vessels. Recreational vessel traffic includes private motor boats and sailboats. A number of federal agencies, state agencies, educational institutions, and environmental non-governmental organizations participate in ongoing research offshore including oceanographic, biological, geophysical, and archaeological surveys. The Lease Area is between the Nantucket/Ambrose TSS along the northern boundary and the Hudson Canyon/Ambrose TSS along the southern boundary of the Lease Area. A third TSS, Barnegat/Ambrose, runs north-south off the coast of New Jersey. Empire's NSRA assumes a conservative growth potential in commercial shipping movements of 10 percent that is applied to the base-case scenario for traffic volumes in the geographic analysis area that includes the Nantucket/Ambrose, Hudson Canyon/Ambrose, and Barnegat/Ambrose TSS (COP Volume 3, Appendix DD, Section 7.5.1; Empire 2023).

USCG chartered a workgroup on May 11, 2011, to gather data, identify existing and future waterway usage, and conduct modeling and analysis of traffic patterns in light of the complex interactions of the various factors that would affect navigational safety along the Atlantic Coast of the United States including potential navigational conflicts with various planned wind energy areas. USCG published the workgroup's Interim Report (77 *Federal Register* 55781; September 11, 2012) and a notification (81 *Federal Register* 13307; March 14, 2016) that announced the availability of the final report issued by the Atlantic Coast PARS workgroup. USCG announced the final report to be complete as published on April 5, 2017 (82 *Federal Register* 16510). The Atlantic Coast PARS Final Report along with the other PARS referenced in Section 3.16 served to gauge and inform the navigational assessment of the Proposed Action and cumulative impacts.

F.2.10 National Marine Fisheries Service Activities

Research and enhancement permits may be issued for marine mammals protected by the MMPA and for threatened and endangered species protected under the ESA. NMFS is anticipated to continue issuing research permits under Section 10(a)(1)(A) of the ESA to allow take of certain ESA-listed species for scientific research. Scientific research permits issued by NMFS currently authorize studies on ESA-listed species in the Atlantic Ocean. Current fisheries management and ecosystem monitoring surveys conducted by or in coordination with NEFSC could overlap with offshore wind lease areas in the New England region and south into the Mid-Atlantic region. Surveys include (1) the NEFSC Bottom Trawl Survey, a more than 50-year multispecies stock assessment tool using a bottom trawl; (2) the NEFSC Sea Scallop/Integrated Habitat Survey, a sea scallop stock assessment and habitat characterization tool, using a bottom dredge and camera tow; (3) the NEFSC Surfclam/Ocean Quahog Survey, a stock assessment tool for both species using a bottom dredge; and (4) the NEFSC Ecosystem Monitoring Program, a more than 40-year shelf ecosystem monitoring program using plankton tows and conductivity, temperature, and depth units. These surveys are anticipated to continue within the region, regardless of offshore wind development.

The regulatory process administered by NMFS, which includes stock assessments for all marine mammals and 5-year reviews for all ESA-listed species, assists in informing decisions on take authorizations and the assessment of project-specific and cumulative impacts that consider ongoing and planned activities in biological opinions. Stock assessments completed regularly under the MMPA include estimates of potential biological removal that stocks of marine mammals can sustainably absorb. MMPA take authorizations require that a proposed action have no more than a negligible impact on species or stocks, and that a proposed action impose the least practicable adverse impact on the species. MMPA authorizations are reinforced by monitoring and reporting requirements so that NMFS is kept informed of deviations from what has been approved. Biological opinions for federal and non-federal

actions are similarly grounded in status reviews and conditioned to avoid jeopardy and to allow continued progress toward recovery. These processes help to ensure that, through compliance with these regulatory requirements, a proposed action would not have a measurable impact on the conservation, recovery, and management of the resource.

F.2.10.1. Directed Take Permits for Scientific Research and Enhancement

NMFS issues permits for research on protected species for scientific purposes. These scientific research permits include the authorization of directed take for activities such as capturing animals and taking measurements and biological samples to study their health, tagging animals to study their distribution and migration, photographing and counting animals to get population estimates, taking animals in poor health to an animal hospital, and filming animals. NMFS also issues permits for enhancement purposes; these permits are issued to enhance the survival or recovery of a species or stock in the wild by taking actions that increase an individual's or population's ability to recover in the wild. Scientific research and enhancement permits have been issued previously for satellite, acoustic, and multi-sensor tagging studies on large and small cetaceans; research on reproduction, mortality, health, and conservation issues for NARWs; and research on population dynamics of harbor and gray seals. Reasonably foreseeable future impacts from scientific research and enhancement permits include physical and behavioral stressors (e.g., restraint and capture, marking, implantable and suction tagging, biological sampling).

F.2.10.2. Fisheries Use and Management

NMFS implements regulations to manage commercial and recreational fisheries in federal waters, including those within which the Projects would be located; the State of New Jersey and the State of New York regulate commercial fisheries in their state waters (within 3 nm of the coastline). The Projects overlap two of NMFS's eight regional councils to manage federal fisheries: MAFMC, which includes New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina; and NEFMC, which includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (NEFMC 2016). The councils manage species with many FMPs that are frequently updated, revised, and amended and coordinate with each other to jointly manage species across jurisdictional boundaries (MAFMC 2019). Many of the fisheries managed by the councils are fished for in state waters or outside of the Mid-Atlantic region, so the council works with the Atlantic States Marine Fisheries Commission (ASMFC). ASMFC is composed of the 15 Atlantic coast states and coordinates the management of marine and anadromous resources found in the states' marine waters. In addition, the states and NMFS, under the framework of ASMFC's *Amendment 3 to the Interstate Fishery Management Plan for American Lobster*, cooperatively manage the American lobster resource and fishery (NOAA 1997).

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

NMFS also manages highly migratory species, such as tuna and sharks, that can travel long distances and cross domestic boundaries. Table F-3 summarizes other FMPs and actions in the region.

Table F-3 Other Fishery Management Plans

Area	Plan and Projects
ASFMC	ASMFC *Five-Year Strategic Plan 2019–2023* (ASMFC 2019) ASMFC 2022 Action Plan (ASMFC 2021) *Management, Policy and Science Strategies for Adapting Fisheries Management to Changes in Species Abundance and Distribution Resulting from Climate Change* (ASMFC 2018)
New York	*New York Ocean Action Plan 2017–2027*: adaptive management plan (NYSDEC 2017) New York State filed a petition with NOAA, NMFS, and MAFMC to demand that commercial fluke allocations be revised to provide fishers with equitable access to summer flounder. New York is also reviewing other species where there is an unfair allocation, including black sea bass and bluefish, and may pursue similar actions (*Federal Register* 31945 July 10, 2018).
Long Island Regional Development Council	East Hampton Shellfish Hatchery project to consolidate the hatchery's municipal hatchery and nursing facilities. Haskell's seafood facility in East Quogue is proposed become a fully functioning seafood processing plant.
New Jersey	NJDEP Division of Fish and Wildlife Marine Fisheries Management Rule Amendment Proposal with amendments to rules governing crab and lobster management, commercial Atlantic menhaden fishery, marine fisheries, and fishery management in New Jersey was published in the March 1, 2021, New Jersey Register (New Jersey Division of Fish and Wildlife 2021).

F.2.11 Global Climate Change

Section 7.6.1.4 of the *Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Activities on the Outer Continental Shelf* (Minerals Management Service 2007) describes global climate change with respect to assessing renewable energy development. Climate change is predicted to affect Northeast fishery species differently (Hare et al. 2016), and the NMFS biological opinion discusses in detail the potential impacts of global climate change on protected species that occur within the Proposed Action area (NMFS 2013).

The Intergovernmental Panel on Climate Change released a special report in October 2018 that compared risks associated with an increase of global warming of 1.5 °C and an increase of 2 °C. The report found that climate-related risks depend on the rate, peak, and duration of global warming, and that an increase of 2 °C was associated with greater risks associated with climatic changes such as extreme weather and drought; global sea level rise; impacts on terrestrial ecosystems; impacts on marine biodiversity, fisheries, and ecosystems and their functions and services to humans; and impacts on health, livelihoods, food security, water supply, and economic growth (IPCC 2018).

Table F-4 summarizes regional plans and policies that are in place to address climate change, and Table F-5 summarizes resiliency plans.

Table F-4 Climate Change Plans and Policies

Plans and Policies	Summary/Goal
New York	
Order Adopting a Clean Energy Standard (State of New York Public Service Commission 2016)	Requirement that 50% of New York's electricity come from renewable energy sources by 2030.

Plans and Policies	Summary/Goal
New York State Energy Plan 2015; 2017 Biennial Report to 2015 Plan (NYSERDA 2015, 2017a)	Requires 40% reduction in GHG from 1990 levels, 50% electricity to come from renewable energy resources, and a 600-trillion-British-thermal-unit increase in statewide energy efficiency.
Governor Cuomo State of State Address 2017, 2018, 2021	2017: Set offshore wind energy development goal of 2,400 MW by 2030 (BOEM 2021b citing Governor's Office 2017a). 2018: Procurement of at least 800 MW of offshore wind power between two solicitations in 2018 and 2019; new energy efficiency target for investor-owned utilities to more than double utility energy efficiency progress by 2025; energy storage initiative to achieve 1,500 MW of storage by 2025 and up to 3,000 MW by 2030 (BOEM 2021b citing Governor's Office 2018b, 2018c). 2021: The governor's 2021 agenda—Reimagine | Rebuild | Renew—establishes a goal of building out the renewable energy program. The agenda notes the development of two new offshore wind farms more than 20 miles offshore of Long Island, as well as the creation of dedicated offshore port facilities and additional transmission capacity development.
Governor Hochul State of the State Address (2022)	2022: Announced NYSERDA's third offshore wind procurement to be initiated in 2022; the procurement is expected to result in at least 2 GW of new offshore wind projects. 2022: Announced a $500 million infrastructure investment to develop offshore wind manufacturing and supply chain infrastructure. 2022: Announced a legislative proposal to ensure all new building construction reaches zero emissions by 2027, and to develop 2 million electrified or electrification-ready homes by 2030.
New York State Offshore Wind Master Plan (2017) (NYSERDA 2017b)	Grants NYSERDA ability to award 25-year long-term contracts for projects ranging from approximately 200 MW to approximately 800 MW, with an ability to award larger quantities if sufficiently attractive proposals are received. Each proposer is also required to submit at least one proposal of approximately 400 MW. Bids are due in February 2019; awards are expected in spring 2019; and contracts are expected to be executed thereafter.
2020 Offshore Wind Solicitation	As noted above, NYSERDA has provisionally awarded two offshore wind projects, totaling 2,490 MW. EW 2 (1,260 MW) and Beacon Wind (1,230 MW) of Equinor Wind US, LLC will generate enough clean energy to power 1.3 million homes and will be major economic drivers, supporting the following: • More than 5,200 direct jobs • Combined economic activity of $8.9 billion in labor, supplies, development, and manufacturing statewide • $47 million in workforce development and just access funding
The Climate Leadership and Community Protection Act, enacted on July 18, 2019, signed into law in July 2019, and effective January 1, 2020	The act establishes economy-wide targets to reduce GHG emissions by 40% of 1990 levels by 2030 and 85% of 1990 levels by 2050.

Plans and Policies	Summary/Goal
New Jersey	
New Jersey Energy Master Plan (New Jersey State 2019)	Updated in 2019, the plan sets the framework to implement Executive Order 28 by decarbonizing and modernizing New Jersey's energy system, expanding the clean energy innovation economy, and accelerating the deployment of renewable energy resources to meet the offshore wind energy generation goal established in Executive Order 92.
Executive Order 28: Measures to Advance New Jersey's Clean Energy Economy (2018)	Sets target of total conversion of the state's energy production profile to 100% clean energy sources on or before January 1, 2050.
Executive Order 92: Increase Offshore Wind Goal to 7,500 Megawatts by 2036 (2019)	Establishes a goal of 3,500 MW of offshore wind energy generation by 2030.
Executive Order 100: Protecting Against Climate Threats (PACT); Land Use Regulations and Permitting (2020)	Establishes a GHG monitoring and reporting program, establishes criteria to govern and reduce emissions, and integrates climate change considerations, such as sea level rise, into regulatory and permitting programs.

Table F-5 Resiliency Plans and Policies

Plans and Policies	Summary
New York	
Part 490 of Community Risk and Resiliency Act of 2014	Establishes statewide science-based sea-level rise projections for coastal regions of the state. As of 2019, NYSDEC is in the process of developing a State Flood Risk Management Guidance document for state agencies (NYSDEC n.d.).
NY Rising Community Reconstruction Program (2018)	$20.4 million in projects on Long Island to help flood-prone communities plan and prepare for extreme weather events as they continue projects to recover from Superstorm Sandy, Hurricane Irene, and Tropical Storm Lee. Three projects were announced for Suffolk County and five for Nassau County (BOEM 2021b citing Governor's Office 2018c).
New Jersey	
New Jersey Draft Climate Change Resilience Strategy (NJDEP 2021)	This is New Jersey's first statewide climate resiliency strategy and was released as a draft in April 2021. The *Draft Climate Change Resilience Strategy* develops a framework for policy, regulatory, and operational changes to support the resilience of New Jersey's communities, economy, and infrastructure. It includes 125 recommended actions across the following six priority areas: build resilient and healthy communities, strengthen the resilience of New Jersey's ecosystems, promote coordinated governance, invest in information, increase public understanding, promote climate-informed investments and innovative financing, and coastal resilience plan.

F.2.12 Oil and Gas Activities

The proposed Project area is in the North Atlantic Planning Area of the OCS Oil and Gas Leasing Program (National OCS Program). On September 8, 2020, the White House issued a presidential

memorandum for the Secretary of the Interior on the withdrawal of certain areas of the United States OCS from leasing disposition for 10 years, including the areas currently designated by BOEM as the South Atlantic and Straits of Florida Planning Areas (The White House 2020a). The South Atlantic Planning Area includes the OCS off South Carolina, Georgia, and northern Florida. On September 25, 2020, the White House issued a similar memorandum for the Mid-Atlantic Planning Area that lies south of the northern administrative boundary of North Carolina (The White House 2020b). This withdrawal prevents consideration of these areas for any leasing for purposes of exploration, development, or production during the 10-year period beginning July 1, 2022, and ending June 30, 2032. However, currently, there has been no decision by the Secretary of the Interior regarding future oil and gas leasing in the North Atlantic or remainder of the Mid-Atlantic Planning Areas. Existing leases in the withdrawn areas are not affected.

BOEM issues geological and geophysical permits to obtain data for hydrocarbon exploration and production; locate and monitor marine mineral resources; aid in locating sites for alternative energy structures and pipelines; identify possible manmade, seafloor, or geological hazards; and locate potential archaeological and benthic resources. Geological and geophysical surveys are typically classified into categories by equipment type and survey technique. There are currently no such permits under review for areas offshore New York and New Jersey (BOEM 2021c).

Several liquefied natural gas ports are on the East Coast of the United States. Table F-6 lists existing, approved, and proposed liquified natural gas ports on the East Coast that provide (or may provide in the future) services such as natural gas export, natural gas supply to the interstate pipeline system or local distribution companies, storage of liquified natural gas for periods of peak demand, or production of liquified natural gas for fuel and industrial use. In addition, there are ten existing liquid natural gas export or import facilities and 18 liquid natural gas facilities that are approved but have not been constructed across the Gulf Coast states of Texas, Louisiana, and Mississippi (FERC 2022a, 2022b).

Table F-6 Liquid Natural Gas Terminals in the Eastern United States

Terminal Name	Type	Company	Jurisdiction	Status
Everett, MA	Import terminal	GDF SUEZ—DOMAC	FERC	Existing
Offshore Boston, MA	Import terminal	Neptune LNG	MARAD/USCG	Existing
Offshore Boston, MA	Import terminal, authorized to re-export delivered LNG	Excelerate Energy—Northeast Gateway	MARAD/USCG	Existing
Cove Point, MD (Chesapeake Bay)	Import terminal	Dominion—Cove Point LNG	FERC	Existing
Elba Island, GA (Savannah River)	Import terminal	El Paso—Southern LNG	FERC	Existing
Elba Island, GA (Savannah River)	Export terminal	Southern LNG Company	FERC	Existing
Jacksonville, FL	Export terminal	Eagle LNG Partners	FERC	Proposed

Source: FERC 2022a, 2022b.
DOMAC = Distrigas of Massachusetts; FL = Florida; GA = Georgia; LNG = liquified natural gas; MA = Massachusetts; MARAD = U.S. Department of Transportation Maritime Administration; MD = Maryland

F.2.13 Onshore Development Activities

Onshore development activities that may contribute to cumulative impacts include visible infrastructure such as onshore wind turbines and cell towers, port development, and other energy projects such as transmission and pipeline projects. Coastal development projects permitted through regional planning

commissions, counties, and towns may also contribute to cumulative impacts. These may include residential, commercial, and industrial developments spurred by population growth in the region (Table F-7).

Table F-7 Existing, Approved, and Proposed Onshore Development Activities

Type	Description
Local planning documents	City of New York *2021–2025 Consolidated Plan* (NYC Planning 2021) *Nassau County Master Plan (*Nassau County Planning Department 2010) *Creating Resilience: A Planning Initiative, City of Long Beach Comprehensive Plan* (City of Long Beach 2018) *Staten Island Comprehensive Economic Development Strategy 2020* (Staten Island Economic Development Corporation 2020) *Plan CC Comprehensive Plan* (City of Corpus Christi 2016) *Aransas Pass 2018 Comprehensive Plan* (Aransas Pass 2018)
Oceanside POI	Long Island Power Authority is proposing to build a new substation (Hampton Road Substation) on the EW 2 Onshore Substation A parcel to improve the existing power grid and support the interconnection of EW 2. The Hampton Road Substation would serve to step down the voltage from 345 kV to 138 kV and would include the POI to interconnect EW 2 into the existing electric grid. The Hampton Road Substation would house both 345-kV and 138-kV substation facilities, including a new 345-kV gas-insulated switchgear breaker array, two new 345-/138-kV step-down transformers, and a 138-kV gas-insulated switchgear breaker array. Improvements would also include four underground 138-kV loop-in/loop-out lines that would connect from the Hampton Road Substation to Long Island Power Authority's existing transmission lines under Lawson Boulevard in Oceanside within an approximately 0.1-mile (0.2-kilometer)-long cable corridor. If final design determines that the loop-in/loop-out lines would be oil-filled rather than solid dielectric, an oil pump station would also be part of the planned facilities (Empire 2023).
Onshore wind projects	According to the U.S. Geological Survey, there are two onshore wind projects within the 40-mile viewshed of the Projects. The Bayonne Wind Energy Project consists of one 1.5-MW turbine with a tip height of 103.6 meters and a rotor diameter of 77 meters (Hoen et al. 2021). Additionally, there is one unnamed onshore wind project in Sunset Park, Brooklyn that consists of one turbine. The specifications of that turbine are unknown.
Communications towers	There are numerous communication towers in communities within the viewshed of the Projects. For example, there are 17 towers within a 3-mile radius of Long Beach, New York; 38 communication towers within a 3-mile radius of Oceanside, New York; and 362 communication towers within a 3-mile radius of Gowanus (Brooklyn), New York (AntennaSearch.com 2023).

