APPENDIX E1

Description and Screening of Relevant Offshore Wind and Non–Offshore Wind Impact-Producing Factors and Negligible Impact Determinations

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Tables

Introduction

The Bureau of Ocean Energy Management (BOEM) developed the tables in Appendix E1 for each resource category based on the 2019 study titled *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). The next page provides an overview table of the impact-producing factors (IPFs) considered for each resource in the environmental impact statement (EIS).

Tables E1-1 to E2-21 provide an analysis of the relevant ongoing and future non–offshore wind activities by IPF for each resource, as well as a reference to where in the Revolution Wind Farm and Revolution Export Cable Project EIS each of those IPFs is analyzed in relation to future offshore wind activities and the Proposed Action and alternatives, if applicable. Some IPFs were determined either not applicable or to have negligible impacts and therefore do not warrant detailed analysis in the EIS pursuant to 40 CFR 1502.15. In these cases, IPF analysis is solely provided in Tables E1-1 to E2-21.

A full list of abbreviations is provided in the EIS's Abbreviations section. Please refer to this section for abbreviations used in the tables in this appendix.

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Appendix E1 Overview Table

IPFs	Air		Bats		Benthic Habitat and Invertebrates		Birds		Coastal Habitats and Fauna		Commercial Fisheries and For-Hire Recreational Fishing		Cultural Resources		Demographics, Employment, and Economics		Environmental Justice		Finfish and Essential Fish Habitat		Land Use and Coastal Infrastructure		Marine Mammals		Navigation and Vessel Traffic		Other Uses		Recreation and Tourism		Sea Turtles		Visual Resources		Water Quality		Wetlands and Other Waters of the United States	
	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On	Off	On
Accidental releases	X	X			X		X	X			X		X	X				X	X		X	X	X				X	X			X				X	X		X
Air emissions	X	X															X	X																				
Anchoring					X						X		X						X						X				X	X	X				X			
Bycatch					X																		X								X							
Discharges					X													X									X	X							X	X		X
Electromagnetic fields					X														X		X	X	X								X							
Energy generation, energy security															X																							
Light			X	X	X		X	X			X		X	X	X		X		X		X	X	X				X	X	X	X	X		X	X				
New cable emplacement and maintenance				X	X		X	X		X	X		X	X	X		X	X	X		X	X	X		X		X	X	X	X	X				X	X		
Noise			X	X	X		X	X		X	X						X	X	X		X	X	X				X	X	X	X	X							
Port utilization					X							X				X			X		X	X	X		X		X	X	X	X	X				X	X		
Presence of structures			X	X	X		X	X		X	X		X	X	X		X	X	X		X	X	X		X		X	X	X	X	X		X	X	X	X		X
Regulated fishing effort											X																											
Sediment deposition and burial					X														X				X								X							X
Traffic					X		X	X			X				X	X	X	X	X				X		X	X	X		X	X	X							
Climate change	X	X			X		X	X		X	X		X	X	X		X		X				X				X	X			X							
Ocean acidification					X		X	X											X				X								X							

Notes: Off = Offshore, On = Onshore

Air Quality

Table E1-1. Summary of Activities and the Associated Impact-Producing Factors for Air Quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
Accidental releases: Fuel/fluids/ hazmat	Accidental releases of air toxics or HAPS are due to potential chemical spills. Ongoing releases occur in low frequencies. These could 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 (2021), which collects data on oil spills from tankers and other sources. From 1990 to1999, the average annual input to the coastal Northeast was 220,000 barrels of petroleum and offshore it was less than 70,000 barrels.	Accidental releases of air toxics or HAPS would be due to potential chemical spills. See Table E1-4 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. These could lead to short-term periods of toxic pollutant emissions through evaporation. Air quality impacts would be short term and limited to the local area at and around the accidental release location.	Air quality impacts associated with accidental spills from other reasonably foreseeable projects could also occur; however, releases would be short term, localized, and generally small in volume and would not contribute to air quality in measurable amounts. Therefore, impacts to air quality would be **negligible** adverse.	**Offshore:** Alternatives B through F would result in air quality impacts from air emissions associated with accidental spills during construction and installation. Releases would be short term, localized, and generally small in volume and would not contribute to air quality in measurable amounts. Construction under Alternatives C through F could result in a reduced risk of inadvertent spills due to the reduced number of installed WTGs, resulting in a potential decrease in Project-related spill emissions. However, impacts to air quality under Alternatives B through F would still be **negligible** adverse. Once the RWF has been constructed, spills are unlikely. Air quality impacts associated with any accidental spills would be short term, localized, and generally small in volume and would not contribute to air quality in measurable amounts. Alternatives C through F would result in O&M and decommissioning impacts to air quality at quantities and durations similar to, or slightly reduced from, the Proposed Action. However, impacts to air quality under Alternatives B through F would be **negligible** adverse. BOEM estimates that the Project would result in a 56% incremental increase in total chemical usage over the No Action Alternative in the water quality geographic analysis area. However, with the implementation of EPMs and compliance with regulations, the incremental additional effects of accidental releases from the Proposed Action would not contribute appreciably to overall impacts on air quality. Project-related accidental spills or discharges, including those associated with vessel allisions or collisions, associated with Alternatives C through F would result in air quality impacts at quantities and durations similar to, or slightly reduced from, the Proposed Action. Therefore, when combined with past, present, and reasonably foreseeable projects, Alternatives B through F would result in **negligible** adverse cumulative impacts to air quality due to accidental releases.
				Onshore: Inadvertent spills in onshore waters during construction, such as the release of fuels and oils from vehicles or infrastructure, which would disperse rapidly, would be classified as routine and would be localized, short term, and minor (BOEM 2015). Therefore,