Type	Description
Development projects	As part of New York State's $100 billion infrastructure project, $5.6 billion will go to transform the Long Island Railroad to improve system connectivity. Within Suffolk County, the following stations will receive funds for upgrades: Brentwood, Deer Park, East Hampton, Northport, Ronkonkoma, Stony Brook, Port Jefferson, and Wyandanch. The East Hampton historic Long Island Railroad station will undergo upgrades and modernizations (Metropolitan Transit Authority 2017; BOEM 2021b citing Governor's Office 2017b). Additional plans for transit-oriented design and highway improvements are planned in Suffolk County in state and county planning documents. The Fire Island Inlet to Montauk Point Project is a $1.2 billion project by USACE, NYSDEC, and Long Island, New York municipalities to engage in inlet management; beach, dune, and berm construction; breach response plans; raising and retrofitting 4,400 homes; road-raising; groin modifications; and coastal process features. Within Suffolk County, portions of the Towns of Babylon, Islip, Brookhaven, Southampton, and East Hampton; 12 incorporated villages along Long Island's south shore (mainland); Fire Island National Seashore; and the Poospatuck and Shinnecock Indian Reservations will be involved in this project (USACE 2018).
Port studies/ upgrades	Ports in New York may require upgrades to support the offshore wind industry developing in the northeastern United States. Upgrades may include onshore developments or underwater improvements (such as dredging). In December 2017, NYSERDA issued an offshore wind master plan that assessed 54 distinct waterfront sites along the New York Harbor and Hudson River and 11 distinct areas with multiple small sites along the Long Island coast. Twelve waterfront areas and five distinct areas were singled out for "potential to be used or developed into facilities capable of supporting OSW projects" (Table 26, NYSERDA 2017b). Nearly all identified sites would require some level of infrastructure upgrade (from minimal to significant) depending on offshore wind activities intended for the site. Particular sites of interest include Red Hook-Brooklyn, SBMT, and the Port of Coeymans (NYSERDA 2017b). For additional information regarding specific proposed improvements to these ports, see Capital Region Economic Development Council 2018, American Association of Port Authorities 2016, Rulison 2018, and NYCEDC 2018. New York State proposed port improvements include the governor's 2021 agenda "Reimagine | Rebuild | Renew," which includes upgrades to create five dedicated port facilities for offshore wind, including the following: • The nation's first offshore wind tower manufacturing facility, to be built at the Port of Albany • An offshore wind turbine staging facility and O&M hub to be established at SBMT • Increasing the use of the Port of Coeymans for cutting-edge turbine foundation manufacturing • Buttressing ongoing O&M out of Port Jefferson and Port of Montauk Harbor in Long Island Corpus Christi Polymers, LLC is planning to finish construction of a partially completed chemical manufacturing plant on Port of Corpus Christi property on the north side of the Inner Harbor area of Corpus Christi Bay. The $1.1 billion plant would produce between 1.1 million and 1.3 million metric tons of purified terephthalic acid and polyethylene terephthalate and would be the largest of its kind in the world. Completion of the project is expected to be in 2023 (Market Report Company 2022). Several new saltwater desalination plants are being proposed in the Corpus Christi area. The City of Corpus Christi is pursuing development of a saltwater desalination plant with a capacity of up to 30 mgd on property on the Inner Harbor Ship Channel

Type	Description
	and a 20- to 40-mgd saltwater desalination plant on a site near the La Quinta Ship Channel. The Port of Corpus Christi is pursuing development of a 30-mgd saltwater desalination plant on a site near the La Quinta Ship Channel and 50-mgd saltwater desalination plant on Harbor Island adjacent to the Corpus Christi Ship Channel (Virtual Builders Exchange 2022). The Port of Corpus Christi is partnering with Bluewater Texas Terminal to build two single-point mooring buoys 21 nm from the mouth of the Corpus Christi Ship Channel to serve as new offshore oil terminals. The offshore terminals will be used to load Very Large Crude Carriers at production rates of up to 80,000 barrels per hour with throughput capacities of 16 Very Large Crude Carriers per month. Crude oil from Permian and Eagle Ford shale plays will feed the export port via pipelines connected to the Harvest Midway Terminal, a planned multi-use crude oil storage terminal near Taft, Texas (Corpus Christi Business News 2020).

mgd = million gallons per day

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ATTACHMENT 1
ONGOING AND FUTURE NON-OFFSHORE WIND ACTIVITY ANALYSIS

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LIST OF TABLES

BOEM developed the following tables based on its 2019 study *National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf* (BOEM 2019), which evaluates potential impacts associated with ongoing and future non-offshore wind activities.

Table F1-1 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Air Quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	Accidental releases of air toxics HAPs are due to potential chemical spills. Ongoing releases occur in low frequencies. These may lead to short-term periods of toxic pollutant emissions through surface evaporation. According to the U.S. Department of Energy, 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Approximately 40.5 million barrels of oil were lost as a result of tanker incidents from 1970 to 2009, according to International Tanker Owners Pollution Federation Limited, which collects data on oil spills from tankers and other sources. From 1990 to 1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and offshore it was up to less than 70,000 barrels.	Accidental releases of air toxics or HAPs will be due to potential chemical spills. See Table F1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. These may lead to short-term periods of toxic pollutant emissions through evaporation. Air quality impacts will be short-term and limited to the local area at and around the accidental release location.
Air emissions: Construction and decommissioning	Air emissions originate from combustion engines and electric power generated by burning fuel. These activities are regulated under the CAA to meet set standards. Air quality has generally improved over the last 35 years; however, some areas in the Northeast have experienced a decline in air quality over the last 2 years. Some areas of the Atlantic coast remain in nonattainment for ozone, with the source of this pollution from power generation. Many of these states have made commitments toward cleaner energy goals to improve this, and offshore wind is part of these goals. Primary processes and activities that can affect the air quality impacts are expansions and modifications to existing fossil fuel power plants, onshore and offshore	The largest air quality impacts over the next 35 years will occur during the construction phase of any one project; however, projects will be required to comply with the CAA. During the limited construction and decommissioning phases, emissions may occur that are above *de minimis* thresholds and will require offsets and mitigation. Primary emission sources will be increased commercial vehicular traffic, air traffic, public vehicular traffic, and combustion emissions from construction equipment and fugitive emissions from construction-generated dust. As projects come online, power generation emissions overall will decline and the industry as a whole will have a net benefit on air quality.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Air emissions: O&M	activities involving renewable energy facilities, and various construction activities.	Activities associated with O&M of onshore wind projects will have a proportionally very small contribution to emissions compared to the construction and decommissioning activities over the next 35 years. Emissions will largely be due to commercial vehicular traffic and operation of emergency diesel generators. Such activity will result in short-term, intermittent, and widely dispersed emissions and small air quality impacts.
Air emissions: Power generation emissions reductions		Many Atlantic states have committed to clean energy goals, with offshore wind being a large part of that. Other reductions include transitioning to onshore wind and solar. The No Action Alternative without implementation of other future offshore wind projects would likely result in increased air quality impacts regionally due to the need to construct and operate new energy generation facilities to meet future power demands. These facilities may consist of new natural-gas-fired power plants, coal-fired, oil-fired, or clean-coal-fired plants. These types of facilities would likely have larger and continuous emissions and result in greater regional scale impacts on air quality.
Climate change	The construction, operation, and decommissioning of offshore wind projects would produce GHG emissions (nearly all CO_2) that can contribute to climate change; however, these contributions would be minuscule compared to aggregate global emissions. CO_2 is relatively stable in the atmosphere and generally mixed uniformly throughout the troposphere and stratosphere. Hence the impact of GHG emissions does not depend upon the source location. Increasing energy production from offshore wind projects will likely decrease GHGs emissions by replacing energy from fossil fuels.	Development of future onshore wind projects will produce a small overall increase in GHG emissions over the next 35 years. However, these contributions would be very small compared to the aggregate global emissions. The impact on climate change from these activities would be very small. As more projects come online, some reduction in GHG emissions from modifications of existing fossil fuel facilities to reduce power generation. Overall, it is anticipated that there would be no cumulative impact on global warming as a result of onshore wind project activities.

HAP = hazardous air pollutant; hazmat = hazardous materials

Table F1-2 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Bats

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded and would result in high-intensity, low-exposure level, long-term, but localized intermittent risk to bats in nearshore waters. Direct impacts are not expected to occur as recent research has shown that bats may be less sensitive to TTS than other terrestrial mammals (Simmons et al. 2016). Indirect impacts (i.e., displacement from potentially suitable habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized.	Similar to ongoing activities, noise associated with pile driving activities would be limited to nearshore waters, and these high-intensity, but low-exposure risks would not be expected to result in direct impacts. Some indirect impacts (i.e., displacement from potentially suitable foraging habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized, and no population-level effects would be expected.
Noise: Construction	Onshore construction occurs regularly for generic infrastructure projects in the bats geographic analysis area. There is a potential for displacement caused by equipment if construction occurs at night (Schaub et al. 2008). Any displacement would only be temporary. No individual or population level impacts would be expected. Some bats roosting in the vicinity of construction activities may be disturbed during construction but would be expected to move to a different roost farther from construction noise. This would not be expected to result in any impacts as frequent roost switching is a common component of a bat's life history (Hann et al. 2017; Whitaker 1998).	Onshore construction is expected to continue at current trends. Some behavioral responses and avoidance of construction areas may occur (Schaub et al. 2008). However, no injury or mortality would be expected.
Presence of structures: Migration disturbances	There may be few structures scattered throughout the offshore bats geographic analysis area, such as navigation and weather buoys and light towers. Migrating bats can easily fly around or over these sparsely distributed structures, and no migration disturbance would be expected. Bat use of offshore areas is very limited and generally restricted to spring and fall migration. Very few bats would be expected to encounter structures on the OCS and no population-level effects would be expected.	The infrequent installation of future new structures in the marine environment of the next 35 years is expected to continue. As described under Ongoing Activities, these structures would not be expected to cause disturbance to migrating tree bats in the marine environment.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Turbine strikes	There may be few structures in the offshore bats geographic analysis area, such as navigation and weather buoys, turbines, and light towers. Migrating tree bats can easily fly around or over these sparsely distributed structures, and no strikes would be expected.	The infrequent installation of future new structures in the marine environment of the next 35 years is expected to continue. As described under Ongoing Activities, these structures would not be expected to result in increased collision risk to migrating tree bats in the marine environment.
Land disturbance: onshore construction	Onshore construction activities are expected to continue at current trends. Potential direct effects on individuals may occur if construction activities include tree removal when bats are potentially present. Injury or mortality may occur if trees being removed are occupied by bats at the time of removal. While there is some potential for indirect impacts associated with habitat loss, no individual or population-level effects would be expected.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss and could result in injury or mortality of individuals.
Climate change: Warming and sea level rise, storm severity/frequency	Storms during breeding and roosting season can reduce productivity and increase mortality. Intensity of this impact is speculative.	No future activities were identified within the bats geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, increased disease frequency	Disease can weaken, lower reproductive output, and/or kill individuals. Some tropical diseases will move northward. Extent and intensity of this impact is highly speculative.	No future activities were identified within the bats geographic analysis area other than ongoing activities.

Table F1-3 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Benthic Resources

Associated IPFs: Sub-IFPs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table F1-23 for a discussion of ongoing accidental releases. Accidental releases of hazmat occur periodically, mostly consisting of fuels, lubricating oils, and other petroleum compounds. Because most of these materials tend to float in seawater, they rarely contact benthic resources. The chemicals with potential to sink or dissolve rapidly often dilute to non-toxic levels before they affect benthic resources. The corresponding impacts on benthic resources are rarely noticeable.	Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. See previous cell and Table F1-23 on water quality for details.
Accidental releases: Invasive species	Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on benthic resources (e.g., competitive disadvantage, smothering) depend on many factors, but can be noticeable, widespread, and permanent.	No future activities were identified within the geographic analysis area other than ongoing activities.
Accidental releases: Trash and debris	Ongoing releases of trash and debris occurs from onshore sources, fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying. However, there does not appear to be evidence that ongoing releases have detectable impacts on benthic resources.	No future activities were identified within the geographic analysis area other than ongoing activities.
Anchoring	Regular vessel anchoring related to ongoing military, survey, commercial, and recreational activities continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and the potential for direct contact to cause injury and mortality of benthic resources, as well as physical damage to their habitats. All impacts are localized; turbidity is temporary; injury and mortality are recovered in the short term; and physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IFPs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
EMFs	EMFs continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the geographic analysis area. Some benthic species can detect EMFs, although EMFs do not appear to present a barrier to movement. The extent of impacts (behavioral changes) is likely less than 50 feet (15.2 meters) from the cable and the intensity of impacts on benthic resources is likely undetectable.	No future activities were identified within the geographic analysis area other than ongoing activities.
New cable emplacement/ maintenance	Cable maintenance activities infrequently disturb benthic resources and cause temporary increases in suspended sediment; these disturbances would be local and limited to the emplacement corridor. New cables are infrequently added near shore. Cable emplacement/maintenance activities injure and kill benthic resources, and result in temporary to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. (See also the IPFs of Seabed profile alterations and Sediment deposition and burial.)	There are three planned submarine cables in the geographic analysis area including two transmission cables and one telecommunications cable. Impacts of planned cable emplacement would be the same as described for ongoing activities.
Noise: Onshore/ offshore construction	See Table F1-11 on finfish, invertebrates, and EFH. Detectable impacts of construction noise on benthic resources rarely, if ever, overlap from multiple sources.	See Table F1-11 on finfish, invertebrates, and EFH. Detectable impacts of construction noise on benthic resources would rarely, if ever, overlap from multiple sources.
Noise: G&G	See Table F1-11 on finfish, invertebrates, and EFH. Detectable impacts of G&G noise on benthic resources rarely, if ever, overlap from multiple sources.	See Table F1-11 on finfish, invertebrates, and EFH. Detectable impacts of G&G noise on benthic resources would rarely, if ever, overlap from multiple sources.
Noise: O&M	See Table F1-11 on finfish, invertebrates, and EFH.	See Table F1-11 on finfish, invertebrates, and EFH.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can cause injury and/or mortality to benthic resources in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IFPs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Cable laying/ trenching	Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are local, temporary, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area. These disturbances would be infrequent over the next 35 years, local, temporary, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.
Port utilization: Expansion	See Table F1-11 on finfish, invertebrates, and EFH.	See Table F1-11 on finfish, invertebrates, and EFH.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear are periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb, injure, or kill benthic resources, creating small, short-term, localized impacts.	Future new cables would present additional risk of gear loss, resulting in small, short-term, localized impacts (disturbance, injury).
Presence of structures: Hydrodynamic disturbance	See Table F1-11 on finfish, invertebrates, and EFH.	See Table F1-11 on finfish, invertebrates, and EFH.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables continuously create uncommon relief in a mostly sandy seascape. Structure-oriented fishes are attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes can adversely affect populations and communities of benthic resources. These impacts are local and permanent.	New cables installed in the geographic analysis area over the next 35 years would likely require hard protection atop portions of the route (see the “new cable emplacement/maintenance” row in this table). Any new towers, buoy, or piers would also create uncommon relief in a mostly flat, sandy seascape. Structure-oriented fishes could be attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes could adversely affect populations and communities of benthic resources. These impacts are expected to be local and to be permanent as long as the structures remain.

Associated IPFs: Sub-IFPs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables continuously provide uncommon hard-bottom habitat. A large portion is homogeneous sandy seascape but there is some other hard and/or complex habitat. Benthic species dependent on hard-bottom habitat can benefit on a constant basis, although the new habitat can also be colonized by invasive species (e.g., certain tunicate species). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat.	See above for quantification and timing. Any new towers, buoy, piers, or cable protection structures would create uncommon relief in a mostly sandy seascape. Benthic species dependent on hard-bottom habitat could benefit, although the new habitat could also be colonized by invasive species (e.g., certain tunicate species). Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010).
Presence of structures: Cable infrastructure	The presence of cable infrastructure, especially hard protection atop cables, causes impacts through entanglement/gear loss/damage, fish aggregation, and habitat conversion.	See other sub-IPFs within Presence of structures.
Discharges	The gradually increasing amount of vessel traffic is increasing the cumulative permitted discharges from vessels. Many discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated. However, there does not appear to be evidence that the volumes and extents have any impact on benthic resources.	There is the potential for new ocean dumping/dredge disposal sites in the Northeast. Impacts (disturbance, reduction in fitness) of infrequent ocean disposal to benthic resources are short-term because spoils are typically recolonized naturally. In addition, USEPA has established dredge spoil criteria and it regulates the disposal permits issued by USACE; these discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated.
Regulated fishing effort	Ongoing commercial and recreational regulations for finfish and shellfish implemented and enforced by states, towns, and/or NOAA, depending on jurisdiction, affect benthic resources by modifying the nature, distribution and intensity of fishing-related impacts, including those that disturb the seafloor (trawling, dredge fishing).	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IFPs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized short-term impacts (habitat alteration, injury, and mortality) on benthic resources through this IPF. Dredging typically occurs only in sandy or silty habitats, which are abundant in the geographic analysis area and are quick to recover from disturbance. Therefore, such impacts, while locally intense, have little impact on benthic resources in the geographic analysis area.	No future activities were identified within the geographic analysis area other than ongoing activities.
Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. Sediment deposition could have adverse impacts on some benthic resources, especially eggs and larvae, including smothering and loss of fitness. Impacts may vary based on season/time of year. Where dredged materials are disposed, benthic resources are smothered. However, such areas are typically recolonized naturally in the short term. Most sediment dredging projects have time-of-year restrictions to minimize impacts on benthic resources. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.	USACE and/or private ports may undertake dredging projects periodically. Where dredged materials are disposed, benthic resources are buried. However, such areas are typically recolonized naturally in the short term. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.
Climate change: Ocean acidification	Ongoing CO_2 emissions causing ocean acidification may contribute to reduced growth or the decline of benthic invertebrates that have calcareous shells, as well as reefs and other habitats formed by shells.	No future activities were identified within the geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat, ecology, and migration patterns	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the distributions of benthic species and altering ecological relationships, likely causing permanent changes of unknown intensity gradually over the next 35 years.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IFPs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Climate change: Warming and sea level rise, disease frequency	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of benthic species, and likely causing permanent changes of unknown intensity over the next 35 years.	No future activities were identified within the geographic analysis area other than ongoing activities.