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
				negligible adverse impacts to air quality from onshore spills are anticipated from the Proposed Action during construction and installation and O&M. The Proposed Action when combined with past, present, and other reasonably foreseeable projects would also result in short-term and **negligible** adverse cumulative impacts on air quality. Alternatives C through F would not impact onshore activities; therefore, impacts would be the same as those described for the Proposed Action: **negligible** adverse.
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 O_3, 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 could affect the air quality impacts are expansions and modifications to existing fossil fuel power plants, onshore and offshore activities involving renewable energy facilities, and various construction activities.	The largest air quality impacts over the next 35 years would occur during the construction phase of any one project; however, projects would be required to comply with the CAA. During the limited construction and decommissioning phases, emissions could occur that are above de minimis thresholds and would require offsets and mitigation. Primary emission sources would be due to increased commercial vehicular traffic, air traffic, public vehicular traffic, and combustion emissions from construction equipment as well as fugitive emissions from construction-generated dust. As projects come online, power generation emissions overall would decline, and the industry as a whole would have a net benefit on air quality.	See Section 3.4.1.1 for analysis.	See Sections 3.4.2.2 and 3.4.2.3 for analysis.
Air emissions: O&M		Activities associated with O&M of onshore wind projects would have a proportionally very small contribution to emissions compared to construction and decommissioning activities over the next 35 years. Emissions would largely be due to commercial vehicular traffic and operation of emergency diesel generators. Such activity would result in short-term, intermittent, and widely dispersed emissions and small air quality impacts.	See Section 3.4.1.1 for analysis.	See Sections 3.4.2.2 and 3.4.2.3 for analysis.
Air emissions: Power generation emissions reductions		Many Atlantic states have committed to clean energy goals, with offshore wind playing a large role. Other reductions include transitioning to onshore wind and solar. The No Action Alternative without implementation of other future offshore wind projects could result in increased air quality impacts regionally due to the need to construct and operate new energy generation facilities to meet future power demands. Unless substituted by other, non–offshore wind sources, these facilities could consist of new natural gas–fired power plants or coal-fired, oil-fired, or clean coal–fired plants. These types of facilities would likely have larger and	See Section 3.4.1.1 for analysis.	See Sections 3.4.2.2 and 3.4.2.3 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
		continuous emissions and result in greater regional-scale impacts on air quality.		
Climate change	The construction and installation, O&M, 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 would likely decrease GHG emissions by replacing energy from fossil fuels.	Development of future onshore wind projects would 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 would be expected 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.	See Section 3.4.1.1 for analysis.	See Sections 3.4.2.2 and 3.4.2.3 for analysis.

Bats

Table E1-2. Summary of Activities and the Associated Impact-Producing Factors for Bats