Table F1-4 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Birds

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table F1-23 for a quantitative analysis of these risks. Ongoing releases are frequent/chronic. Ingestion of hydrocarbons can lead to morbidity and mortality due to decreased hematological function, dehydration, drowning, hypothermia, starvation, and weight loss (Briggs et al. 1997; Haney et al. 2017; Paruk et al. 2016). Additionally, even small exposures that result in feather oiling can lead to sublethal effects that include changes in flight efficiencies and result in increased energy expenditure during daily and seasonal activities including chick provisioning, commuting, courtship, foraging, long-distance migration, predator evasion, and territory defense (Maggini et al. 2017). These impacts rarely result in population-level impacts.	See Table F1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 years would increase the potential risk of accidental releases and associated impacts, including mortality, decreased fitness, and health effects on individuals. Impacts are unlikely to affect populations.
Accidental releases: Trash and debris	Trash and debris are accidentally discharged through onshore sources; fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation, navigation, and traffic; survey activities; and cables, lines, and pipeline laying on an ongoing basis. In a study from 2010, students at sea collected more than 520,000 bits of plastic debris per square mile. In addition, many fragments come from consumer products blown out of landfills or tossed out as litter (Law et al. 2010). Birds may accidentally ingest trash mistaken for prey. Mortality is typically a result of blockages caused by both hard and soft plastic debris (Roman et al. 2019).	As population and vessel traffic increase gradually over the next 35 years, accidental release of trash and debris may increase. This may result in increased injury or mortality of individuals. However, there does not appear to be evidence that the volumes and extents would have any impact on bird populations.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Light: Vessels	Ocean vessels have an array of lights including navigational lights, deck lights, and interior lights. Such lights can attract some birds. The impact is localized and temporary. This attraction would not be expected to result in an increased risk of collision with vessels. Population-level impacts would not be expected.	Gradually increasing vessel traffic over the next 35 years would increase the potential for bird and vessel interactions. While birds may be attracted to vessel lights, this attraction would not be expected to result in increased risk of collision with vessels. No population-level impacts would be expected.
Light: Structures	Buoys, towers, and onshore structures with lights can attract birds. Onshore structures like houses and ports emit a great deal more light than offshore buoys and towers. This attraction has the potential to result in an increased risk of collision with lighted structures (Hüppop et al. 2006). Light from structures is widespread and permanent near the coast, but minimal offshore.	Light from onshore structures is expected to gradually increase in proportion with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Cable emplacement and maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be temporary and generally limited to the emplacement corridor. Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances will be temporary and limited to the emplacement corridor. Suspended sediment could impair the vision of diving birds that are foraging in the water column (Cook and Burton 2010). However, given the localized nature of the potential impacts, individuals would be expected to successfully forage in nearby areas not affected by increased sedimentation and no biologically significant impacts on individuals or populations would be expected.	Future new cables, would occasionally disturb the seafloor and cause temporary increases in suspended sediment, resulting in localized, short-term impacts. Impacts would be temporary and localized, with no biologically significant impacts on individuals or populations.
Noise: Aircraft	Aircraft routinely travel in the geographic analysis area for birds. With the possible exception of rescue operations and survey aircraft, no ongoing aircraft flights would occur at altitudes that would elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non-biologically significant increased energy expenditure. Disturbance, if any, would be localized and temporary and impacts would be expected to dissipate once the aircraft has left the area.	Aircraft noise is likely to continue to increase as commercial air traffic increases; however, very few flights would be expected to be at a sufficiently low altitude to elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non-biologically significant increased energy expenditure. Disturbance, if any, would be localized and temporary and impacts would be expected to dissipate once the aircraft has left the area.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities could result in diving birds leaving the local area. Non-diving birds would be unaffected. Any displacement would only be temporary during non-migratory periods, but impacts could be greater if displacement were to occur in preferred feeding areas during seasonal migration periods.	Same as ongoing activities, with the addition of possible future oil and gas surveys.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water could result in intermittent, temporary, localized impacts on diving birds due to displacement from foraging areas if birds are present in the vicinity of pile-driving activity. The extent of these impacts depends on pile size, hammer energy, and local acoustic conditions. No biologically significant impacts on individuals or populations would be expected.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Noise: Onshore construction	Onshore construction is routinely used in generic infrastructure projects. Equipment could potentially cause displacement. Any displacement would only be temporary and no individual fitness or population-level impacts would be expected.	Onshore construction will continue at current trends. Some behavior responses could range from escape behavior to mild annoyance, but no individual injury or mortality would be expected.
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Sub-surface noise from vessels could disturb diving birds foraging for prey below the surface. The consequence to birds would be similar to noise from G&G but likely less because noise levels are lower.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Presence of structures: Entanglement, gear loss, gear damage	Each year, 2,551 seabirds die annually from interactions with U.S. commercial fisheries on the Atlantic (Sigourney et al. 2019). Even more die due to abandoned commercial fishing gear (nets). In addition, recreational fishing gear (hooks and lines) is periodically lost on existing buoys, pilings, hard protection, and other structures and has the potential to entangle birds.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various hard protections atop cables create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these objects. These impacts are local and can be short-term to permanent. These fish aggregations can provide localized, short-term to permanent, beneficial impacts on some bird species because it could increase prey species availability.	New cables, installed incrementally in the geographic analysis area for birds over the next 20 to 35 years, would likely require hard protection atop portions of the cables (see New cable emplacement/maintenance row). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented fishes could be attracted to these locations. Abundance of certain fishes may increase. These impacts are expected to be local and may be short-term to permanent. These fish aggregations can provide localized, short-term to permanent beneficial impacts on some bird species due to increased prey species availability.
Presence of structures: Migration disturbances	A few structures may be scattered about the offshore geographic analysis area for birds, such as navigation and weather buoys and light towers. Migrating birds can easily fly around or over these sparsely distributed structures.	The infrequent installation of future new structures in the marine or onshore environment over the next 35 years would not be expected to result in migration disturbances.
Presence of structures: Turbine strikes, displacement, and attraction	A few structures may be in the offshore geographic analysis area for birds, such as navigation and weather buoys, turbines, and light towers. Given the limited number of structures currently in the geographic analysis area, individual- and population-level impacts due to displacement from current foraging habitat would not be expected. Stationary structures in the offshore environment would not be expected to pose a collision risk to birds. Some birds like cormorants and gulls may be attracted to these structures and opportunistically roost on these structures.	The installation of future new structures in the marine or onshore environment over the next 35 years would not be expected to result in an increase in collision risk or to result in displacement. Some potential for attraction and opportunistic roosting exists, but would be expected to be limited given the anticipated number of structures.
Traffic: Aircraft	General aviation accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2019). Additionally, aircraft are used for scientific and academic surveys in marine environments.	Bird fatalities associated with general aviation would be expected to increase with the current trend in commercial air travel. Aircraft will continue to be used to conduct scientific research studies as well as wildlife monitoring and pre-construction surveys. These flights would be well below the 100,000 flights and no bird strikes would be expected to occur.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Land disturbance: Onshore construction	Onshore construction activity will continue at current trends. There is some potential for indirect impacts associated with habitat loss and fragmentation.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss but would not be expected to result in injury or mortality of individuals.
Climate change: Warming and sea level rise, storm severity/frequency	Increased storm frequency and severity during the breeding season can reduce productivity of bird nesting colonies and kill adults, eggs, and chicks.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Ocean acidification	Increasing ocean acidification may affect prey species upon which some birds feed and could lead to shifts in prey distribution and abundance. Intensity of impacts on birds is speculative.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat/ecology	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the distribution of bird prey resources.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Warming and sea level rise, altered migration patterns	Birds rely on cues from the weather to start migration. Wind direction and speed influence the amount of energy used during migration. For nocturnal migrants, wind assistance is projected to increase across eastern portions of the continent (0.32 m/s; 9.6%) during spring migration by 2091, and wind assistance is projected to decrease within eastern portions of the continent (0.17 m/s; 6.6%) during autumn migration (La Sorte et al. 2018).	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Warming and sea level rise, protective measures (barriers, seawalls)	The proliferation of coastline protections have the potential to result in long-term, high-consequence, impacts on bird nesting habitat.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.
Climate change: Warming and sea level rise, increased disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the frequencies and distributions of various diseases of birds.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.

hazmat = hazardous materials

Table F1-5 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Terrestrial and Coastal Fauna

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Land disturbance: Erosion and sedimentation	Periodic ground-disturbing activities contribute to elevated levels of erosion and sedimentation, but usually not to a degree that affects terrestrial and coastal fauna, assuming that industry standard BMPs are implemented.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore construction	Periodic clearing of shrubs and tree saplings along existing utility ROWs causes disturbance and temporary displacement of mobile species and may cause direct injury or mortality of less-mobile species, resulting in short-term impacts that are less than noticeable. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, and cell tower projects also causes disturbance, displacement, and potential injury and/or mortality of fauna, resulting in small temporary impacts.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore, land use changes	Periodically, undeveloped parcels are cleared and developed for human uses, permanently changing the condition of those parcels as habitat for terrestrial fauna. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, transportation infrastructure, sewer infrastructure, and cell tower projects could permanently convert various areas.	No future activities were identified within the geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat/ecology	Climate change, influenced in part by GHG emissions, is altering the seasonal timing and patterns of species distributions and ecological relationships, likely causing permanent changes of unknown intensity gradually over the next 35 years.	No future activities were identified within the geographic analysis area other than ongoing activities.

ROW = right-of-way

Table F1-6 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Coastal Habitats

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table F1-23 for a discussion of ongoing accidental releases. Accidental releases of fuel/fluids/hazmat have the potential to cause habitat contamination and harm to the species that build biogenic coastal habitats (e.g., eelgrass, oysters, mussels, slipper limpets, salt marsh cordgrass) from releases and/or cleanup activities. Only a portion of the ongoing releases contact coastal habitats in the geographic analysis area. Impacts are small, localized, and temporary.	See Table F1-23 for a discussion of accidental releases.
Accidental releases: Trash and debris	Ongoing releases of trash and debris occur from onshore sources, fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying. As population and vessel traffic increase, accidental releases of trash and debris may increase. Such materials may be obvious when they come to rest on shorelines; however, there does not appear to be evidence that the volumes and extents would have any detectable impact on coastal habitats.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
Anchoring	Vessel anchoring related to ongoing military, survey, commercial, and recreational activities will continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and potential for direct contact to cause physical damage to coastal habitats. All impacts are localized; turbidity is short-term and temporary; physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
EMF	EMFs continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the analysis area. The extent of impacts is likely less than 50 feet from the cable, and the intensity of impacts on coastal habitats is likely undetectable.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Light: Vessels	Navigation lights and deck lights on vessels would be a source of ongoing light. The extent of impacts is limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats is likely undetectable.	Light is expected to continue to increase gradually with increasing vessel traffic over the next 35 years. The extent of impacts would likely be limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats would likely be undetectable.
Light: Structures	Ongoing lights from navigational aids and other structures onshore and nearshore. The extent of impacts is likely limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats is likely undetectable.	No future activities were identified within the geographic analysis area for coastal habitats other than ongoing activities.
New cable emplacement/ maintenance	Ongoing cable maintenance activities infrequently disturb bottom sediments; these disturbances are local and limited to the emplacement corridor (see the Sediment deposition and burial IPF).	There are three planned submarine cables in the geographic analysis area including two transmission cables and one telecommunications cable. Impacts of planned cable emplacement would be the same as described for ongoing activities.
Noise: Onshore/ offshore construction	Ongoing noise from construction occurs frequently near shores of populated areas in New England and the Mid-Atlantic, but infrequently offshore. Noise from construction near shore is expected to gradually increase over the next 35 years in line with human population growth along the coast of the geographic analysis area. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary.	No future activities were identified within the analysis area other than ongoing activities.
Noise: G&G	Site characterization surveys and scientific surveys are ongoing. The intensity and extent of the resulting impacts are difficult to generalize but are local and temporary.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 35 years. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can reach coastal habitats. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the analysis area other than ongoing activities.
Noise: Cable laying/ trenching	Rare but ongoing trenching for pipeline and cable laying activities emits noise; cable burial via jet embedment also causes similar noise impacts. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats are discountable compared to the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines may occur in the geographic analysis area infrequently over the next 35 years. These disturbances would be temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats are discountable compared to the impacts of the physical disturbance and sediment suspension.
Presence of structures: Habitat conversion	Various structures, including pilings, piers, towers, riprap, buoys, and various means of hard protection, are periodically added to the seascape, creating uncommon relief in a mostly flat seascape and converting previously existing habitat (whether hard-bottom or soft-bottom) to a type of hard habitat, although it differs from the typical hard-bottom habitat in the analysis area, namely, coarse substrates in a sand matrix. The new habitat may or may not function similarly to hard-bottom habitat typical in the region (Kerckhof et al. 2019; HDR 2019). Soft bottom is the dominant habitat type on the OCS, and structures do not meaningfully reduce the amount of soft-bottom habitat available (Guida et al. 2017; Greene et al. 2010). Structures can also create an artificial reef effect, attracting a different community of organisms.	Any new cable or pipeline installed in the geographic analysis area would likely require hard protection atop portions of the route (see cells to the left). Such protection is anticipated to increase incrementally over the next 35 years. Where cables would be buried deeply enough that protection would not be used, presence of the cable would have no impact on coastal habitats.
Presence of structures: Transmission cable infrastructure	Various means of hard protection atop existing cables can create uncommon hard-bottom habitat. Where cables are buried deeply enough that protection is not used, presence of the cable has no impact on coastal habitats.	See above.
Land disturbance: Erosion and sedimentation	Ongoing development of onshore properties, especially shoreline parcels, periodically causes short-term erosion and sedimentation of coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Land disturbance: Onshore construction	Ongoing development of onshore properties, especially shoreline parcels, periodically causes short-term to permanent degradation of onshore coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance: Onshore, land use changes	Ongoing development of onshore properties, especially shoreline parcels, periodically causes the conversion of onshore coastal habitats to developed space.	No future activities were identified within the geographic analysis area other than ongoing activities.
Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized, short-term impacts on coastal habitats through this IPF. Dredging typically occurs only in sandy or silty habitats, which are abundant in the analysis area and are quick to recover from disturbance. Therefore, such impacts, while locally intense, have little effect on the general character of coastal habitats.	No future activities were identified within the geographic analysis area other than ongoing activities.
Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition within coastal habitats. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. No dredged material disposal sites were identified within the geographic analysis area.	No future activities were identified within the geographic analysis area other than ongoing activities.
Climate change: Ocean acidification	Ongoing CO_2 emissions causing ocean acidification may contribute to reduced growth or the decline of reefs and other habitats formed by shells.	No future activities were identified within the geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat/ecology	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a widespread loss of shoreline habitat from rising seas and erosion. In submerged habitats, warming is altering ecological relationships and the distributions of ecosystem engineer species, likely causing permanent changes of unknown intensity gradually over the next 3 years.	No future activities were identified within the geographic analysis area other than ongoing activities.

hazmat = hazardous materials

Table F1-7 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Commercial Fisheries and For-Hire Recreational Fishing

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Anchoring	Impacts from anchoring occur due to ongoing military, survey, commercial, and recreational activities. The short-term, localized impact on this resource is the presence of a navigational hazard (anchored vessel) to fishing vessels.	Impacts from anchoring may occur on a semi-regular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Anchoring could pose a temporary (hours to days), localized (within a few hundred meters of anchored vessel) navigational hazard to fishing vessels.
New cable emplacement/ maintenance	New cable emplacement and infrequent cable maintenance activities disturb the seafloor, increase suspended sediment, and cause temporary displacement of fishing vessels. These disturbances would be local and limited to the emplacement corridor.	Future new cables and cable maintenance would occasionally disturb the seafloor and cause temporary displacement in fishing vessels and increases in suspended sediment resulting in local, short-term impacts. If the cable routes enter the geographic analysis area for this resource, short-term disruption of fishing activities would be expected.
Noise: Construction, trenching, operations and maintenance	Noise from construction occurs frequently in coastal habitats in populated areas in New England and the Mid-Atlantic, but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. Infrequent offshore trenching could occur in connection with cable installation. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Low levels of elevated noise from operational WTGs likely have low to no impacts on fish and no impacts at a fishery level. Noise is also created by O&M of marine minerals extraction, which has small, local impacts on fish, but likely no impacts at a fishery level.	Noise from construction near shore is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Noise from dredging and sand and gravel mining could occur. New or expanded marine minerals extraction may increase noise during their O&M over the next 35 years. Impacts from construction, operations, and maintenance would likely be small and local on fish, and not seen at a fishery level. Periodic trenching would be needed for repair or new installation of underground infrastructure. These disturbances would be temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on commercial fish species are typically less prominent than the impacts of the physical disturbance and sediment suspension. Therefore, fishery-level impacts are unlikely.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: G&G	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb fish and invertebrates in the immediate vicinity of the investigation and can cause temporary behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 35 years. Seismic surveys used in oil and gas exploration create high-intensity impulsive noise to penetrate deep into the seabed, potentially resulting in injury or mortality to finfish and invertebrates in a small area around each sound source and short-term stress and behavioral changes to individuals over a greater area. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves more similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when ports or marinas, piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can cause injury and/or mortality to finfish and invertebrates in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area, leading to temporary local impacts on commercial fisheries and for-hire recreational fishing. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the analysis area other than ongoing activities.
Noise: Vessels	Vessel noise is anticipated to continue at levels similar to current levels. While vessel noise may have some impact on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	Planned new barge route and dredging disposal sites would generate vessel noise when implemented.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 35 years.	Ports would need to perform maintenance and upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size. Port utilization is expected to increase over the next 35 years, with increased activity during construction. The ability of ports to receive the increase in vessel traffic may require port modifications, such as channel deepening, leading to local impacts on fish populations. Port expansions could also increase vessel traffic and competition for dockside services, which could affect fishing vessels.
Presence of structures: Navigation hazard and allisions	Structures within and near the cumulative lease areas that pose potential navigation hazards include offshore wind turbines, buoys, and shoreline developments such as docks and ports. An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. Two types of allisions occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements or is distracted.	No known reasonably foreseeable structures are proposed to be located in the geographic analysis area that could affect commercial fisheries. Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts on fish, but likely no impacts at a fishery level.	No future activities were identified within the analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion and fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. A large portion is homogeneous sandy seascape but there is some other hard and/or complex habitat. Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat. Structure-oriented fishes are attracted to these locations. These impacts are local and can be short-term to permanent. Fish aggregation may be considered adverse, beneficial, or neither. Commercial and for-hire recreational fishing can occur near these structures. For-hire recreational fishing is more popular, as commercial mobile fishing gear risk snagging on the structures.	New cables, installed incrementally in the analysis area over the next 20 to 35 years, would likely require hard protection atop portions of the route (see New cable emplacement/maintenance IPF above). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented species could be attracted to these locations. Structure-oriented species would benefit (Claisse et al. 2014; Smith et al. 2016). This may lead to more and larger structure-oriented fish communities and larger predators opportunistically feeding on the communities, as well as increased private and for-hire recreational fishing opportunities. Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010). These impacts are expected to be local and may be long term.
Presence of structures: Migration disturbances	Human structures in the marine environment, e.g., shipwrecks, artificial reefs, buoys, and oil platforms, can attract finfish and invertebrates that approach the structures during their migrations. This could slow species migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure (Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals.	The infrequent installation of future new structures in the marine environment over the next 35 years may attract finfish and invertebrates that approach the structures during their migrations. This could tend to slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement (Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded. Therefore, fishery-level impacts are not anticipated.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Presence of structures: Cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Shoreline developments are ongoing and include docks, ports, and other commercial, industrial, and residential structures.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Traffic: Vessels and vessel collisions	No substantial changes are anticipated to the vessel traffic volumes. The geographic analysis area would continue to have numerous ports and the extensive marine traffic related to shipping, fishing, and recreation would continue to be important to the region's economy. The region's substantial marine traffic may result in occasional collisions. Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, then navigation is more complex, as the vessels need to avoid both the structure and each other. The risk for collisions is ongoing but infrequent.	New vessel traffic in the geographic analysis area would consistently be generated by proposed barge routes and dredging demolition sites. Marine commerce and related industries would continue to be important to the regional economy.
Climate change	Impacts to commercial fisheries and for-hire recreational fishing are expected to result from climate change events such as increased magnitude or frequency of storms, shoreline changes, ocean acidification, and water temperature changes. Risks to fisheries associated with these events include habitat/distribution shifts, disease incidence, and risk of invasive species. If these risk factors result in a decrease in catch and/or an increase in fishing costs (e.g., transiting time), the profitability of businesses engaged in commercial fisheries and for-hire recreational fishing would be adversely affected. While climate change is predicted to have adverse impacts on the distribution and/or productivity of some stocks targeted by commercial fisheries and for-hire recreational fishing, other stocks may be beneficially affected. The economies of communities reliant on marine species that are vulnerable to the effects of climate change could be adversely affected. If the distribution of important stocks changes, it could affect where commercial and for-hire recreational fisheries are located. Furthermore, coastal communities with fishing businesses that have infrastructure near the shore could be adversely affected by sea level rise.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Regulated fishing effort	Commercial and recreational regulations for finfish and shellfish implemented and enforced by NMFS and coastal states, affect how the commercial and for-hire recreational fisheries operate. Commercial and recreational for-hire fisheries are managed by FMPs, which are established to manage fisheries to avoid overfishing through catch quotas, special management areas, and closed area regulations. These can reduce or increase the size of available landings to commercial and for-hire recreational fisheries. For example, ongoing fishing restrictions designed to rebuild depleted stocks in the Northeast Multispecies (large-mesh) fishery will continue to reduce landings in that fishery.	Reasonably foreseeable fishery management actions include measures to reduce the risk of interactions between fishing gear and the NARW by 60% (McCreary and Brooks 2019). This will likely have a have a major adverse impact on fishing effort in the lobster and Jonah crab fisheries in the geographic analysis area for this resource. As discussed in Karp et al. (2019), changing climate and ocean conditions and the resultant effects on species distributions and productivity can have significant effects on management decisions, such as allocation, spatiotemporal closures, stock status determinations, and catch limits. See No Action alternative for additional fishery management actions that will affect commercial fisheries and for-hire recreational fishing.

Table F1-8 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Cultural Resources

Associated IPF: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table F1-23 for water quality for a quantitative analysis of these risks. Accidental releases of fuel/fluids/hazmat occur during vessel use for recreational, fisheries, marine transportation, or military purposes, and other ongoing activities. Both released fluids and cleanup activities that require the removal of contaminated soils and/or seafloor sediments can cause impacts on cultural resources because resources are affected during by the released chemicals as well as the ensuing cleanup activities.	Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases within the geographic analysis area for cultural resources, increasing the frequency of small releases. Although the majority of anticipated accidental releases would be small, resulting in small-scale impacts on cultural resources, a single, large-scale accidental release such as an oil spill, could have significant impacts on marine and coastal cultural resources. A large-scale release would require extensive cleanup activities to remove contaminated materials resulting in damage to or the complete removal of terrestrial and marine cultural resources. In addition, the accidentally released materials in deep water settings could settle on seafloor cultural resources such as wreck sites, accelerating their decomposition and/or covering them and making them inaccessible/unrecognizable to researchers, resulting in a significant loss of historic information. As a result, although considered unlikely, a large-scale accidental release and associated cleanup could result in permanent, geographically extensive, and large-scale impacts on cultural resources.

Associated IPF: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Trash and debris	Accidental releases of trash and debris occur during vessel use for recreational, fisheries, marine transportation, or military purposes and other ongoing activities. While the released trash and debris can directly affect cultural resources, the majority of impacts associated with accidental releases occur during cleanup activities, especially if soil or sediment removed during cleanup affect known and undiscovered archaeological resources. In addition, the presence of large amounts of trash on shorelines or the ocean surface can impact the cultural value of TCPs for stakeholders. State and federal laws prohibiting large releases of trash would limit the size of any individual release and ongoing local, state, and federal efforts to clean up trash on beaches and waterways would continue to mitigate the effects of small-scale accidental releases of trash.	Future activities with the potential to result in accidental releases include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications). Accidental releases would continue at current rates along the northeast Atlantic coast.
Anchoring	The use of vessel anchoring and gear (i.e., wire ropes, cables, chain, sweep on the seafloor) that disturbs the seafloor, such as bottom trawls and anchors, by military, recreational, industrial, and commercial vessels can impact cultural resources by physically damaging maritime archaeological resources such as shipwrecks and debris fields.	Future activities with the potential to result in anchoring/ gear utilization include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); military use; marine transportation; fisheries use and management; and oil and gas activities. These activities are likely to continue to occur at current rates along the entire coast of the eastern United States.
Gear utilization: Dredging	Activities associated with dredge operations and activities could damage marine archaeological resources. Ongoing activities identified by BOEM with the potential to result in dredging impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities.	Dredging activities would gradually increase through time as new offshore infrastructure is built, such as gas pipelines and electrical lines, and as ports and harbors are expanded or maintained.

Associated IPF: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Light: Vessels	Light associated with military, commercial, or construction vessel traffic can temporarily affect coastal historic structures and TCP resources when the addition of intrusive, modern lighting changes the physical environment ("setting") of cultural resources. The impacts of construction and operations lighting would be limited to cultural resources on the shoreline for which a nighttime sky is a contributing element to historic integrity. This excludes resources that are closed at night, such as historic buildings, lighthouses, and battlefields, and resources that generate their own nighttime light, such as historic districts. Offshore construction activities that require increased vessel traffic, construction vessels stationed offshore, and construction area lighting for prolonged periods can cause more sustained and significant visual impacts on coastal historic structure and TCP resources.	Future activities with the potential to result in vessel lighting impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Light pollution from vessel traffic would continue at the current intensity along the northeast coast, with a slight increase due to population increase and development over time.
Light: Structures	The construction of new structures that introduce new light sources into the setting of historic architectural properties or TCPs can result in impacts, particularly if the historic and/or cultural significance of the resource is associated with uninterrupted nighttime skies or periods of darkness. Any tall structure (commercial building, radio antenna, large satellite dishes, etc.) requiring nighttime hazard lighting to prevent aircraft collision can cause these types of impacts.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Port utilization: Expansion	Major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Expansion of port facilities can introduce large, modern port infrastructure into the viewsheds of nearby historic properties, affecting their setting and historic significance.	Future activities with the potential to result in port expansion impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; fisheries use and management; and oil and gas activities. Port expansion would continue at current levels, which reflect efforts to capture business associated with the offshore wind industry (irrespective of specific projects).

Associated IPF: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures	The only existing offshore structures within the viewshed of the geographic analysis area are minor features such as buoys.	Non-offshore wind structures that could be viewed would be limited to meteorological towers. Marine activity would also occur within the marine viewshed of the geographic analysis area.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and could cause impacts on submerged archaeological resources. These disturbances would be local and limited to emplacement corridors.	Future activities with the potential to result in seafloor disturbances similar to offshore impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; and oil and gas activities. Such activities could cause impacts on submerged archaeological resources including shipwrecks and formerly subaerially exposed pre-contact Native American archaeological sites.
Land disturbance: Onshore construction	Onshore construction activities can impact archaeological resources by damaging and/or removing resources.	Future activities that could result in terrestrial land disturbance impacts include onshore residential, commercial, industrial, and military development activities in central Cape Cod, particularly those proximate to OECRs and interconnection facilities. Onshore construction would continue at current rates.
Climate change: Warming and sea level rise, storm severity/frequency	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, architectural, and TCP resources. Increased storm frequency and severity would also result in damage to and/or destruction of architectural properties. Sea level rise would increase erosion-related impacts on archaeological and architectural resources, while sea level rise would inundate archaeological, architectural, and TCP resources.	Sea level rise and storm severity/frequency would increase due to the effects of climate change.
Climate change: Warming and sea level rise, altered habitat/ecology	Altered habitat/ecology related to warming seas and sea level rise would impact the ability of Native Americans and other communities to use maritime TCPs for traditional fishing, shell fishing, and fowling activities.	The rate of change to habitats/ecology would increase as a result of climate change.

Associated IPF: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Climate change: Warming and sea level rise, altered migration patterns	Altered migration patterns related to warming seas and sea level rise would impact the ability of Native Americans and other communities to use maritime TCPs for traditional fishing, shell fishing, and fowling activities.	The rate of change to migratory animal patterns would increase as a result of climate change.
Climate change: Warming and sea level rise, property/ infrastructure damage	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, architectural, and TCP resources. Increased storm frequency and severity would result in damage to and/or destruction of architectural properties. Sea level rise would increase erosion-related impacts on archaeological and architectural resources while sea level rise would inundate archaeological, architectural, and TCP resources.	The rate of property and infrastructure damage would increase as a result of climate change.
Climate change: Warming and sea level rise, protective measures (barriers, sea walls)	The installation of protective measures such as barriers and sea walls would impact archaeological resources during associated ground-disturbing activities. Construction of these modern protective structures would alter the viewsheds from historic properties and/or TCPs, resulting in impacts on the historic and/or cultural significance of resources.	The installation of coastal protective measures would increase as a result of climate change.
Climate change: Warming and sea level rise, storm severity/frequency, sediment erosion, deposition	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, architectural, and TCP resources. Increased storm frequency and severity would result in damage to and/or destruction of architectural properties. Sea level rise would increase erosion related impacts on archaeological and architectural resources while sea level rise would inundate archaeological, architectural, and TCP resources.	Sea level rise and storm severity/frequency would increase due to the effects of climate change.

hazmat = hazardous materials; OECR = onshore export cable route

Table F1-9 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Demographics, Employment, and Economics

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Energy generation/ security	In 2019, New Jersey energy production totaled 328 trillion Btu, of which 13.8 trillion Btu was from renewable sources, including geothermal, hydroelectric, wind, solar, and biomass (U.S. Energy Information Administration 2020).	Ongoing development of onshore solar and wind energy would provide diversified, small-scale energy generation. State and regional energy markets would require additional peaker plants and energy storage to meet the electricity needs when utility scale renewables are not producing.
Light: Structures	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
Light: Vessels	Ocean vessels have an array of lights including navigational lights and deck lights.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors. In the geographic analysis area for demographics, employment, and economics there are six existing power cables.	Future new cables would disturb the seafloor and cause temporary increases in suspended sediment resulting in infrequent, localized, short-term impacts over the next 35 years.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the geographic analysis area for demographics, employment, and economics other than ongoing activities.
Noise: Cable laying/ trenching	Infrequent trenching for pipeline and cable laying activities emit noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	Periodic trenching would be needed over the next 35 years for repair or new installation of underground infrastructure.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge route and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Port of Paulsboro is being upgraded specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities over the next 35 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Port utilization: Maintenance/ dredging	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. As ports expand, maintenance dredging of shipping channels is expected to increase.	Ports would need to perform maintenance and upgrades over the next 35 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. The likelihood of allisions is expected to continue at or near current levels.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are direct costs for gear owners and are expected to continue at or near current levels.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these locations, which may be known as FADs. Recreational and commercial fishing can occur near the FADs, although recreational fishing is more popular, because commercial mobile fishing gear is more likely to snag on FADs.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion	Structures, including foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure-oriented species thus benefit on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure and each other.	Vessel traffic, overall, is not expected to meaningfully increase over the next 35 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	No existing offshore structures are within the viewshed of the offshore wind lease areas except buoys.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Transmission cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Additional communication cables run between the U.S. East Coast and European countries along the eastern Atlantic.	No known proposed structures not associated with offshore wind development are reasonably foreseeable.
Traffic: Vessels	Ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 35 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy.
Traffic: Vessel collisions	The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of collisions is expected to continue at or near current rates.	No substantial changes anticipated.
Land disturbance: Onshore construction	Onshore development activities support local population growth, employment, and economies. Disturbances can cause temporary, localized traffic delays and restricted access to adjacent properties. The rate of onshore land disturbance is expected to continue at or near current rates.	Onshore development projects would be ongoing in accordance with local government land use plans and regulations.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Climate change	Climate models predict climate change if current trends continue. Climate change has adverse implications for demographics and economic health of coastal communities, due in part to the costs of resultant damage to property and infrastructure, fisheries and other natural resources, increased disease frequency, and sedimentation, among other factors.	Onshore projects that reduce air emissions could contribute to the effort to limit climate change. Onshore solar and wind energy projects, although producing less energy than potential offshore wind developments, would also provide incremental reductions.
Regulated fishing effort	Commercial and recreational regulations for finfish and shellfish implemented and enforced by NMFS and coastal states affect how commercial and for-hire recreational fisheries operate. Commercial and recreational for-hire fisheries are managed by FMPs, which are established to manage fisheries to avoid overfishing through catch quotas, special management areas, and closed area regulations. These can reduce or increase the size of available landings to commercial and for-hire recreational fisheries.	Reasonably foreseeable fishery management actions include measures to reduce the risk of interactions between fishing gear and the NARW by 60% (McCreary and Brooks 2019). This will likely have a significant impact on fishing effort in the lobster and Jonah crab fisheries in the geographic analysis area for this resource. See No Action alternative for additional fishery management actions that will affect commercial fisheries and for-hire recreational fishing.

Btu = British thermal unit; FAD = fish aggregating device

Table F1-10 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Environmental Justice

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Air emissions: Construction/ decommissioning	Ongoing population growth and new development within the analysis area is likely to increase traffic with resulting increase in emissions from motor vehicles. Some new industrial development may result in emissions-producing uses. At the same time, many industrial waterfront areas near environmental justice communities are losing industrial uses and converting to more commercial or residential uses.	New development may include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations will continue to lose industrial uses, with no new industrial development to replace it. Cities such as New Bedford are promoting start-up space and commercial uses to re-use industrial space.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Air emissions: Operations and maintenance	Ongoing population growth and new development within the analysis area is likely to increase traffic with resulting increase in emissions from motor vehicles. Some new industrial development may result in emissions-producing uses. At the same time, many industrial waterfront areas near environmental justice communities are losing industrial uses and converting to more commercial or residential uses.	New development may include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations will continue to lose industrial uses, with no new industrial development to replace it. Cities such as New Bedford are promoting start-up space and commercial uses to re-use industrial space.
Light: Structures	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors.	Future new cables would disturb the seafloor and cause temporary increases in suspended sediment, resulting in infrequent, localized, short-term impacts over the next 35 years.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the analysis area other than ongoing activities.
Noise: Trenching	Infrequent trenching for pipeline and cable laying activities emits noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	Periodic trenching would be needed over the next 35 years for repair or new installation of underground infrastructure.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	Vessel noise is anticipated to continue at or near current levels.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Port of Paulsboro is being upgraded specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Presence of structures: Entanglement, gear loss/damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are direct costs for gear owners and are expected to continue at or near current levels.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure, and each other.	Vessel traffic is generally not expected to meaningfully increase over the next 35 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	There are no existing offshore structures within the viewshed of the offshore wind lease areas except buoys.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: cable infrastructure	Existing submarine cables cross cumulative lease areas.	Existing cable O&M activities would continue within the analysis area.
Traffic: Vessels	Ports and marine traffic related to shipping, fishing and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	Vessel traffic is not expected to meaningfully increase over the next 35 years. Marine commerce and related industries would continue to be important to area employment.
Land disturbance: Erosion and sedimentation	Potential erosion and sedimentation from development and construction is controlled by local and state development regulations.	New development activities would be subject to erosion and sedimentation regulations.
Land disturbance: Onshore construction	Onshore development supports local population growth, employment, and economics.	Onshore development would continue in accordance with local government land use plans and regulations.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Land disturbance: Onshore, land use changes	Onshore development would result in changes in land use in accordance with local government land use plans and regulations.	Development of onshore solar and wind energy would provide diversified, small-scale energy generation.
Climate change	Climate models predict climate change if current trends continue. Climate change has adverse implications for demographics and the economic health of coastal communities, due in part to the costs of resultant damage to property and infrastructure, fisheries, and other natural resources; increased disease frequency; and sedimentation, among other factors.	Onshore projects that reduce air emissions could contribute to the effort to limit climate change. Onshore solar and wind energy projects, although producing less energy than potential offshore wind developments, would also provide incremental reductions.
Regulated fishing effort	Commercial and recreational regulations for finfish and shellfish implemented and enforced by NMFS and coastal states affect how commercial and for-hire recreational fisheries operate. Commercial and recreational for-hire fisheries are managed by FMPs, which are established to manage fisheries to avoid overfishing through catch quotas, special management areas, and closed area regulations. These can reduce or increase the size of available landings to commercial and for-hire recreational fisheries.	Reasonably foreseeable fishery management actions include measures to reduce the risk of interactions between fishing gear and the NARW by 60% (McCreary and Brooks 2019). This will likely have a significant impact on the fishing effort in the lobster and Jonah crab fisheries in the geographic analysis area for this resource. See No Action alternative for additional fishery management actions that will affect commercial fisheries and for-hire recreational fishing.