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
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 could be less sensitive to temporary threshold shifts 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.	See Section 3.5.1.1 for analysis.	See Sections 3.5.2.2 and 3.5.2.3 for analysis during offshore activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
Noise: Onshore 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 could be disturbed during construction but would be expected to move to a different roost farther from construction noise. This behavior 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 could occur (Schaub et al. 2008). However, no injury or mortality would be expected.	See Section 3.5.1.1 for analysis.	See Sections 3.5.2.2 and 3.5.2.3 for analysis during onshore activities.
Presence of structures: Migration disturbances	There could be few structures scattered throughout the offshore bats geographic analysis area, such as navigation and weather buoys and light towers (NOAA 2020a). 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.	See Section 3.5.1.1 for analysis.	See Sections 3.5.2.2 and 3.5.2.3 for analysis.
Presence of structures: Turbine strikes	There could be few structures in the offshore bats geographic analysis area, such as navigation and weather buoys, turbines, and light towers (NOAA 2020a). 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 to the left under Ongoing Activities, these structures would not be expected to result in increased collision risk to migrating tree bats in the marine environment.	See Section 3.5.1.1 for analysis.	See Sections 3.5.2.2 and 3.5.2.3 for analysis.
New cable emplacement/maintenance	Cable emplacement and maintenance activities are expected to continue to follow current trends. Potential direct effects on individuals could occur if these activities include tree removal when bats are potentially present. Injury or mortality could 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.	See Section 3.5.1.1 for analysis.	See Sections 3.5.2.2 and 3.5.2.3 for analysis during onshore activities.
Light: Vessels	Ocean vessels have an array of lights, including navigational lights, deck lights, and interior lights. Bats could demonstrate attraction to or avoidance of construction vessels installing offshore facilities, particularly if insects (i.e., prey) are drawn to the lights of the vessels. 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.	No future activities were identified within the bats geographic analysis area other than ongoing activities.	See Section 3.5.1.1 for analysis.	See Sections 3.5.2.2 and 3.5.2.3 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
Light: Structures	Buoys, towers, and onshore structures with lights could attract bats. 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.	See Section 3.5.1.1 for analysis.	See Sections 3.5.2.2 and 3.5.2.3 for analysis.
Climate change: Warming and sea level rise, storm severity/frequency	Storms during breeding and roosting season could 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, including increased storm severity/frequency and increased disease frequency, could impact bats. However, the intensity and extent of these potential impacts are speculative at this time; therefore, climate change is not discussed further in the context of potential impacts to bats.
Climate change: Warming and sea level rise, increased disease frequency	Disease can weaken, lower reproductive output, and/or kill individuals. Some tropical diseases would 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.		Climate change, including increased storm severity/frequency and increased disease frequency, could impact bats. However, the intensity and extent of these potential impacts are speculative at this time; therefore, climate change is not discussed further in the context of potential impacts to bats.

Birds

Table E1-3. Summary of Activities and the Associated Impact-Producing Factors for Birds

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
Accidental releases: Fuel/fluids/hazmat	See Table E1-4 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 E1-4 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.	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.
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 cable, line, and pipeline laying on an ongoing basis. In a study from 2010, students at sea collected more	As population and vessel traffic increase gradually over the next 35 years, accidental release of trash and debris could increase. This could result in increased injury or mortality of individuals. However, there does not appear	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
	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 could 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).	to be evidence that the volumes and extents would have any impact on bird populations.		
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 could 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.	See Section 3.7.1.1 for analysis during offshore activities.	See Sections 3.7.2.2 and 3.7.2.3 for analysis during offshore activities.
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.	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.
New cable emplacement/ maintenance	Cable emplacement and maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would 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 would 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.	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.
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 could flush, resulting in nonbiologically 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 could flush, resulting in nonbiologically 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.	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.
Noise: G&G	Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around	Same as ongoing activities, with the addition of possible future oil and gas surveys.	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
	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.			
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.	See Section 3.7.1.1 for analysis during offshore activities.	See Sections 3.7.2.2 and 3.7.2.3 for analysis during offshore activities.
Noise: Onshore construction	Onshore construction is routinely used in generic infrastructure projects. Equipment could cause displacement. Any displacement would only be temporary, and no individual fitness or population-level impacts would be expected.	Onshore construction would continue at current trends. Some behavior responses could range from escape behavior to mild annoyance, but no individual injury or mortality would be expected.	See Section 3.7.1.1 for analysis during onshore activities.	See Sections 3.7.2.2 and 3.7.2.3 for analysis during onshore activities.
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.	See Section 3.7.1.1 for analysis during offshore activities.	See Sections 3.7.2.2 and 3.7.2.3 for analysis during offshore 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.	See Section 3.7.1.1 for analysis during offshore activities.	See Sections 3.7.2.2 and 3.7.2.3 for analysis during offshore activities.
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 to some bird species because they 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 above). 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 could increase. These impacts are expected to be local and could be short term to permanent. These fish aggregations can provide localized short-term to permanent beneficial impacts on	See Section 3.7.1.1 for analysis during offshore activities.	See Sections 3.7.2.2 and 3.7.2.3 for analysis during offshore activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
		some bird species due to increased prey species availability.		
Presence of structures: Migration disturbances	A few structures could be scattered about the offshore geographic analysis area for birds, such as navigation and weather buoys and light towers (NOAA 2020a). Migrating birds could 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.	See Section 3.7.1.1 for analysis during offshore activities.	See Sections 3.7.2.2 and 3.7.2.3 for analysis during offshore activities.
Presence of structures: Turbine strikes, displacement, and attraction	A few structures could be in the offshore geographic analysis area for birds, such as navigation and weather buoys, turbines, and light towers (NOAA 2020a). 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 could 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 displacement. Some potential for attraction and opportunistic roosting exists but would be expected to be limited given the anticipated number of structures.	See Section 3.7.1.1 for analysis during offshore activities.	See Sections 3.7.2.2 and 3.7.2.3 for analysis during offshore activities.
Traffic	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 and follow the current trend in commercial air travel. Aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. These flights would be well below 100,000 flights, and no bird strikes would be expected to occur.	Aircraft flying at low altitudes and vehicle traffic could cause birds to flush, resulting in increased energy expenditure. Disturbance to birds, if any, would be temporary and localized, with impacts dissipating once the aircraft has left the area. General aircraft traffic accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2019). Because aircraft flights associated with offshore wind development would be minimal in comparison to baseline conditions, aircraft strikes with birds are rare. For this reason, aircraft traffic would not be expected to contribute to overall impacts on birds and as a result, BOEM expects no measurable impacts to birds from aircraft traffic. Planned future offshore projects, specifically wind projects, would result in increased short-term construction vessel traffic and long-term maintenance vessel traffic. Some of the vessel traffic from planned future projects would use designated shipping channels. Vessel traffic could cause seabirds to flush, resulting in temporary habitat loss (Schwemmer et al. 2011). Avoidance of shipping channels could result in long-term habitat loss and fragmentation; however, these adverse impacts would be short-term **negligible** as birds would become habituated to channeled traffic.	**Offshore:** Helicopters could be used for crew changes and construction support during installation of the WTGs; however, their use would be infrequent and used during foundation construction (see COP Appendix T [Tech Environmental 2021]). Vessel traffic associated with construction activities could flush birds in the path of vessels, causing temporary displacement from the area; however, impacts would be temporary and similar to baseline conditions because vessel traffic already occurs, resulting in similar temporary displacement of birds in the geographic analysis area (Stantec 2018). The expected adverse impacts of aircraft and vessel traffic associated with the Proposed Action alone would not increase the impacts of this IPF beyond the impacts described under the No Action Alternative. Alternatives C through F would reduce the number of WTGs installed, potentially resulting in a reduced number of helicopter trips and vessel traffic required during construction. However, no measurable change from Proposed Action construction impacts to birds from this IPF is anticipated. Therefore, impacts under Alternatives B through F are expected to be short term **negligible** adverse. A hoist-equipped helicopter could be used to support O&M of the RWF; however, helicopter use would be infrequent (see COP Appendix T [Tech Environmental 2021]). Increases in vessel traffic during maintenance activities would be limited and infrequent. The expected adverse impacts to birds from aircraft and vessel traffic associated with Alternatives B through F alone would not increase the impacts of this IPF beyond the impacts