Table F1-11 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Finfish, Invertebrates, and Essential Fish Habitat

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table F1-23 for a quantitative analysis of these risks. Ongoing releases are frequent/chronic. Impacts, including mortality, decreased fitness, and contamination of habitat, are localized and temporary, and rarely affect populations.	See Table F1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. Impacts are unlikely to affect populations.
Accidental releases: Invasive species	Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on finfish, invertebrates, and EFH depend on many factors, but can be widespread and permanent.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Anchoring	Vessel anchoring related to ongoing military use, and survey, commercial, and recreational activities continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. Impacts on finfish, invertebrates, and EFH are greatest for sensitive EFH (e.g., eelgrass, hard bottom) and sessile or slow-moving species (e.g., corals, sponges, and sedentary shellfish).	Impacts from anchoring may occur on a semi-regular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. These impacts would include increased turbidity levels and potential for direct contact causing mortality of benthic species and, possibly, degradation of sensitive habitats. All impacts would be localized; turbidity would be temporary; impacts from direct contact would be recovered in the short term. Degradation of sensitive habitats such as certain types of hard bottom (e.g., boulder piles), if it occurs, could be long term.
EMF	EMF emanates continuously from installed telecommunication and electrical power transmission cables. Biologically significant impacts on finfish, invertebrates, and EFH have not been documented for AC cables (CSA Ocean Sciences, Inc. and Exponent 2019; Thomsen et al. 2015), but behavioral impacts have been documented for benthic species (skates and lobster) near operating DC cables (Hutchison et al. 2018). The impacts are localized and affect the animals only while they are within the EMF. There is no evidence to indicate that EMF from undersea AC power cables negatively affects commercially and recreationally important fish species (CSA Ocean Sciences, Inc. and Exponent 2019).	During operation, future new cables would produce EMF. Submarine power cables in the geographic analysis area are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. Although the EMF would exist as long as a cable was in operation, impacts, on finfish, invertebrates, and EFH would likely be difficult to detect.
Light: Vessels	Marine vessels have an array of lights including navigational lights and deck lights. There is little downward-focused lighting, and therefore only a small fraction of the emitted light enters the water. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles, e.g., spawning, possibly leading to short-term impacts.	Vessels would continue to be a light source within the analysis area.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Light: Structures	Offshore buoys and towers emit light, and onshore structures, including buildings and ports, emit a great deal more on an ongoing basis. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles, e.g., spawning, possibly leading to short-term impacts. Light from structures is widespread and permanent near the coast, but minimal offshore.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances are local, limited to the cable corridor. New cables are infrequently added near shore. Cable emplacement/maintenance activities disturb, displace, and injure finfish and invertebrates and result in temporary to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. (See also the IPF of Sediment deposition and burial.)	Future new cables would occasionally disturb the seafloor and cause temporary increases in suspended sediment, resulting in local short-term impacts. If the cable routes enter the geographic analysis area for this resource, short-term disturbance would be expected. The intensity of impacts would depend on the time (season) and place (habitat type) where the activities would occur.
Noise: Aircraft	Noise from aircraft reaches the sea surface on a regular basis. However, there is not likely to be any impact of aircraft noise on finfish, invertebrates, and EFH, as very little of the aircraft noise propagates through the water.	Aircraft noise is likely to continue to increase as commercial air traffic increases. However, there is not likely to be any impact of aircraft noise on finfish, invertebrates, and EFH.
Noise: Onshore/ offshore construction	Noise from construction occurs frequently in near shores of populated areas in New England and the Mid-Atlantic but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. See also sub-IPF for Noise: Pile driving.	Noise from construction near shores is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: G&G	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb finfish and invertebrates in the immediate vicinity of the investigation and can cause temporary behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions.	Site characterization surveys, scientific surveys, and exploratory oil and gas surveys are anticipated to occur infrequently over the next 35 years. Seismic surveys used in oil and gas exploration create high-intensity impulsive noise to penetrate deep into the seabed, potentially resulting in injury or mortality to finfish and invertebrates in a small area around each sound source and short-term stress and behavioral changes to individuals over a greater area. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves more similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.
Noise: O&M	Some finfish and invertebrates may be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Farm, this low frequency noise barley exceeds ambient levels at 164 feet (50 meters) from the WTG base. Based on the results of Thomsen et al. (Thomsen et al. 2015), SPLs would be expected to be at or below ambient levels at relatively short distances (approximately 164 feet [50 meters]) from WTG foundations. These low levels of elevated noise likely have little to no impact. Noise is also created by O&M of marine minerals extraction and commercial fisheries, each of which has small local impacts.	New or expanded marine minerals extraction and commercial fisheries may intermittently increase noise during their O&M over the next 35 years. Impacts would likely be small and local.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can cause injury and/or mortality to finfish and invertebrates in a small area around each pile and can cause short-term stress and behavioral changes to individuals over a greater area. Eggs, embryos, and larvae of finfish and invertebrates could also experience developmental abnormalities or mortality resulting from this noise, although thresholds of exposure are not known (Weilgart 2018; Hawkins and Popper 2017). Potentially injurious noise could also be considered as rendering EFH temporarily unavailable or unsuitable for the duration of the noise. The extent depends on pile size, hammer energy, and local acoustic conditions.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Noise: Cable laying/ trenching	Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area for this resource. These disturbances would be infrequent over the next 35 years, temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.
Noise: Vessels	While ongoing vessel noise may have some effect on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	See cell to the left.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 35 years.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase may require port modifications, leading to local impacts. Future channel deepening activities will likely be undertaken. Existing ports have already affected finfish, invertebrates, and EFH, and future port projects would implement BMPs to minimize impacts. Although the degree of impacts on EFH would likely be undetectable outside the immediate vicinity of the ports, adverse impacts on EFH for certain species and/or life stages may lead to impacts on finfish and invertebrates beyond the vicinity of the port.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating small, localized, short-term impacts.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Presence of structures: Hydrodynamic disturbance	Manmade structures, especially tall vertical structures such as foundations for towers of various purposes, continuously alter local water flow at a fine scale. Water flow typically returns to background levels within a relatively short distance from the structure. Therefore, impacts on finfish, invertebrates, and EFH are typically undetectable. Indirect impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood. New structures are periodically added.	Tall vertical structures can increase seabed scour and sediment suspension. Impacts would likely be highly localized and difficult to detect. Indirect impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. Structure-oriented fishes are attracted to these locations. These impacts are local and often permanent. Fish aggregation may be considered adverse, beneficial, or neutral.	New cables, installed incrementally in the geographic analysis area for this resource over the next 20 to 35 years, would likely require hard protection atop portions of the route (see the New cable emplacement/ maintenance IPF). Any new towers, buoys, or piers would also create uncommon relief in a mostly sandy seascape. Structure-oriented fishes could be attracted to these locations. Abundance of certain fishes may increase. These impacts are local and may be permanent.
Presence of structures: Habitat conversion	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. A large portion is homogeneous sandy seascape but there is some other hard and/or complex habitat. Structure-oriented species thus benefit on a constant basis; however, the diversity may decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019 [Chapter 7]). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat.	New cable, installed incrementally in the analysis area over the next 20 to 35 years, would likely require hard protection atop portions of the route (see New cable emplacement/maintenance). Any new towers, buoys, or piers would also create uncommon relief in a mostly sandy seascape. Structure-oriented species would benefit (Claisse et al. 2014; Smith et al. 2016); however, the diversity may decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019 [Chapter 7]). Soft bottom is the dominant habitat type from Cape Hatteras to the Gulf of Maine (over 60 million acres), and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010).
Presence of structures: Migration disturbances	Human structures in the marine environment, e.g., shipwrecks, artificial reefs, and oil platforms, can attract finfish and invertebrates that approach the structures during their migrations. This could slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure is (Moser and Shepherd 2009; Fabrizio et al. 2014; Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals.	The infrequent installation of future new structures In the marine environment over the next 35 years may attract finfish and invertebrates that approach the structures during their migrations. This could tend to slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement (Moser and Shepherd 2009; Fabrizio et al. 2014; Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded.
Presence of structures: Cable infrastructure	See other sub-IPFs within the Presence of structures IPF. See Table F1-6 on Coastal Habitats.	See other sub-IPFs within the Presence of structures IPF. See Table F1-6 on Coastal Habitats.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Regulated fishing effort	Regulated fishing effort results in the removal of a substantial amount of the annually produced biomass of commercially regulated finfish and invertebrates and can also influence bycatch of non-regulated species. Ongoing commercial and recreational regulations for finfish and shellfish implemented and enforced by states, municipalities, and/or NOAA, depending on jurisdiction, affect finfish, invertebrates, and EFH by modifying the nature, distribution and intensity of fishing-related impacts, including those that disturb the seafloor (trawling, dredge fishing).	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Seabed profile alterations	Ongoing sediment dredging for navigation purposes results in localized short-term impacts (habitat alteration, change in complexity) on finfish, invertebrates, and EFH through this IPF. Dredging is most likely in sand wave areas where typical jet plowing is insufficient to meet target cable burial depth. Sand waves that are dredged would likely be redeposited in like-sediment areas. Any particular sand wave may not recover to the same height and width as pre-disturbance; however, the habitat function would largely recover post-disturbance. Therefore, seabed profile alterations, while locally intense, have little impact on finfish, invertebrates, and EFH on a regional (Cape Hatteras to Gulf of Maine) scale.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Sediment deposition and burial	Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. Sediment deposition could have negative impacts on eggs and larvae, particularly demersal eggs such as longfin squid, which are known to have high rates of egg mortality if egg masses are exposed to abrasion or burial. Impacts may vary based on season/time of year.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Climate change: Ocean acidification	Continuous CO_2 emissions causing ocean acidification may contribute to reduced growth or the decline of invertebrates that have calcareous shells over the course of the next 35 years.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Climate change: Warming and sea level rise, altered habitat, ecology, and migration patterns	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the distributions of finfish, invertebrates, and EFH. This sub-IPF has been shown to affect the distribution of fish in the northeast United States, with several species shifting their centers of biomass either northward or to deeper waters (Hare et al. 2016).	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.
Climate change: Warming and sea level rise, disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 35 years, influencing the frequencies of various diseases of finfish and invertebrates.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.

AC = alternating current; DC = direct current; hazmat = hazardous materials

Table F1-12 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Land Use and Coastal Infrastructure

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	Various ongoing onshore and coastal construction projects include the use of vehicles and equipment that contain fuel, fluids, and hazardous materials that could be released.	Ongoing onshore construction projects involve vehicles and equipment that use fuel, fluids, or hazardous materials could result in an accidental release. Intensity and extent would vary, depending on the size, location, and materials involved in the release.
Light: Structures	Various ongoing onshore and coastal construction projects have nighttime activities, as well as existing structures, facilities, and vehicles that would use nighttime lighting.	Ongoing onshore construction projects involving nighttime activity could generate nighttime lighting. Intensity and extent would vary, depending on the location, type, direction, and duration of nighttime lighting.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The New Jersey Wind Port is being developed and the Port of Paulsboro is being upgraded specifically to support the construction of offshore wind energy facilities.	Ports would need to perform maintenance and upgrade facilities to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep draft vessels as they continue to increase in size.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Viewshed	The only existing offshore structures within the offshore viewshed are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components would be limited to met towers. Marine activity would also occur within the marine viewshed.
Presence of structures: Cable infrastructure	Onshore buried cables would only occur where permitted by local land use authorities, which would avoid long-term land use conflicts.	No known proposed structures are reasonably foreseeable and proposed to be located in the geographic analysis area for land use and coastal infrastructure.
Land disturbance: Onshore construction	Onshore construction supports local population growth, employment, and economics.	Onshore development would continue in accordance with local government land use plans and regulations.
Land disturbance: Onshore, land use changes	New development or redevelopment would result in changes in land use in accordance with local government land use plans and regulations.	Ongoing and future development and redevelopment is anticipated to reinforce existing land use patterns, based on local government planning documents.

hazmat = hazardous materials; met = meteorological

Table F1-13 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Marine Mammals

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table F1-23 for a quantitative analysis of these risks. Ongoing releases are frequent/chronic. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal effects on the individual fitness, including adrenal effects, hematological effects, liver effects lung disease, poor body condition, skin lesions, and several other health affects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species (Table F1-11).	See Table F1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal effects on the individual fitness, including adrenal effects, hematological effects, liver effects lung disease, poor body condition, skin lesions, and several other health affects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to effects on prey species (Table F1-11).

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying, and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Worldwide 62 of 123 (50.4%) marine mammal species have been documented ingesting marine litter (Werner et al. 2016). Stranding data indicate potential debris induced mortality rates of 0 to 22%. Mortality has been documented in cases of debris interactions, as well as blockage of the digestive track, disease, injury, and malnutrition (Baulch and Perry 2014). However, it is difficult to link physiological effects to individuals to population level impacts (Browne et al. 2015).	As population and vessel traffic increase gradually over the next 35 years, accidental release of trash and debris may increase. Trash and debris may continue to be accidentally released through fisheries use and other offshore and onshore activities. There may also be a long-term risk from exposure to plastics and other debris in the ocean. Worldwide 62 of 123 (50.4%) of marine mammal species have been documented ingesting marine litter (Werner et al. 2016). Mortality has been documented in cases of debris interactions, as well as blockage of the digestive track, disease, injury, and malnutrition (Baulch and Perry 2014).
EMF	EMFs emanate constantly from installed telecommunication and electrical power transmission cables. Marine mammals appear to have a detection threshold for magnetic intensity gradients (i.e., changes in magnetic field levels with distance) of 0.1% of the earth's magnetic field or about 0.05 μT (Kirschvink 1990) and are thus likely to be very sensitive to minor changes in magnetic fields (Walker et al. 2003). There is a potential for animals to react to local variations of the geomagnetic field caused by power cable EMFs. Depending on the magnitude and persistence of the confounding magnetic field, such an effect could cause a trivial temporary change in swim direction or a longer detour during the animal's migration (Gill et al. 2005). Such an effect on marine mammals is more likely to occur with direct current cables than with AC cables (Normandeau et al. 2011). However, there are numerous transmission cables installed across the seafloor and no impacts on marine mammals have been demonstrated from this source of EMF.	During operation, future new cables would produce EMF. Submarine power cables in the marine mammal geographic analysis area are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any, would likely be difficult to detect, if they occur at all. Marine mammals have the potential to react to submarine cable EMF; however, no effects from the numerous submarine cables have been observed. Furthermore, this IPF would be limited to extremely small portions of the areas used by migrating marine mammals. As such, exposure to this IPF would be low, and as a result impacts on marine mammals would not be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
New cable emplacement/ maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be local and generally limited to the emplacement corridor. Data are not available regarding marine mammal avoidance of localized turbidity plumes; however, Todd et al. (2015) suggest that since some marine mammals often live in turbid waters and some species of mysticetes and sirenians employ feeding methods that create sediment plumes, some species of marine mammals have a tolerance for increased turbidity. Similarly, McConnell et al. (1999) documented movements and foraging of grey seals in the North Sea. One tracked individual was blind in both eyes, but otherwise healthy. Despite being blind, observed movements were typical of the other study individuals, indicating that visual cues are not essential for grey seal foraging and movement (McConnell et al. 1999). If elevated turbidity caused any behavioral responses such as avoiding the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any impacts would be temporary and short term. Turbidity associated with increased sedimentation may result in temporary, short-term impacts on marine mammal prey species (Table F1-11).	The impact on water quality from accidental sediment suspension during cable emplacement is temporary and short term. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any negative impacts would be temporary and short term. Turbidity associated with increased sedimentation may result in temporary, short-term impacts on some marine mammal prey species (Table F1-11).

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Aircraft	Aircraft routinely travel in the marine mammal geographic analysis area. With the possible exception of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from marine mammals. If flights are at a sufficiently low altitude, marine mammals may respond with behavioral changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). These brief responses would be expected to dissipate once the aircraft has left the area. Similarly, aircraft have the potential to disturb hauled-out seals if aircraft overflights occur within 2,000 feet (610 meters) of a haul out area (Efroymson et al. 2000). However, this disturbance would be temporary, short-term, and result in minimal energy expenditure. These brief responses would be expected to dissipate once the aircraft has left the area.	Future low altitude aircraft activities such as survey activities and navy training operations could result short-term responses of marine mammals to aircraft noise. If flights are at a sufficiently low altitude, marine mammals may respond with a behavior changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). These brief responses would be expected to dissipate once the aircraft has left the area.
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities have the potential to result in high intensity, high consequence impacts, including auditory injuries, stress, disturbance, and behavioral responses, if present within the ensonified area (NOAA 2018). Survey protocols and underwater noise mitigation procedures are typically implemented to decrease the potential for any marine mammal to be within the area where sound levels are above relevant harassment thresholds associated with an operating sound source to reduce the potential for behavioral responses and injury (PTS/TTS) close to the sound source. The magnitude of effects, if any, is intrinsically related to many factors, including acoustic signal characteristics, behavioral state (e.g., migrating), biological condition, distance from the source, duration and level of the sound exposure, as well as environmental and physical conditions that affect acoustic propagation (NOAA 2018).	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Turbines	Marine mammals would be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Facility, this low frequency noise barely exceeds ambient levels at 164 feet (50 meters) from the WTG base. Based on the results of Thomsen et al. (2015) and Kraus et al. (2016), SPLs would be expected to be at or below ambient levels at relatively short distances from the WTG foundations.	This sub-IPF does not apply to future non-offshore wind development.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can result in high-intensity, low-exposure level, long-term, but localized intermittent risk to marine mammals. Impacts would be localized in nearshore waters. Pile driving activities may negatively affect marine mammals during foraging, orientation, migration, predator detection, social interactions, or other activities (Southall et al. 2007). Noise exposure associated with pile-driving activities can interfere with these functions and have the potential to cause a range of responses, including insignificant behavioral changes, avoidance of the ensonified area, PTS, harassment, and ear injury, depending on the intensity and duration of the exposure. BOEM assumes that all ongoing and potential future activities will be conducted in accordance with a project-specific IHA to minimize impacts on marine mammals.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Noise: Cable laying/ trenching	Noise from cable laying could periodically occur in the analysis area.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, scientific and academic research vessels, as well as other construction vessels. The frequency range for vessel noise falls within marine mammals' known range of hearing and would be audible. Noise from vessels presents a long-term and widespread impact on marine mammals across in most oceanic regions. While vessel noise may have some effect on marine mammal behavior, it would be expected to be limited to brief startle and temporary stress response. Results from studies on acoustic impacts from vessel noise on odontocetes indicate that small vessels at a speed of 5 knots in shallow coastal water can reduce the communication range for bottlenose dolphins within 164 feet (50 meters) of the vessel by 26% (Jensen et al. 2009). Pilot whales in a quieter, deep-water habitat could experience a 50% reduction in communication range from a similar size boat and speed (Jensen et al. 2009). Since lower frequencies propagate farther away from the sound source compared to higher frequencies, LFCs are at a greater risk of experiencing Level B Harassment produced by vessel traffic.	Any offshore projects that require the use of ocean vessels could potentially result in long term but infrequent impacts on marine mammals, including temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes. However, BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of marine mammals and no stock or population level effects would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats, and are expected to result in temporary, short-term impacts, if any, on marine mammals. Vessel noise may affect marine mammals, but response would be expected to be temporary and short-term (see Vessels: Noise sub-IPF above). The impacts on water quality from sediment suspension during port expansion activities is temporary, short-term, and would be similar to those described under the New cable emplacement/maintenance IPF above.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications. Future channel deepening activities are being undertaken to accommodate deeper draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long-term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g. ferry use and cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strike could also occur (see the Traffic: Vessel collisions sub-IPF below).
Presence of structures: Entanglement or ingestion of lost fishing gear	There are more than 130 artificial reefs in the Mid-Atlantic region. This sub-IPF may result in long-term, high intensity impacts, but with low exposure due to localized and geographic spacing of artificial reefs, long-term. Currently bridge foundations and the Block Island Wind Facility may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of marine mammals encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Moore and van der Hoop 2012), if present nearshore where these structures are located. There are very few, if any, areas within the OCS geographic analysis area for marine mammals that would serve to concentrate recreational fishing and increase the likelihood that marine mammals would encounter lost fishing gear.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion and prey aggregation	There are more than 130 artificial reefs in the Mid-Atlantic region. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations and Block Inland Wind Facility WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the "reef" effect (Taormina et al. 2018; NMFS 2015). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for seals and small odontocetes compared to the surrounding soft-bottoms.	The presence of structures associated with non-offshore wind development in near shore coastal waters have the potential to provide habitat for seals and small odontocetes as well as preferred prey species. This "reef effect" has the potential to result in long term, low-intensity benefits. Bridge foundations will continue to provide foraging opportunities for seals and small odontocetes with measurable benefits to some individuals. Hard-bottom (scour control and rock mattresses used to bury the offshore export cables) and vertical structures (i.e., WTG and OSS foundations) in a soft-bottom habitat can create artificial reefs, thus inducing the "reef effect" (Taormina et al. 2018; Causon and Gill 2018). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for marine mammals compared to the surrounding soft-bottoms.
Presence of structures: Avoidance/ displacement	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF. There may be some impacts resulting from the existing Block Island Wind Facility, but given that there are only 5 WTGs, no measurable impacts are occurring.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Behavioral disruption - breeding and migration	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Displacement into higher risk areas (Vessels and Fishing)	No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Traffic: Vessel collisions	Current activities that are contributing to this sub-IPF include port traffic levels, fairways, TSS, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Vessel strike is relatively common with cetaceans (Kraus et al. 2005) and one of the primary causes of death to NARWs with as many as 75% of known anthropogenic mortalities of NARWs likely resulting from collisions with large ships along the U.S. and Canadian eastern seaboard (Kite-Powell et al. 2007). Marine mammals are more vulnerable to vessel strike when they are within the draft of the vessel and when they are beneath the surface and not detectable by visual observers. Some conditions that make marine mammals less detectable include weather conditions with poor visibility (e.g., fog, rain, and wave height) or nighttime operations. Vessels operating at speeds exceeding 10 knots have been associated with the highest risk for vessel strikes of NARWs (Vanderlaan and Taggart 2007). Reported vessel collisions with whales show that serious injury rarely occurs at speeds below 10 knots (Laist et al. 2001). Data show that the probability of a vessel strike increases with the velocity of a vessel (Pace and Silber 2005; Vanderlaan and Taggart 2007).	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. While these impacts would be high consequence, the patchy distribution of marine mammals makes stock or population-level effects unlikely (Navy 2018).
Climate change: Warming and sea level rise, storm severity/frequency	Increased storm frequency could result in increased energetic costs for marine mammals and reduced fitness, particularly for juveniles, calves and pups.	No future activities were identified within the geographic analysis area for marine mammals other than ongoing activities.
Climate change: Ocean acidification	This sub-IPF has the potential to lead to long-term, high-consequence impacts on marine ecosystems by contributing to reduced growth or the decline of invertebrates that have calcareous shells.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat/ecology	This sub-IPF has the potential to lead to long-term, high-consequence impacts on marine mammals as a result of changes in distribution, reduced breeding, and/or foraging habitat availability, and disruptions in migration.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Climate change: Warming and sea level rise, altered migration patterns	This sub-IPF has the potential to lead to long-term, high-consequence impacts on marine mammal habitat use and migratory patterns. For example, the NARW appears to be migrating differently and feeding in different areas in response to changes in prey densities related to climate change (Record et al. 2019; MacLeod 2009; Nunny and Simmonds 2019).	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, increased disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of marine mammals, such as Phocine distemper. Climate change is clearly influencing infectious disease dynamics in the marine environment; however, no studies have shown a definitive causal relationship between any components of climate change and increases in infectious disease among marine mammals. This is due in large part to a lack of sufficient data and to the likely indirect nature of climate change's impact on these diseases. Climate change could potentially affect the incidence or prevalence of infection, the frequency or magnitude of epizootics, and/or the severity or presence of clinical disease in infected individuals. There are a number of potential proposed mechanisms by which this might occur (see summary in Burge et al. 2014 Climate Change Influences on Marine Infectious Diseases: Implications for Management and Society).	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.
Climate change: Warming and sea level rise, storm severity/frequency, sediment erosion, deposition	Increased storm frequency could result in increased energetic costs for marine mammals, reduced fitness, particularly for juveniles, calves and pups. Erosion could impact seal haul outs reducing their habitat availability, especially as things like sea walls are added, blocking seals access to shore.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.

μT = microtesla; AC = alternating current; hazmat = hazardous materials

Table F1-14 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Navigation and Vessel Traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Anchoring	Larger commercial vessels (specifically tankers) sometimes anchor outside of major ports to transfer their cargo to smaller vessels for transport into port, an operation known as lightering. These anchors have deeper ground penetration and are under higher stresses. Smaller vessels (commercial fishing or recreational vessels) would anchor for fishing and other recreational activities. These activities cause temporary to short-term impacts on navigation in the immediate anchorage area. All vessels may anchor in an emergency scenario (such as power loss) if they lose power to prevent them from drifting and creating navigational hazards for other vessels or drifting into structures.	Lightering and anchoring operations are expected to continue at or near current levels, with the expectation of moderate increase commensurate with any increase in tankers visiting ports. Deep-draft visits to major port visits are expected to increase as well, increasing the potential for an emergency need to anchor, creating navigational hazards for other vessels. Recreational activity and commercial fishing activity would likely stay largely the same related to this IPF.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.	Ports would need to perform maintenance and perform upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size. Impacts would be short term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. There are two types of allisions that occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements or is distracted.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 35 years. Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Fish aggregation	Items in the water, such as ghost fishing gear, buoys, and energy platform foundations can create an artificial reef effect, aggregating fish. Recreational and commercial fishing can occur near the artificial reefs. Recreational fishing is more popular than commercial near artificial reefs as commercial mobile fishing gear can risk snagging on the artificial reef structure.	Fishing near artificial reefs is not expected to change meaningfully over the next 35 years.
Presence of structures: Habitat conversion	Equipment in the ocean can create a substrate for mollusks to attach to, and fish eggs to settle near. This can create a reef-like habitat and benefit structure-oriented species on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Migration disturbances	Noise-producing activities, such as pile driving and vessel traffic, may interfere and adversely affect marine mammals during foraging, orientation, migration, response to predators, social interactions, or other activities. Marine mammals may also be sensitive to changes in magnetic field levels. The presence of structures and operational noise could cause mammals to avoid areas.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, then navigation is made more complex, as the vessels need to avoid both the structure and each other.	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 35 years. Even with increased port visits by deep-draft vessels, this is still a relatively small adjustment when considering the whole of New England vessel traffic. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Currently, the offshore area is occupied by marine trade, stationary and mobile fishing, and survey activities.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Cable infrastructure	See IPF for Anchoring.	See IPF for Anchoring.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
New cable emplacement/ maintenance	Within the geographic analysis area for navigation and vessel traffic, existing cables may require access for maintenance activities. Infrequent cable maintenance activities may cause temporary increases in vessel traffic and navigational complexity.	Future new cables would cause temporary increases in vessel traffic during installation or maintenance, resulting in infrequent, localized, short-term impacts over the next 35 years. Care would need to be taken by vessels that are crossing the cable routes during these activities.
Traffic: Aircraft	USCG SAR helicopters are the main aircraft that may be flying at low enough heights to risk interaction with WTGs. USCG SAR aircraft need to fly low enough that they can spot objects in the water.	SAR operations could be expected to increase with any increase in vessel traffic. However, as vessel traffic volume is not expected to increase appreciably, neither should SAR operations. Final EIS Section 3.16 provides a discussion of navigation impacts on fishing vessel traffic.
Traffic: Vessels	See the sub-IPF for Presence of structures: Navigation hazard.	See the sub-IPF for Presence of structures: Navigation hazard.
Traffic: Vessels, collisions	See the sub-IPF for Presence of structures: Navigation hazard.	See the sub-IPF for Presence of structures: Navigation hazard.

Table F1-15 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Other Uses: Military and National Security Uses

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Allisions	Existing stationary facilities that present allision risks include buoys that are used to mark inlet approaches, channels, and shoals (NOAA 2021), dock facilities, meteorological buoys associated with offshore wind lease areas, and other offshore or shoreline-based structures.	No additional non-offshore wind stationary structures were identified within the geographic analysis area. Stationary structures such as private or commercial docks may be added close to the shoreline.
Presence of structures: Fish aggregation	No existing stationary structures that would act as FADs were identified within the geographic analysis area.	No future non-offshore wind additional stationary structures that would act as FADs were identified within the geographic analysis area.
Presence of structures: Navigation hazard	Existing stationary facilities within the geographic analysis area that present navigational hazards include buoys that are used to mark inlet approaches, channels, and shoals (NOAA 2021), dock facilities, meteorological buoys associated with offshore wind lease areas, and other offshore or shoreline-based structures.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore, development activities are anticipated to continue with additional proposed communications towers and onshore commercial, industrial, and residential developments.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Space use conflicts	Existing stationary facilities within the geographic analysis area that could present a space use conflict include onshore wind turbines, communication towers, and other onshore commercial, industrial, and residential structures.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore, development activities are anticipated to continue with additional proposed communications towers and onshore commercial, industrial, and residential developments.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Submarine cables would remain in current locations with infrequent maintenance continuing along those cable routes for the foreseeable future.
Traffic: Vessels	Current vessel traffic in the region is described in Final EIS Section 3.16. Vessel activities associated with offshore wind in the cumulative lease areas is currently limited to site assessment surveys.	Continued vessel traffic in the region, as described in Final EIS Section 3.16.
Traffic: Vessels, collisions	Current vessel traffic in the region is described in Final EIS Section 3.16. Vessel activities associated with offshore wind in the cumulative lease areas is currently limited to site assessment surveys.	Continued vessel traffic in the region is described in Final EIS Section 3.16.

FAD = fish aggregating device

Table F1-16 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Other Uses: Aviation and Air Traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Towers	Existing aboveground stationary facilities within the geographic analysis area that present aviation hazards include onshore wind turbines, communication towers, dock facilities, and other onshore structures exceeding 200 feet in height.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore development activities are anticipated to continue with additional proposed communications towers.
Presence of structures: Space use conflicts	Existing aboveground stationary facilities within the geographic analysis area that could cause space use conflicts for aircraft include onshore wind turbines, communication towers, and other onshore structures exceeding 200 feet in height.	No future non-offshore wind stationary structures were identified within the offshore analysis area. Onshore, development activities are anticipated to continue with additional proposed communications towers.

Table F1-17 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Other Uses: Cables and Pipelines

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Allisions and navigation hazards	Structures within and near the geographic analysis area that pose potential allision hazards include buoys that are used to mark inlet approaches, channels, and shoals, meteorological buoys associated with offshore wind lease areas, and shoreline developments such as docks, ports, and other commercial, industrial, and residential structures.	Reasonably foreseeable non-offshore wind structures that could affect submarine cables have not been identified in the geographic analysis area.
Presence of structures: Space use conflicts	Existing submarine cables cross cumulative lease areas and create potential space use conflicts with marine mineral and sand borrow areas.	Reasonably foreseeable non-offshore wind structures that could create space use conflicts with submarine cables have not been identified in the geographic analysis area.
Presence of structures: Cable infrastructure	Existing submarine cables cross cumulative lease areas.	Reasonably foreseeable non-offshore wind structures have not been identified in the geographic analysis area.

Table F1-18 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Other Uses: Radar Systems

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Towers	Wind developments in the direct line of sight with, or extremely close to, radar systems can cause clutter and interference.	Reasonably foreseeable non-offshore wind structures proposed for construction in the lease areas that could affect radar systems have not been identified.

Table F1-19 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Other Uses: Scientific Research and Surveys

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Navigation hazards	Stationary structures are limited in the open ocean environment of the geographic analysis area, and include met buoys associated with site assessment activities, the five Block Island Wind Farm WTGs, and the two CVOW WTGs.	Reasonably foreseeable non-offshore wind activities would not implement stationary structures within the open ocean environment that would pose navigational hazards and raise the risk of allisions for survey vessels and collisions for survey aircraft.

CVOW = Coastal Virginia Offshore Wind; met = meteorological

Table F1-20 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Recreation and Tourism

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Anchoring	Anchoring occurs due to ongoing military, survey, commercial, and recreational activities.	Impacts from anchoring would continue, and may increase due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Modest growth in vessel traffic could increase the temporary, localized impacts of navigational hazards, increased turbidity levels, and potential for direct contact causing mortality of benthic resources.
Light: Vessels	Ocean vessels have an array of lights including navigational lights and deck lights.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.
Light: Structures	Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast, but minimal offshore.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors.	Cable maintenance or replacement of existing cables in the geographic analysis area would occur infrequently and would generate short-term disturbances.
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Cable laying/ trenching	Offshore trenching occurs periodically in connection with cable installation or sand and gravel mining.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance.	Ports would need to perform maintenance and upgrade facilities over the next 35 years to ensure that they can still receive the projected future volume of vessels visiting their ports, and to be able to host larger deep-draft vessels as they continue to increase in size.
Port utilization: Maintenance/ dredging	Periodic maintenance is necessary for harbors within the analysis area.	Ongoing maintenance and dredging of harbors within the geographic analysis area will continue as needed. No specific projects are known.
Presence of structures: Allisions	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. The likelihood of allisions is expected to continue at or near current levels.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Presence of structures: Entanglement, gear loss, gear damage	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures.	No future activities were identified within the recreation and tourism geographic analysis area other than ongoing activities.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these locations. Recreational and commercial fishing can occur near these aggregation locations, although recreational fishing is more popular, because commercial mobile fishing gear is more likely to snag on structures.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion	Structures, including foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly flat seascape. Structure-oriented species thus benefit on a constant basis.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Navigation hazard	Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, because vessels need to avoid both the structure and each other.	Vessel traffic, overall, is not expected to meaningfully increase over the next 35 years. The presence of navigation hazards is expected to continue at or near current levels.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	Reasonably foreseeable activities (non-offshore wind) would not result in additional offshore structures.
Presence of structures: Viewshed	The only existing offshore structures within the viewshed of the Projects are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components of the Projects would be limited to meteorological towers. Marine activity would also occur within the marine viewshed.
Traffic: Vessels	Geographic analysis area ports and marine traffic related to shipping, fishing, and recreation are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 35 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy.
Traffic: Vessel collisions	The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of collisions is expected to continue at or near current rates.	An increased risk of collisions is not anticipated from future activities.

Table F1-21 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Sea Turtles

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	See Table F1-23 for a quantitative analysis of these risks. Ongoing releases are frequent and chronic. Sea turtle exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality (Shigenaka et al. 2010) or sublethal effects on individual fitness, including adrenal effects, dehydration, hematological effects, increased disease incidence, liver effects, poor body condition, skin effects, skeletomuscular effects, and several other health effects that can be attributed to oil exposure (Camacho et al. 2013; Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (Table F1-11).	See Table F1-23 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. Sea turtle exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality (Shigenaka et al. 2010; Wallace et al. 2010) or sublethal effects on individual fitness, including adrenal effects, dehydration, hematological effects, increased disease incidence, liver effects, poor body condition, skin effects, skeletomuscular effects, and several other health effects that can be attributed to oil exposure (Camacho et al. 2013; Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to effects on prey species (Table F1-11).

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, cables, lines, and pipeline laying, as well as debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Direct ingestion of plastic fragments is well documented and has been observed in all species of sea turtles (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). In addition to plastic debris, ingestion of tar, paper, Styrofoam™, wood, reed, feathers, hooks, lines, and net fragments have also been documented (Thomás et al. 2002). Ingestion can also occur when individuals mistake debris for potential prey items (Gregory 2009; Hoarau et al. 2014; Thomás et al. 2002). Potential ingestion of marine debris varies among species and life history stages due to differing feeding strategies (Nelms et al. 2016). Ingestion of plastics and other marine debris can result in both lethal and sublethal impacts on sea turtles, with sublethal effects more difficult to detect (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Long-term sublethal effects may include dietary dilution, chemical contamination, depressed immune system function, poor body condition, as well as reduced growth rates, fecundity, and reproductive success. However, these effects are cryptic and clear causal links are difficult to identify (Nelms et al. 2016).	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, lines and pipeline laying, and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Direct and indirect ingestion of plastic fragments and other marine debris is well documented and has been observed in all species of sea turtles (Bugoni et al. 2001; Gregory 2009; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014; Thomás et al. 2002). Ingestion can result in both lethal and sublethal impacts on sea turtles, with sublethal effects more difficult to detect (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). However, these effects are cryptic and clear causal links are difficult to identify (Nelms et al. 2016).