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
				described under the No Action Alternative: short term **negligible** adverse. Aircraft flights associated with Project activities would be infrequent, and aircraft strikes with birds would be rare. Aircraft flights associated with other past, present, and reasonably foreseeable activities passing through the Lease Area would be minimal and infrequent. Vessel traffic could cause birds to flush, resulting in a temporary loss of habitat during construction activities associated with all Project alternatives. Impacts could be greater if avoidance and displacement of birds occur during seasonal migration periods. However, impacts would be temporary and similar to baseline conditions because vessel traffic already occurs in the geographic analysis area (Stantec 2018) and birds are habituated to regularly used shipping channels. In the context of reasonably foreseeable environmental trends, the combined aircraft and vessel traffic impacts from ongoing and planned actions, including Alternatives B through F, would be similar to the impacts under the No Action Alternative: long term **negligible** adverse.
				Onshore: Aircraft traffic would not have an onshore impact on birds. Therefore, impacts would be **negligible** adverse under all alternatives.
Climate change: Warming and sea level rise, storm severity/frequency, altered habitat/ecology	Increased storm frequency and severity during the breeding season can reduce productivity of bird nesting colonies and kill adults, eggs, and chicks. Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 30 years, influencing the distribution of bird prey resources.	No future activities were identified within the geographic analysis area for birds other than ongoing activities.	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.
Climate change: Ocean acidification	Increasing ocean acidification could 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.	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.
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.	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/ Extent	Action Alternatives B through F
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.	See Section 3.7.1.1 for analysis.	See Sections 3.7.2.2 and 3.7.2.3 for analysis.

Water Quality

No IPFs with solely negligible impacts were identified.