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
EMF	EMFs emanate constantly from installed telecommunication and electrical power transmission cables. Sea turtles appear to have a detection threshold of magnetosensitivity and behavioral responses to field intensities ranging from 0.0047 to 4000 µT for loggerhead turtles, and 29.3 to 200 µT for green turtles, with other species likely similar due to anatomical, behavioral, and life history similarities (Normandeau et al. 2011). Juvenile or adult sea turtles foraging on benthic organisms may be able to detect magnetic fields while they are foraging on the bottom near the cables and up to potentially 82 feet (25 meters) in the water column above the cable. Juvenile and adult sea turtles may detect the EMF over relatively small areas near cables (e.g., when resting on the bottom or foraging on benthic organisms near cables or concrete mattresses). There are no data on impacts on sea turtles from EMFs generated by underwater cables, although anthropogenic magnetic fields can influence migratory deviations (Luschi et al. 2007; Snoek et al. 2016). However, any potential impacts from AC cables on turtle navigation or orientation would likely be undetectable under natural conditions, and thus would be insignificant (Normandeau et al. 2011).	During operations, future new cables would produce EMF. Submarine power cables in the geographic analysis area for sea turtles are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels. (Section 5.2.7 of BOEM's 2007 Final Programmatic EIS for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf.) EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any, would likely be difficult to detect, if they occur at all. Furthermore, this IPF would be limited to extremely small portions of the areas used by resident or migrating sea turtles. As such, exposure to this IPF would be low, and as a result, impacts on sea turtles would not be expected.
Light: Vessels	Ocean vessels such as ongoing commercial vessel traffic, recreational and fishing activity, scientific and academic research traffic have an array of lights including navigational, deck lights, and interior lights. Such lights have some limited potential to attract sea turtles, although the impacts, if any, are expected to be localized and temporary.	Construction, operations, and decommissioning vessels associated with non-offshore wind activities produce temporary and localized light sources that could result in the attraction or avoidance behavior of sea turtles. These short-term impacts are expected to be of low intensity and occur infrequently.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Light: Structures	Artificial lighting on nesting beaches or in nearshore habitats has the potential to result in disorientation to nesting females and hatchling turtles. Artificial lighting on the OCS does not appear to have the same potential for effects. Decades of oil and gas platform operation in the Gulf of Mexico, that can have considerably more lighting than offshore WTGs, has not resulted in any known impacts on sea turtles (BOEM 2019).	Non-offshore wind activities would not be expected to appreciably contribute to this sub-IPF. As such, no impact on sea turtles would be expected.
New cable emplacement/ maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be local and generally limited to the emplacement corridor. Data are not available regarding effects of suspended sediments on adult and juvenile sea turtles, although elevated suspended sediments may cause individuals to alter normal movements and behaviors. However, these changes are expected to be too small to be detected (NOAA 2020). Sea turtles would be expected to swim away from the sediment plume. Elevated turbidity is most likely to affect sea turtles if a plume causes a barrier to normal behaviors, but no impacts would be expected due to swimming through the plume (NOAA 2020). Turbidity associated with increased sedimentation may result in short-term, temporary impacts on sea turtle prey species (Table F1-11).	The impact on water quality from accidental sediment suspension during cable emplacement is short-term and temporary. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any impacts would be short-term and temporary. Turbidity associated with increased sedimentation may result in short-term, temporary impacts on some sea turtle prey species (Table F1-11).
Noise: Aircraft	Aircraft routinely travel in the geographic analysis area for sea turtles. With the possible exception of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from sea turtles. If flights are at a sufficiently low altitude, sea turtles may respond with a startle response (diving or swimming away), altered submergence patterns, and a temporary stress response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area.	Future low-altitude aircraft activities such as survey activities and navy training operations could result in short-term responses of sea turtles to aircraft noise. If flights are at a sufficiently low altitude, sea turtles may respond with a startle response (diving or swimming away), altered submergence patterns, and a temporary stress response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities have the potential to result in some impacts including potential auditory injuries, short-term disturbance, behavioral responses, and short-term displacement of feeding or migrating sea turtles, if present within the ensonified area (NSF and USGS 2011). The potential for PTS and TTS is considered possible in proximity to G&G surveys utilizing air guns, but impacts are unlikely as turtles would be expected to avoid such exposure and survey vessels would pass quickly (NSF and USGS 2011). No significant impacts would be expected at the population level.	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.
Noise: Turbines	Available evidence suggests that typical underwater noise levels from operating WTGs would be below current cumulative injury and behavioral effect thresholds for sea turtles. Operating turbines were determined to produce underwater noise on the order of 110 to 125 $dB_{RMS,}$ occasionally reaching as high as 128 dB_{RMS}, in the 10-Hz to 8-kilohertz range (Tougaard et al. 2020). As measured at the Block Island Wind Facility, low frequency operational noise barely exceeds ambient levels at 164 feet (50 meters) from the WTG base (Miller and Potty 2017). Operational noise impacts would be expected to be negligible.	This sub-IPF does not apply to future non-offshore wind development.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Noise: Pile driving	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or through the seabed can result in high intensity, low exposure levels, and long-term, but localized intermittent risk to sea turtles. Impacts, potentially including behavioral responses, masking, TTS, and PTS, would be localized in nearshore waters. Data regarding threshold levels for impacts on sea turtles from sound exposure during pile driving are very limited, and no regulatory threshold criteria have been established for sea turtles. Based on current literature, the following thresholds are used to assess impacts on turtles: Potential mortal injury: 210 dB cumulative SPL or greater than 207 dB peak SPL (Popper et al. 2014) Potential mortal injury: 204 dB_{SEL}, 232 dB_{PEAK} (PTS), 189 dB_{SEL}, 226 dB_{PEAK} (TTS) (Navy 2017) Behavioral harassment: 175 dB referenced to 1 µPa RMS (Navy 2017)	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Noise: Vessels	The frequency range for vessel noise (10 to 1000 Hz; MMS 2007) overlaps with sea turtles' known hearing range (less than 1,000 Hz with maximum sensitivity between 200 to 700 Hz; Bartol 1994) and would therefore be audible. However, Hazel et al. (2007) suggests that sea turtles' ability to detect approaching vessels is primarily vision-dependent, not acoustic. Sea turtles may respond to vessel approach and/or noise with a startle response (diving or swimming away) and a temporary stress response (NSF and USGS 2011). Samuel et al. (2005) indicated that vessel noise could have an effect on sea turtle behavior, especially their submergence patterns.	Any offshore projects that require the use of ocean vessels could potentially result in long-term but infrequent impacts on sea turtles, including temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes, especially their submergence patterns (NSF and USGS 2011; Samuel et al. 2005). However, BOEM expects that these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of sea turtles and no stock or population level effects would be expected.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats, and are expected to result in short-term, temporary impacts, if any, on sea turtles. Vessel noise may affect sea turtles, but response would be expected to be short-term and temporary (see the Vessels: Noise sub-IPF above). The impact on water quality from sediment suspension during port expansion activities is short-term, temporary, and would be similar to those described under the New cable emplacement/maintenance IPF above.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications. Future channel deepening activities are being undertaken to accommodate deeper-draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long-term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strikes could also occur (see the Traffic: Vessel collisions sub-IPF below).
Presence of structures: Entanglement or ingestion of lost fishing gear	The Mid-Atlantic region has more than 130 artificial reefs. Currently bridge foundations and the Block Island Wind Facility may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of sea turtles encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Berreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014) if present where these structures are located. At the scale of the OCS geographic analysis area for sea turtles, there are very few areas that would serve to concentrate recreational fishing and increase the likelihood that sea turtles would encounter lost fishing gear.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Presence of structures: Habitat conversion and prey aggregation	The Mid-Atlantic region has more than 130 artificial reefs. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations, Block Island Wind Facility WTGs, and two WTGs with the CVOW pilot project) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Taormina et al. 2018; NMFS 2015). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for sea turtles compared to the surrounding soft-bottoms.	The presence of structures associated with non-offshore wind development in near-shore coastal waters has the potential to provide habitat for sea turtles as well as preferred prey species. This reef effect has the potential to result in long-term, low-intensity beneficial impacts. Bridge foundations will continue to provide foraging opportunities for sea turtles with measurable benefits to some individuals.
Presence of structures: Avoidance/ displacement	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF. There may be some impacts resulting from the existing Block Island Wind Facility (5 WTGs) and the CVOW pilot project (2 WTGs) but given the limited number of WTGs, no measurable impacts are occurring.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Behavioral disruption - breeding and migration	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.
Presence of structures: Displacement into higher risk areas (Vessels and Fishing)	No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to this sub-IPF.	Not contemplated for non-offshore wind facility sources.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Traffic: Vessel collisions	Current activities contributing to this sub-IPF include port traffic levels, fairways, TSS, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Propeller and collision injuries from boats and ships are common in sea turtles. Vessel strike is an increasing concern for sea turtles, especially in the southeastern United States, where development along the coasts is likely to result in increased recreational boat traffic. In the United States, the percentage of strandings of loggerhead sea turtles that were attributed to vessel strikes increased from approximately 10% in the 1980s to a record high of 20.5% in 2004 (NMFS and USFWS 2007). Sea turtles are most susceptible to vessel collisions in coastal waters, where they forage from May through November. Vessel speed may exceed 10 knots in such waters, and evidence suggests that they cannot reliably avoid being struck by vessels exceeding 2 knots (Hazel et al. 2007).	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. While these impacts would be high consequence, the patchy distribution of sea turtles makes stock or population-level effects unlikely (Navy 2018).
Climate change: Warming and sea level rise, storm severity/frequency	Increased storm frequency could lead to long-term, high-consequence impacts on sea turtle onshore beach nesting habitat, including changes to nesting periods, changes in sex ratios of nestlings, drowned nests, as well as loss or degradation of nesting beaches. Offshore impacts, including sedimentation of near-shore hard bottom habitats have the potential to result in long-term, high consequence changes to foraging habitat availability for green turtles.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Ocean acidification	This sub-IPF has the potential to lead to long-term, high-consequence impacts on marine ecosystems by contributing to reduced growth or the decline of invertebrates that have calcareous shells.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Warming and sea level rise, altered habitat/ecology	This sub-IPF has the potential to lead to long-term, high-consequence impacts on sea turtles by influencing distributions of sea turtles and/or prey resources. This sub-IPF has the potential to lead to long-term, high-consequence impacts on sea turtle breeding, foraging, and sheltering habitat use.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Climate change: Warming and sea level rise, altered migration patterns	This sub-IPF has the potential to lead to long-term, high-consequence impacts on sea turtle habitat use and migratory patterns.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Warming and sea level rise, disease frequency	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of sea turtles such as fibropapillomatosis.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Warming and sea level rise, protective measures (barriers, sea walls)	The proliferation of coastline protections have the potential to result in long-term, high-consequence impacts on sea turtle nesting by eliminating or precluding access to potentially suitable nesting habitat or access to potentially suitable habitat.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.
Climate change: Warming and sea level rise, storm severity, frequency, sediment erosion, deposition	Sediment erosion and/or deposition in coastal waters have the potential to result in long-term, high-consequence impacts on green sea turtle foraging habitat. Additionally, sediment erosion has the potential to result in the degradation or loss of potentially suitable nesting habitat.	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.

µT = microtesla; AC = alternating current; CVOW = Coastal Virginia Offshore Wind; hazmat = hazardous materials

Table F1-22 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Scenic and Visual Resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat, suspended sediments, trash and debris	Ongoing offshore and onshore construction projects involve the use of vehicles, vessels, and equipment that contain fuel, fluids, and hazmat that have the potential for accidental release. Offshore and onshore construction can also result in sedimentation from land and seabed disturbance and accidental releases of trash and debris with associated visual impacts.	Future offshore and onshore construction projects have the potential to result in accidental releases from vehicles, vessels, and equipment that contain fuel, fluids, and hazmat. Future offshore and onshore construction could also result in sedimentation from land and seabed disturbance and accidental releases of trash and debris with associated visual impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Land disturbance: Erosion and sedimentation, onshore construction, onshore land use changes	Onshore human-caused and naturally occurring erosion and sedimentation results from construction, maintenance, and weather events.	Ongoing onshore construction projects could generate noticeable disturbance in the landscape. Intensity and extent would vary depending on the location, type, and duration of activities.
Light: Offshore structures and vessels, onshore vehicles, roads, laydown, parking, facilities, equipment, and structures	Offshore vessels have an array of lights including navigational lights, deck lights, and interior lights. Various ongoing onshore and coastal construction projects have nighttime activities, as well as existing structures, facilities, and vehicles that would require nighttime lighting.	Ongoing onshore construction projects involving nighttime activity could generate nighttime lighting. Intensity and extent would vary depending on the location, type, direction, and duration of nighttime lighting.
Structures: Viewshed	Buoys are the only existing stationary structures within the offshore viewshed of the Projects. Typically, buoys are visible only in the immediate foreground (less than 1 mile). Stationary and moving barges, boats, and ships also are visible in the daytime and nighttime viewsheds.	Onshore wind-related structures that could be viewed in conjunction with the offshore project components would be limited to meteorological towers, substations, and electrical transmission towers and conductors.
Traffic: Helicopters, vessels, vehicles	Ongoing activities contribute air, marine, and onshore traffic and visible congestion.	Planned onshore and offshore construction projects involving vessel, vehicle, and helicopter traffic could generate noticeable changes in the characteristic seascape and landscape and viewer experience. Intensity and extent of the changes would vary depending on the location, type, direction, and duration of the traffic.

hazmat = hazardous materials

Table F1-23 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Water Quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Accidental releases: Fuel/fluids/hazmat	Accidental releases of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable lines, and pipeline laying activities. According to the DOE, 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Approximately 40.5 million barrels of oil were lost as a result of tanker incidents from 1970 to 2009, according to International Tanker Owners Pollution Federation Limited, which collects data on oil spills from tankers and other sources. From 1990 to 1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and into the offshore was < 70,000 barrels. Impacts on water quality from a small accidental release would be expected to brief and localized due to containment and cleanup requirements, and petroleum weathering processes (i.e., the chemical and physical changes in the aquatic environment) that break down petroleum. Catastrophic accidental releases (e.g., a tanker grounding), although less common than small localized releases, would be anticipated to have long-term impacts on water quality due to the large area of surface water affected and volumes of petroleum that make it more difficult to contain and clean up.	Future accidental releases from offshore vessel usage, spills, and consumption will likely continue on a similar trend. Impacts are unlikely to affect water quality.
Accidental releases: Trash and debris	Trash and debris may be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, and cables, lines, and pipeline laying. Accidental releases of trash and debris are expected to be low probability events. BOEM assumes operator compliance with federal and international requirements for management of shipboard trash; such events also have a relatively limited spatial impact.	As population and vessel traffic increase gradually over the next 35 years, accidental release of trash and debris may increase. However, there does not appear to be evidence that the volumes and extents anticipated would have any effect on water quality.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Anchoring	Impacts from anchoring occur due to ongoing military use and survey, commercial, and recreational activities.	Impacts from anchoring may occur semi-regularly over the next 35 years due to offshore military operations or survey activities. These impacts would include increased seabed disturbance resulting in increased turbidity levels. All impacts would be localized, short term, and temporary.
New cable emplacement/ maintenance	Elevated suspended sediment concentrations can occur under natural tidal conditions and increase during storms, trawling, and vessel propulsion. Survey activities, and new cable and pipeline laying activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would be short-term and either be limited to the emplacement corridor or localized.	Suspension of sediments may continue to occur infrequently over the next 35 years due to survey activities, and submarine cable, lines, and pipeline-laying activities. Future new cables would occasionally disturb the seafloor and cause short-term increases in turbidity and minor alterations in localized currents resulting in local short-term impacts. If the cable routes enter the water quality geographic analysis area, short-term disturbance in the form of increased suspended sediment and turbidity would be expected.
Port utilization: Expansion	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications, which, along with additional vessel traffic, could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long-term depending on the vessel traffic increase. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.	The general trend along the coastal region from Virginia to Maine is that port activity will increase modestly over the next 35 years. Port modifications and channel deepening activities are being undertaken to accommodate the increase in vessel traffic and deeper-draft vessels that transit the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.
Presence of structures	The installation of onshore and offshore structures leads to alteration of local water currents. These disturbances would be local but, depending on the hydrologic conditions, have the potential to impact water quality through the formation of sediment plumes.	Impacts associated with the presence of structures includes temporary sediment disturbance during maintenance. This sediment suspension would lead to interim and localized impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Non-Offshore Wind Activities Intensity/Extent
Discharges	Discharges impact water quality by introducing nutrients, chemicals, and sediments to the water. There are regulatory requirements related to prevention and control of discharges, the prevention and control of accidental spills, and the prevention and control of nonindigenous species.	Increased coastal development is causing increased nutrient pollution in communities. In addition, ocean disposal activity in the North and Mid-Atlantic is expected to gradually decrease or remain stable. Impacts of ocean disposal on water quality are minimized because USEPA has established dredge spoil criteria and regulate the disposal permits issued by USACE. The impact on water quality from sediment suspension during these future activities would be short-term and localized.
Land disturbance: erosion and sedimentation	Ground disturbance activities may lead to un-vegetated or otherwise unstable soils. Precipitation events could potentially mobilize the soils into nearby surface waters, leading to potential erosion and sedimentation effects and subsequent increased turbidity.	Ground disturbance associated with construction and installation of onshore components could lead to un-vegetated or unstable soils. Precipitation events could mobilize these soils leading to erosion and sedimentation effects and turbidity. The impacts for future offshore wind through this IPF would be staggered in time and localized. The impacts would be short term and localized with an increased likelihood of impacts limited to onshore construction periods.
Land disturbance: Onshore construction	Onshore construction activities may lead to un-vegetated or otherwise unstable soils as well as soil contamination due to leaks or spills from construction equipment. Precipitation events could potentially mobilize the soils into nearby surface waters, leading to increased turbidity and alteration of water quality.	The general trend along coastal regions is that port activity will increase modestly in the future. This increase in activity includes expansion needed to meet commercial, industrial, and recreational demand. Modifications to cargo handling equipment and conversion of some undeveloped land to meet port demand would be required to receive the increase in larger ships.

DOE = U.S. Department of Energy; hazmat = hazardous materials

Table F1-24 Summary of Non-offshore Wind Activities and the Associated Impact-Producing Factors for Wetlands

Associated IPFs: Sub-IPFs	Ongoing Activities	Planned Activities Intensity/Extent
Land disturbance: Erosion and sedimentation	Ground disturbance activities may lead to unvegetated or otherwise unstable soils. Precipitation events could potentially mobilize the soils into nearby wetlands, leading to potential erosion and sedimentation effects and subsequent increased turbidity.	Ground disturbance associated with construction and installation of onshore components could lead to unvegetated or unstable soils. Precipitation events could mobilize these soils, leading to erosion and sedimentation effects and turbidity. Impacts from future offshore wind activities through this IPF would be staggered in time and localized. The impacts would be short term and localized, with an increased likelihood of impacts limited to onshore construction periods.
Land disturbance: Onshore construction	Onshore construction activities may lead to unvegetated or otherwise unstable soils as well as soil contamination due to leaks or spills from construction equipment. Precipitation events could potentially mobilize the soils into nearby wetlands, leading to increased turbidity and alteration of water quality.	The general trend along coastal regions is that port activity and land development will increase modestly in the future. This increase in activity includes expansion needed to meet commercial, industrial, and recreational demand. Modifications to cargo-handling equipment and conversion of some undeveloped land to meet port demand would be required to receive the increase in larger ships.

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ATTACHMENT 2
MAXIMUM-CASE SCENARIO ESTIMATES FOR OFFSHORE WIND PROJECTS

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LIST OF TABLES

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The following tables provide maximum-case scenario estimates of potential offshore wind project impacts assuming maximum buildout within the Empire Wind EIS geographic analysis areas. BOEM developed these estimates based on offshore wind demand, as discussed in its 2019 study *National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf* (BOEM 2019). Estimates disclosed in this EIS's Chapter 3, No Action analyses were developed by summing acreage or number calculations across all lease areas noted as occurring within, or overlapping, a given geographic analysis area. This likely overestimates some impacts in cases where lease areas only partially overlap analysis areas. However, this approach was used to provide the most conservative estimate of future offshore wind development.

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Table F2-1 Offshore Wind Development Activities on the U.S. East Coast: Projects and Assumptions (Part 1, Turbine and Cable Design Parameters)

Region	Lease, Project, Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[3]						Estimated Construction Schedule[4]	Turbine Number[5]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles)[6]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Interarray Cable Length (statute miles)[7]	Hub Height (feet)[8]	Rotor Diameter (feet)[8]	Height of Turbine (feet)[8]
			Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism									
ME	*Aqua ventus (state waters)*	*State Project*					*X*		*2023*	*2*	*11*					*450*	*520*
	Total Other State Waters Projects									**2**	11					450	520
Existing and Ongoing Projects																	
MA/RI	*Block Island (state waters)*	*Built*					*X*		*Built*	*5*	*30*	*28*	*5*	*2*	*328*	*541*	*659*
MA/RI	*Vineyard Wind 1 part of OCS-A 0501*	*COP Approved (ROD issued 2021), PPA, SAP*					*X*		*2023*	*62*	*800*	*98*	*6.5*	*171*	*451*	*721*	*812*
MA/RI	*South Fork, OCS-A 0517*	*COP Approved (ROD issued 2021), PPA, SAP*					*X*		*2023*	*12*	*130*	*139*	*6.5*	*24*	*472*	*735*	*840*
VA/NC	*CVOW, OCS-A 0497*	RAP, FDR/FIR					X		Built	2	12	27	3	9	364	506	620
	Total Existing and Ongoing Projects									81	972	292		206			
Planned Projects																	
Massachusetts/Rhode Island Region																	
MA/RI	Sunrise, OCS-A 0487	COP, PPA, SAP					X		2024	94	1,034	105	6.5	180	459	656	787
MA/RI	Revolution, part of OCS-A 0486	COP, PPA, SAP					X		2023–2024	100	880	100	131	155	512	722	873
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 1 [i.e., Park City Wind])	COP, PPA, SAP					X		2024–2026	62	804	125	10	139	630	837	1,047
MA/RI	New England Wind, OCS-A 0534 and portion of OCS-A 0501 (Phase 2 [i.e., Commonwealth Wind])	COP, PPA, SAP							2024–2026	79	1,500	225	10	201	702	935	1,171
MA/RI	Mayflower OCS-A 0521	COP, PPA, SAP					X		2024–2028	147	2,400	1,179	6.5	497	605	919	1,066
MA/RI	Beacon Wind 1, part of OCS-A 0520	PPA, SAP							2024–2025	78	1,230	233	6.5	186	591	984	853
MA/RI	Beacon Wind 2, part of OCS-A 0520	SAP					X		2025–2026	77	1,200	233	6.5	186	591	984	853
MA/RI	Bay State Wind, part of OCS-A 0500	SAP, COP (unpublished); the MW is included in the description below in the 5,148 MW.					X		By 2030, spread over 2025–2030	110	4,200	120	6.5	172	492	722	853
MA/RI	Liberty Wind, part of OCS-A 0522	This group is exposed to 5,800 MW of demand—for MA (4,000 MW remaining), CT (900 MW remaining), and RI (900 MW expected). Collectively the remaining technical capacity is 5,148 MW.					X					120			492	722	853
MA/RI	OCS-A 0500 remainder						X					120			492	722	853
MA/RI	OCS-A 0487 remainder						X			227		120	6.5	398	492	722	853
MA/RI	Remaining MA/RI Lease Area Total[2]	73%								337	4,400	480	6.5	540	492	722	853

Region	Lease, Project, Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[3]						Estimated Construction Schedule[4]	Turbine Number[5]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles)[6]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Interarray Cable Length (statute miles)[7]	Hub Height (feet)[8]	Rotor Diameter (feet)[8]	Height of Turbine (feet)[8]
			Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism									
	Total MA/RI Leases[2]									**974**	**13,248**	**2,680**		**2,084**			
New York/New Jersey Region																	
NY/NJ	Ocean Wind 1, OCS-A 0498	COP, PPA, SAP					X		2023–2025	98	1,100	194[11]	98	190	512	788	906
NY/NJ	Atlantic Shores South (OCS-A 0499)	COP, PPA, SAP					X		2024–2027	200	1,510	441	58	547	576	919	1,049
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA					X		By 2030, spread over 2026–2030	111	1,554	120	5	173	512	788	906
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP	X	X	X	X	X	X	2023–2026	57	816	46	5	133	525	853	951
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA, SAP	X	X	X	X	X	X	2023–2027	90	1,260	30	5	166	525	853	951
NY/NJ	Atlantic Shores North, OCS-A 0549	SAP					X		By 2030, spread over 2026–2030	157	2,198	99	58	249	576	919	1,049
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537				X		X	X	By 2030, spread over 2026–2030	100	1,200	120	5	157	492	722	853
NY/NJ	Attentive Energy LLC, OCS-A 0538						X	X	By 2030, spread over 2026–2030	102	1,224	120	5	160	492	722	853
NY/NJ	Bight Wind Holdings LLC, OCS-A 0539						X	X	By 2030, spread over 2026–2030	145	1,740	120	5	231	492	722	853
NY/NJ	Atlantic Shores Offshore Wind Bight LLC, OCS-A 0541						X		By 2030, spread over 2026–2030	93	1,116	120	5	147	492	722	853
NY/NJ	Invenergy Wind Offshore LLC, OCS-A 0542						X		By 2030, spread over 2026–2030	97	1,164	120	5	153	492	722	853
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544			X	X		X	X	By 2030, spread over 2026–2030	102	1,224	120	5	160	492	722	853
	Total NY/NJ Leases									**1,352**	**16,106**	**1,650**		**2,466**			
Maryland/Delaware Region																	
DE/MD	Skipjack, part of OCS-A 0519	COP, PPA, SAP					X		2024	16	120	40	10	30	492	722	853
DE/MD	US Wind, part of OCS-A 0490	COP, PPA, SAP					X		2024–2027	121	2,000	146	7	152	528	820	938
DE/MD	GSOE I, OCS-A 0482	Collectively the technical capacity of this is group is 1,080 MW (90 turbines). The remaining capacity may be utilized by demand from NJ or MD.					X		By 2030, spread over 2023–2030	90	1,080	-	-	-	492	722	853
DE/MD	OCS-A 0519 remainder						X					-	-	-			
DE/MD	Remaining DE/MD Lease Area Total									90	1,080	240	5	139			
	Total DE/MD Leases									**227**	**3,200**	**426**		**321**			
Virginia/North Carolina Region																	
VA/NC	CVOW-C, OCS-A 0483	COP, SAP					X		2025–2027	205	3,000	417	5	301	489	761	869

Region	Lease, Project, Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps geographic analysis area)[3]						Estimated Construction Schedule[4]	Turbine Number[5]	Generating Capacity (MW)	Offshore Export Cable Length (statute miles)[6]	Offshore Export Cable Installation Tool Disturbance Width (feet)	Interarray Cable Length (statute miles)[7]	Hub Height (feet)[8]	Rotor Diameter (feet)[8]	Height of Turbine (feet)[8]
			Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism									
VA/NC	Kitty Hawk North, OCS-A 0508	COP, SAP					X		2024–2030	69	1,242	100	30	149	574	935	1,042
VA/NC	Kitty Hawk South, OCS-A 0508	COP					X		2024–2027	121	1,242	353	30	200	574	935	1,042
	Total VA/NC Leases									**395**	**5,484**	**870**		**650**			
	OCS Total (Planned)[9,10]									**2,948**	**38,038**	**5,626**		**5,522**			

Projects in *italics* are projects that have already been constructed or that are ongoing projects. Completed and ongoing projects are not included in project totals.
[1] The spacing/layout for projects are as follows: NE State water projects include a single strand of WTGs and no OSS. For projects in the RI, MA, NY, NJ, DE, MD lease areas, a 1×1–nm grid spacing is assumed. For the CVOW-C Project, the spacing is 0.7 nm; and the Dominion commercial lease area off the coast of Virginia would utilize 0.5 nm average spacing, which is less than the 1×1–nm spacing due to the need to attain the state's goals.
[2] Because development could occur anywhere within the RI and MA lease areas and assumes a continuous 1x1–nm grid, the actual development for these projects is expected to be approximately 73% of the collective technical capacity. Under the scenario described in this appendix, the total area in the RI and MA lease areas is greater than the area needed to meet state demand. Therefore, if a project is not constructed, BOEM assumes that another future project would be constructed to fulfill the unmet demand.
[3] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[4] The estimated construction schedule is based on information known at the time of this analysis and could be different when an applicant submits a COP.
[5] The number of turbines for those lease areas without an announced number of turbines has been calculated based on lease size, a 1×1-nm grid spacing, and/or the generating capacity.
[6] BOEM assumes that each offshore wind development would have its own cable (both onshore and offshore) and that future projects would not utilize a regional transmission line. The length of offshore export cable for those lease areas without a known project size is assumed to include two offshore cables totaling 120 miles (193 kilometers). The offshore export cable would be buried a minimum of 4 feet (1.8 meters) but not more than 10 feet (3.1 meters).
[7] If information for a future project could not be obtained from a COP, the length of interarray cabling is assumed to be the average amount per foundation based on the COPs submitted to date, which is 1.48 miles (2.4 kilometers). In addition, for those lease areas that require more than one OSS, it is assumed that an additional 6.2 miles (9.9 kilometers) of inter-link cable would be required to link the two OSS. Interarray cable is assumed to be buried between 4 and 6 feet.
[8] The hub height, rotor diameter, and turbine height for lease areas is based on worst-case scenario for the resource area. Presentation of heights vary by COP and may be presented relative to MLLW, mean sea level, or height above highest astronomical tide.
[9] BOEM recognizes that the estimates presented within this analysis are likely high, conservative estimates; however, BOEM believes that this analysis is appropriately capturing the potential cumulative impacts and errs on the side of maximum impacts. Totals by lease area and by OCS may not fully sum due to rounding errors.
[10] New York's demand is not double-counted; this total comes from looking at New York's state demand, not adding up the potential of the areas because that would double-count New York.
CT = Connecticut; CVOW = Coastal Virginia Offshore Wind; DE = Delaware; FDR = Facility Design Report; FIR = Fabrication and Installation Report; MA = Massachusetts; MD = Maryland; NE = New England; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement; RAP = research activities plan; RI = Rhode Island
[11] Includes cable length from offshore export cables and substation interconnector cables.

Table F2-2 Offshore Wind Development Activities on the U.S. East Coast: Projects and Assumptions (Part 2, Seabed/Anchoring Disturbance and Scour Protection)

Region	Lease/Project/Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area)[3]						Estimated Foundation Number[2]	WTG Foundation Footprint[3] (acres)	WTG Seabed Disturbance (Foundation + Scour Protection) (acres)[4]	Offshore Export Cable Seabed Disturbance (acres)[5]	Offshore Export Cable Operating Seabed Footprint (acres)[6]	Offshore Export Cable Hard Protection (acres)[7]	Anchoring Disturbance (acres)[8]	Interarray Construction Footprint/Seabed Disturbance (acres)[9]	Interarray Operating Footprint/ Seabed Disturbance (acres)[10]	Interarray Cable Hard Protection (acres)[11]
			Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism										
NY/NJ	Ocean Wind 1, OCS-A 0498	COP, PPA, SAP					X		101	4	84	1,935[12]	78	94	19	1,850[13]	144	77
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP					X		211	9	135	1,606	137	12	262	2,035	317	307
NY/NJ	Ocean Wind 2, OCS-A 0532	PPA					X		113	5	96	727	48	43	12	271	162	0
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP	X	X	X	X	X	X	58	1	52	368	37	33	9	534	82	26
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA, SAP	X	X	X	X	X	X	91	2	82	360	24	32	9	633	129	32
NY/NJ	Atlantic Shores North, OCS-A 0549	SAP					X		160	7	135	600	40	35	10	382	239	0
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537				X		X	X	102	4	87	727	48	43	12	952	146	0
NY/NJ	Attentive Energy LLC, OCS-A 0538						X	X	104	4	88	727	48	43	12	970	149	0
NY/NJ	Bight Wind Holdings LLC, OCS-A 0539						X	X	148	6	126	727	48	43	12	1,403	212	0
NY/NJ	Atlantic Shores Offshore Wind Bight LLC, OCS-A 0541						X		95	4	81	727	48	43	12	890	136	0
NY/NJ	Invenergy Wind Offshore LLC, OCS-A 0542						X		99	4	84	727	48	43	12	925	142	0
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544			X			X		104	4	88	727	48	43	12	970	149	0
	Total NY/NJ Leases		X	X	X		X	X	**1,386**	**54**	**1,138**	**9,959**	**652**	**506**	**393**	**11,815**	**2,006**	**442**
	MA, RI, DE, MD, NC, VA Leases								**1,630**	**206**	**3,466**	**140,321**	**1,814**	**1,017**	**2,009**	**22,484**	**2,529**	**697**
	OCS Total								**3,016**	**260**	**4,604**	**150,280**	**2,465**	**1,523**	**2,402**	**34,299**	**4,534**	**1,139**

[1] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[2] The estimated number of foundations is the total number of turbines plus OSS. If information for a future project could not be obtained from a publicly available COP, it is assumed that for every 50 turbines there would be one OSS installed.
[3] If information for a future project could not be obtained from a publicly available COP, the foundation footprint is assumed to be 0.04 acre, which is based on the largest monopile reported (12 MW) for all lease areas.
[4] The seabed disturbance with the addition of scour protection was calculated based on scour protection expected in submitted COPs. If information for a future project could not be obtained from a publicly available COP, it is assumed that for all lease areas that a 12-MW foundation with addition of scour protection would be 0.85 acre per foundation.
[5] Offshore export cable seabed bottom disturbance is assumed to be due to installation of the export cable, the use of jack-up vessels, and the need to perform dredging. If information for a future project could not be obtained from a publicly available COP, export cable seabed disturbance assumed to be 6.06 acres per mile.
[6] If information for a future project could not be obtained from a publicly available COP, the offshore export cable operating seabed footprint assumed to be 0.4 acre per mile.
[7] If information for a future project could not be obtained from a publicly available COP, the offshore export cable hard protection is assumed to be similar to Vineyard Wind 1 Project, which is 0.357 acre per mile of offshore export cable.
[8] If information for a future project could not be obtained from a publicly available COP, anchoring disturbance for other lease areas is assumed to be a rate equal to 0.10 acre per mile of offshore export cable.
[9] If information for a future project could not be obtained from a publicly available COP, interarray construction seabed disturbance is assumed to be 6.06 acres per mile.
[10] If information for a future project could not be obtained from a publicly available COP, the interarray operating footprint is assumed to be a rate equal to the average amount per foundation of 1.43 acres per foundation.
[11] If information for a future project could not be obtained from a publicly available COP, the interarray cable hard protection is assumed to be zero.
[12] Includes disturbance from offshore export cables and substation interconnector cables. Assumes an 82-foot-wide corridor would be disturbed per cable, based on the Ocean Wind 1 COP.
[13] Assumes an 82-foot-wide corridor would be disturbed, based on the Ocean Wind 1 COP.
nd = not defined; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement

Table F2-3 Offshore Wind Development Activities on the U.S. East Coast: Projects and Assumptions (Part 3, Gallons of Coolant, Oils, Lubricants, and Diesel Fuel)

Region	Lease/Project/Lease Remainder[1]	Status	Geographic Analysis Area (X denotes lease area is within or overlaps analysis area)[1]						Total Coolant Fluids in WTGs (gallons)	Total Coolant Fluids in OSS or ESP (gallons)	Total Oils and Lubricants in WTGs (gallons)	Total Oils and Lubricants in OSS or ESP (gallons)	Total Diesel Fuel in WTGs (gallons)	Total Diesel Fuel in OSS or ESP (gallons)
			Water Quality, Navigation	Benthic	Other Marine Uses (excluding research surveys & navigation)	Marine Archaeology	Birds, Bats, Marine Mammals, Sea Turtles, Finfish, Invertebrates, EFH, Fisheries, Research Surveys	Visual, Recreation & Tourism						
NY/NJ	Ocean Wind 1, OCS-A 0498	COP, PPA, SAP					X		39,690	-	187,964	238,707	77,714	158,502
NY/NJ	Atlantic Shores South, OCS-A 0499	COP, PPA, SAP					X		820,000	10,300	606,200	370,050	80,000	75,000
NY/NJ	Ocean Wind 2, part of OCS-A 0532[2]	PPA					X		44,953	-	212,888	160,732	88,019	105,673
NY/NJ	Empire Wind 1, part of OCS-A 0512	COP, PPA, SAP	X	X	X	X	X	X	49,704	-	285,684	158,503	-	7,925
NY/NJ	Empire Wind 2, part of OCS-A 0512	COP, PPA, SAP	X	X	X	X	X	X	78,480	-	451,080	158,503	-	7,925
NY/NJ	Atlantic Shores North, OCS-A 0549[3]	SAP					X		643,700	8,240	475,867	296,040	62,800	60,000
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537[2]				X		X		40,500	-	191,800	243,579	79,300	161,737
NY/NJ	Attentive Energy LLC, OCS-A 0538[2]						X	X	35,235	-	195,363	248,450	80,886	164,971
NY/NJ	Bight Wind Holdings LLC, OCS-A 0539[2]						X	X	53,460	-	278,110	353,189	114,985	234,518
NY/NJ	Atlantic Shores Offshore Wind Bight LLC, OCS-A 0541[2]						X		36,045	-	178,374	226,528	73,749	150,415
NY/NJ	Invenergy Wind Offshore LLC, OCS-A 0542[2]						X		39,690	-	186,046	236,271	76,921	156,885
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544[2]		X	X	X		X	X	41,310	-	195,636	248,450	80,886	164,971
	Total NY/NJ Leases								**1,935,322**	**18,540**	**3,445,285**	**2,939,003**	**815,260**	**1,448,523**
	MA, RI, DE, MD, NC, VA Leases								**2,068,080**	**21,537**	**5,193,820**	**5,662,633**	**1,355,996**	**1,062,241**
	OCS Total								**4,003,402**	**40,077**	**8,639,105**	**8,601,636**	**2,171,556**	**2,510,764**

[1] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas.
[2] Quantities of coolant, oil and lubricants, and diesel fuel are scaled to Ocean Wind 1 based on number turbines and OSS.
[3] Quantities of coolant, oil and lubricants, and diesel fuel are scaled to Atlantic Shores South based on number turbines and OSS.
ESP = electrical service platform; NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement

Table F2-4 Offshore Wind Leasing Activities on the U.S. East Coast: Projects and Assumptions (Part 4, OCS Construction and Operation Emissions)

Region	Lease/Project/Lease Remainder[1]	Status	Air Quality Geographic Analysis Area	2023	2024	2025	2026	2027	2028	2029	2030	Beyond 2030
Nitrogen oxides (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	1	779	3,330	3,597	2,422	479	479	479	479
NY/NJ	OW Ocean Wind East LLC, OCS-A 0537		X	--	--	--	2,280	2,280	2,280	2,280	2,280	162
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544		X	--	--	--	2,326	2,326	2,326	2,326	2,326	165
	Total Air Quality Analysis Area			1	779	3,330	8,203	7,028	5,085	5,085	5,085	806
Volatile organic compounds (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	31	168	150	103	21	21	21	21
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537		X	--	--	--	60	60	60	60	60	4
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544		X	--	--	--	61	61	61	61	61	4
	Total Air Quality Analysis Area			1	31	168	271	224	142	142	142	29
Carbon monoxide (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	185	816	920	721	228	228	228	228
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537		X	--	--	--	440	440	440	440	440	41
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544		X	--	--	--	449	449	449	449	449	42
	Total Air Quality Analysis Area			0	185	816	1,809	1,610	1,117	1,117	1,117	311
Particulate matter, 10 microns or less (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	19	91	108	75	13	13	13	13
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537		X	--	--	--	75	75	75	75	75	6
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544		X	--	--	--	76	76	76	76	76	6
	Total Air Quality Analysis Area			1	19	91	259	226	164	164	164	25
Particulate matter, 2.5 microns or less (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	19	89	105	73	12	12	12	12
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537		X	--	--	--	71	71	71	71	71	6
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544		X	--	--	--	73	73	73	73	73	6
	Total Air Quality Analysis Area			1	19	89	249	217	156	156	156	24
Sulfur dioxide (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	0	16	75	68	43	7	7	7	7
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537		X	--	--	--	24	24	24	24	24	1
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544		X	--	--	--	24	24	24	24	24	1
	Total Air Quality Analysis Area			1	16	75	116	91	55	55	55	9
Carbon dioxide (tons)												
NY/NJ	Empire Wind (EW 1 & EW 2), OCS-A 0512	COP, PPA, SAP	X	280	48,380	202,661	215,973	160,035	45,918	45,918	45,918	45,918
NY/NJ	OW Ocean Winds East LLC, OCS-A 0537		X	--	--	--	133,941	133,941	133,941	133,941	133,941	11,992
NY/NJ	Vineyard Mid-Atlantic LLC, OCS-A 0544		X	--	--	--	136,620	136,620	136,620	136,620	136,620	12,232
	Total Air Quality Analysis Area			280	48,380	202,661	486,534	430,596	316,479	316,479	316,479	70,142

[1] This column identifies lease areas that are applicable to each resource based on the geographic analysis areas shown in Attachment 1 of this appendix.
Note: Emissions for OW Ocean Winds East LLC and Vineyard Mid-Atlantic LLC are scaled from Ocean Wind, based on number of turbines and estimated construction schedule.
NJ = New Jersey; NY = New York; PPA = Power Purchase Agreement

References Cited

Bureau of Ocean Energy Management (BOEM). 2019. *National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf*. Available: https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/IPFs-in-the-Offshore-Wind-Cumulative-Impacts-Scenario-on-the-N-OCS.pdf. Accessed: December 2020.

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