Table E1-4. Summary of Activities and the Associated Impact-Producing Factors for Water Quality

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
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, line, and pipeline laying activities. According to the 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 (2021), 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 would be expected to brief and localized from accidental releases.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities. Impacts are unlikely to affect water quality.	See Sections 3.21.1.1.1 and 3.21.1.2.1 for analysis.	See Sections 3.21.2.2 and 3.21.2.3 for analysis.
Accidental releases: Trash and debris	Trash and debris could be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities, and cable, line, 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 could increase. However, there does not appear to be evidence that the volumes and extents anticipated would have any effect on water quality.	See Sections 3.21.1.1.1 and 3.21.1.2.1 for analysis.	See Sections 3.21.2.2 and 3.21.2.3 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Anchoring	Impacts from anchoring occur due to ongoing military use and survey, commercial, and recreational activities.	Impacts from anchoring could occur semiregularly over the next 35 years due to offshore military operations or survey activities. These impacts would include increased seafloor disturbance resulting in increased turbidity levels. All impacts would be localized, short term, and temporary.	See Section 3.21.1.1.1 for analysis within offshore waters. Anchoring would not impact onshore waters.	See Sections 3.21.2.2 and 3.21.2.3 for analysis within offshore waters. Anchoring would not impact onshore waters.
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 could continue to occur infrequently over the next 35 years due to survey activities and submarine cable, line, 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. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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.	See Sections 3.21.1.1.1 and 3.21.1.2.1 for analysis.	See Sections 3.21.2.2 and 3.21.2.3 for analysis.
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 would increase modestly. The ability of ports to receive the increase in larger ships would 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 could continue to increase in the foreseeable future.	The general trend along the coastal region from Virginia to Maine is that port activity would 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 could continue to increase in the foreseeable future.	See Sections 3.21.1.1.1 and 3.21.1.2.1 for analysis.	See Sections 3.21.2.2 and 3.21.2.3 for analysis.
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.	See Sections 3.21.1.1.1 and 3.21.1.2.1 for analysis.	See Sections 3.21.2.2 and 3.21.2.3 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
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 Atlantic and Mid-Atlantic is expected to gradually decrease or remain stable. Impacts of ocean disposal on water quality are minimized because the EPA has established dredge spoil criteria and regulate the disposal permits issued by the USACE. The impact on water quality from sediment suspension during these future activities would be short term and localized.	See Sections 3.21.1.1.1 and 3.21.1.2.1 for analysis.	See Sections 3.21.2.2 and 3.21.2.3 for analysis.

Coastal Habitats and Fauna

Table E2-1. Summary of Activities and the Associated Impact-Producing Factors for Coastal Habitats and Fauna

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
New cable emplacement/ maintenance	Onshore buried transmission cables are present in the area near the Project onshore and offshore improvements. Onshore activities would only occur where permitted by local land use authorities, which would avoid long-term land use conflicts. 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 known proposed onshore structures are reasonably foreseeable and proposed to be located in the geographic analysis area for coastal habitats and fauna.	A small amount of infrequent construction impacts associated with onshore power infrastructure would be required over the next 6 to 10 years to tie future offshore wind energy projects to the electric grid. Typically, this would require only small, if any, amounts of coastal habitat removal and would likely occur in previously disturbed areas. Habitat loss occurs when an area supporting wildlife is converted to non-habitat that lacks the natural resources to support occupancy for any species, such as paved areas. Short-term and temporary impacts associated with habitat loss or avoidance during construction could occur, and injury or mortality of individuals could occur. For this reason, land disturbance associated with onshore construction activities would have a **negligible** contribution to overall adverse impacts on coastal habitats and fauna.	**Onshore**: During construction of the onshore transmission cable and associated activities within the landfall work area, land disturbance could result in small temporary impacts (e.g., displacement and potential injury and/or mortality of individuals) on coastal fauna. Land disturbance and subsequent habitat removal or alteration could result from the RWEC connection to the landfall work area and construction of the onshore transmission cable. Potential indirect impacts to coastal habitats would include the spread of invasive species, reduction in habitat quality, and displacement of wildlife and resources based on changes to habitat conditions. The potential for onshore construction and habitat alteration to significantly affect coastal habitat is limited because the landfall work area consists of areas of predominately human-made shoreline and grassland/shrubland areas as a result of previous human activity. Habitat conversion is not a factor for developed areas (e.g., existing buildings, mowed lawns, parking lots, roads) within the landfall envelope. The construction period for the onshore facilities would occur over approximately 18 months, and the infrastructure at the landfall work area would be placed underground when completed. HDD would be employed to connect the RWEC and the landfall work area. This would limit or completely avoid direct impacts to the human-made shoreline and ruderal grassland/shrubland because the RWEC would be installed under these resources. The temporary onshore

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				construction work area for the HDD operations would likely be situated within a previously developed area (e.g., an existing parking lot) and would not impact the human-made shoreline and/or the ruderal grassland/shrubland. However, if these habitat types are disturbed, these impacts would be short term because the area would be reseeded to re-establish previous conditions. The human-made shoreline does not support any vegetative growth. A potential indirect impact to coastal habitat from onshore construction and habitat alteration linked to construction of the landfall work area is habitat degradation via the spread of invasive species. If vegetative clearing is required within the ruderal grassland/shrubland for construction of the landfall work area, then this could provide an opportunity for invasive plant species to outcompete native plants. The baseline conditions of the ruderal grassland/shrubland habitat already support a high occurrence of invasive plant species. Habitats with high levels of invasive species can degrade habitat quality for wildlife by reducing the amount of native plant material available for foraging. However, this area of undisturbed habitat is so small it is unlikely to provide a significant habitat resource to wildlife. The spread of invasive species would be managed in compliance with state and federal regulations. Impacts to coastal habitats and fauna from construction activities at the landfall work area would be considered short-term **negligible** adverse for Alternatives B through F. As noted within the landfall work area impact assessment, wildlife species subject to direct mortality during construction of the onshore facilities are those with limited or no mobility. Onshore transmission cable installation would result in temporary ground disturbance, but permanent disturbances are not anticipated. Most of the temporary ground disturbance would be from a trench that would follow along paved roads or previously disturbed areas (e.g., parking lots) except for a small portion that intersects approximately 0.02 acre of plantation and ruderal forest. The onshore transmission cable would be up to 1 mile long with a maximum temporary disturbance corridor of 25 feet (30 feet at splice vaults) and a maximum disturbance depth of 10 feet that would be mostly limited to established road ROWs or previously disturbed areas such as parking lots with little to no impact to adjacent coastal and terrestrial habitat. Where the onshore transmission cable would connect to the OnSS, it would be installed below a proposed access driveway. Some of the alternative routes under consideration within the

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				transmission cable envelope contain segments that would pass through undeveloped, vegetated areas. If selected, these routes would require vegetative clearing and would be maintained as managed lawn and or gravel access road to maintain access to the cable infrastructure belowground. Since these segments of the onshore transmission cable routes under consideration would be installed within previously undeveloped areas, the impacts resulting from habitat alteration and conversion would be considered long term and **negligible**. Regular O&M activities would not cause further habitat alteration or impact coastal habitats and fauna. However, when cable inspection or repairs require excavation, this nonroutine maintenance could cause limited land disturbance to create access to the infrastructure. Such occurrences are expected to be infrequent and would result in localized and short-term **negligible** adverse impacts to coastal habitats and fauna for Alternatives B through F. Decommissioning of the onshore transmission cable would have similar impacts on coastal habitats and fauna to those described for the construction phase if the underground infrastructure is removed. If the infrastructure is abandoned in place, it would not have any impacts. Construction and installation, O&M, and decommissioning of the onshore transmission cable under all Project alternatives would incrementally contribute to the habitat conversion and habitat loss described under the No Action Alternative. Because of the small amount of affected onshore habitat, land disturbance from Alternatives B through F when added to other past, present, and reasonably foreseeable projects would result in **negligible** adverse incremental impacts to coastal habitats and fauna.
Presence of structures	Periodic clearing of shrubs and tree saplings along existing utility ROWs causes disturbance and temporary displacement of mobile species and could 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.	See Section 3.8.1.1 for analysis.	See Sections 3.8.2.2 and 3.8.2.3 for analysis of onshore impacts. The IPF would not impact offshore resources.
Noise: Onshore/offshore construction	Ongoing noise from construction occurs frequently near shores of populated areas in New England and the mid-Atlantic region but infrequently offshore. Noise from construction near shorelines is expected to gradually	No future activities were identified within the geographic analysis area other than ongoing activities.	Onshore construction noise has the potential to have a **negligible** adverse impact on coastal fauna. BOEM anticipates that these impacts would be temporary and highly localized. Habitat-related impacts (i.e.,	**Onshore:** Another potential indirect impact to coastal fauna during construction of the onshore facilities is displacement or avoidance behavior of individuals due to noise. The overall installation schedule for onshore

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	increase over the next 30 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.		displacement from potentially suitable habitats) could occur as a result of construction activities. These impacts would likely be limited to temporary behavioral avoidance, and no permanent impacts would be expected. Given the temporary and localized nature of potential impacts, and the current level of development within the geographic analysis area, no individual fitness or population-level impacts would occur as a result of noise associated with onshore construction activities.	facilities is expected to be approximately 1 year (see COP Section 3.2, Project Schedule). Construction would typically result in temporary increases in noise. As described in vhb's onshore acoustic assessment (vhb 2020), noise was evaluated based generally on the noisiest condition when the loudest construction equipment would be in operation. The primary noise sources generated during construction would be from increased traffic volumes (i.e., delivery trucks carrying construction equipment and supplies and automobiles used for daily commuting to various work sites) and HDD at the landfall work area. Sound-generating construction equipment associated with HDD operations would include a drill rig, a generator, and mud pumps. Unlike most other construction activities that can be limited to daytime hours, it is typically necessary for HDD operations to occur continuously to minimize the risk of soil settlement and equipment failures. Other noise-generating equipment used during HDD operations would include an excavator, a crane, and either an impact or vibratory sheet pile driver for site preparation. The onshore acoustic assessment (vhb 2020) indicates that construction equipment used to support construction of the landfall work area could create sound levels that range from 56 to 101 dBA at 50 feet from the noise source. Ambient sound measurements conducted within the analysis area under existing conditions ranged from 44 to 45 dBA (Leq) at night and 49 to 50 dBA during the day (vhb 2020). Construction of the onshore transmission cable would involve different construction phases, each using noise-generating equipment such as bulldozers, backhoes, front-end loaders, aerial lifts, trenchers, compactors, concrete saws, graders, pumps, compressors, and trucks. Because the onshore transmission cable installation process would progress along the cable route during this period, the exposure to construction noise would be limited to a discrete duration at any location along the route. The onshore acoustic assessment (vhb 2020) indicates that construction equipment used to support construction of the onshore transmission cable could create sound levels that range from 73 to 90 dBA at 50 feet from the noise source depending on the installation methodology. The sequence for construction of the OnSS and ICF would typically include clearing the site of vegetation, grading the site, installing environmental erosion controls, installing the foundations and erecting buildings for housing equipment, and restoring any disturbed areas on the site and removing environmental controls. The types of construction equipment used would generally include

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				backhoes, cranes, refrigerator units, front-end loaders, and generators. The onshore acoustic assessment (vhb 2020) indicates that construction equipment used to support construction of the OnSS could create sound levels that range from 80 to 85 dBA at 50 feet from the noise source. Potential impacts to coastal fauna from the temporary increase in construction-generated noise could include avoidance behavior and displacement during the construction period (Brown et al. 2012). Because the construction period is temporary, noise impacts on wildlife species during construction of the onshore facilities of Alternatives B through F are expected to be temporary negligible adverse. No impacts related to noise would be expected from operation of the onshore transmission cable because the infrastructure would be underground. However, when cable inspection or repairs require excavation, this non-routine maintenance could generate equipment- and vehicle-related noise. Such occurrences are expected to be infrequent and would result in localized and short-term negligible adverse impacts to coastal habitats and fauna. Decommissioning of the onshore transmission cable would have similar impacts from noise on coastal habitats and fauna to those described for the construction phase if the underground infrastructure is removed. If the infrastructure is abandoned in place, it would not have any impacts. O&M at the proposed OnSS and ICF would introduce new sources of sound, including transformers, shunt reactors, harmonic filters, cooling and ventilation associated with the outdoor substation equipment as well as condensers, pumps, skids, and auxiliary transformers associated with the synchronous condenser building. Operational sound from the OnSS and ICF is modeled to be 45.5 dBA (Leq) or less when measured at the nearest anthropogenic noise sensitive receivers, which would fall within the ambient sound range measured at baseline conditions (44 to 45 dBA (Leq) at night and 49 to 50 dBA during the day) (vhb 2020), and no impacts to coastal fauna are expected. Temporary noise could occasionally be generated during non-routine maintenance at all onshore facilities. Infrequent vehicle usage within the OnSS and ICF could create temporary disturbance to wildlife adjacent to the OnSS, but such disturbance would be short term, and normal wildlife activity would likely resume after the traffic ceases. Impacts from noise during decommissioning of onshore facilities would be similar to those during

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				construction: temporary negligible adverse for all Project alternatives. Construction, O&M, and decommissioning of the onshore facilities would also produce temporary noise that would lead to short-term negligible incremental impacts, if any, on coastal habitats and fauna. The onshore elements of Alternatives B through F would be in already developed areas with existing noise disturbance where wildlife is habituated to human activity. Therefore, the cumulative impact of noise generated by Alternatives B through F on coastal habitats and fauna when combined with past, present, and reasonably foreseeable projects would be localized and short term **negligible** adverse.
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.	See Section 3.8.1.1 for analysis.	See Sections 3.8.2.2 and 3.8.2.3 for analysis of onshore impacts. The IPF would not impact offshore resources.

Wetlands and Other Waters of the United States

Table E2-2. Summary of Activities and the Associated Impact-Producing Factors for Wetlands and Other Waters of the United States

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases: Fuel/fluids/hazmat	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.	No future activities were identified within the geographic analysis area for wetlands and other WOTUS other than ongoing activities.	See Section 3.22.1.1 for analysis.	See Sections 3.22.2.2 and 3.22.2.3 for analysis of onshore impacts. The IPF would not impact offshore resources.
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 cable, line, and pipeline laying.	No future activities were identified within the geographic analysis area for wetlands and other WOTUS other than ongoing activities.	See Section 3.22.1.1 for analysis.	See Sections 3.22.2.2 and 3.22.2.3 for analysis of onshore impacts. The IPF would not impact offshore resources.
Discharges	Discharges impact water quality by introducing nutrients, chemicals, and sediments to the water. There are regulatory requirements related to the prevention and control of discharges, the prevention and control of accidental spills, and the prevention and control of nonindigenous species.	Increased future coastal development has potential to cause increased nutrient pollution in communities, approximately 80% of which is due to groundwater contamination by septic systems. In addition, ocean disposal activity in the North Atlantic is expected to gradually decrease or remain stable. Impacts of ocean disposal on water quality are minimized because the EPA has established dredge spoil criteria and regulates the disposal permits issued by the USACE.	See Section 3.22.1.1 for analysis.	See Sections 3.22.2.2 and 3.22.2.3 for analysis of onshore impacts. The IPF would not impact offshore resources.

Associated IPFs: Sub-IPFs	**Ongoing Activities**	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Action Alternatives B through F**
New cable emplacement/ maintenance	No known proposed cables are reasonably foreseeable and proposed to be located in the geographic analysis area for wetlands and other waters of the United States.	Any new cable or pipeline installed in the geographic analysis area would likely require hard protection atop portions of the route. Such protection is anticipated to increase incrementally over the next 30 years.	See Section 3.22.1.1 for analysis.	See Sections 3.22.2.2 and 3.22.2.3 for analysis of onshore impacts. The IPF would not impact offshore resources.
Presence of structures	Ongoing development of onshore properties, especially shoreline parcels, periodically could lead to unvegetated 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. No known proposed structures are reasonably foreseeable and proposed to be located in the geographic analysis area for wetlands and other WOTUS.	Impacts associated with the presence of structures includes temporary sediment disturbance during maintenance and ongoing development. This sediment suspension would lead to short-term and localized impacts.	See Section 3.22.1.1 for analysis.	See Sections 3.22.2.2 and 3.22.2.3 for analysis of onshore impacts. The IPF would not impact offshore resources.
Sediment deposition and burial	Ongoing cable or structure maintenance activities can infrequently disturb sediments; these disturbances are local and limited to the emplacement corridor. Precipitation events could potentially mobilize the disturbed sediments into nearby surface waters, leading to potential erosion and sedimentation effects and subsequent increased turbidity.	No future activities were identified within the geographic analysis area other than ongoing activities.	Dredge materials from future offshore wind activities would not be disposed of in areas with wetlands or other WOTUS within the geographic analysis area. Therefore, **negligible** adverse impacts to wetlands and other WOTUS within the geographic analysis area are anticipated.	Dredge materials from Project activities would not be disposed of in areas with wetlands or other WOTUS. Therefore, sediment deposition and burial impacts on wetlands and other WOTUS from construction and installation would be the same for Alternatives B through F: **negligible** adverse. O&M of onshore O&M facilities could include dredging activities for Alternatives B through F; however, materials from O&M activities would not be disposed of in areas with wetlands or other WOTUS. Therefore, **negligible** adverse impacts to wetlands and other WOTUS from sediment deposition and burial are anticipated for all Project alternatives. Dredge materials from Alternatives B through F and other future offshore wind projects within the geographic analysis area would not be disposed of in areas with wetlands or other WOTUS. As a result, when combined with past, present, and reasonably foreseeable projects, Alternatives B through F are expected to result in **negligible** adverse impacts to wetlands and other WOTUS.
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.	Impacts of climate change, including increased storm severity and frequency, are ongoing stressors for wetlands and other WOTUS. Future offshore wind projects aim to combat climate change and associated effects by reducing GHG emissions. Under the No Action Alternative, the long-term net decrease in GHG emissions from other ongoing and future offshore wind and other non-fossil fuel–based energy generation projects would be slightly less than with the Proposed Action. As a result, the effects to wetlands and other WOTUS would be **negligible** to **minor** adverse, as they are anticipated to occur but have no measurable influence within the geographic analysis area.	Air pollutants could impact onshore biological resources, including wetlands and WOTUS. Acidification of soils, lakes, and streams could result in changes in community structure and biodiversity within these habitats. The OCS air permitting process will require air dispersion modeling of these emissions to demonstrate compliance with the NAAQS. Specifically, EPA requires modeling of NAAQS and Class I significant impact levels for the purpose of PSD permitting for the construction and operation of Revolution Wind. Compliance with the NAAQS offshore in and near the Lease Area will be evaluated with air quality dispersion modeling through EPAs OCS permitting. Because air emissions generated during the construction and installation period would not exceed applicable air

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				emission standards the impacts to onshore wetlands and other WOTUS would be short-term negligible adverse. Air emissions generated during O&M of onshore facilities would be less than 1% of the counties' annual emissions (see Section 3.4.2.2.2). While cumulative air emissions in the region would increase during construction, it is important to note that the Proposed Action could also contribute to a long-term net decrease in emissions by substituting some existing fossil fuel sources with a renewable source. Therefore, impacts to wetlands and other WOTUS are anticipated to be **negligible** adverse. The cumulative impacts from global climate change would be the same as those described for future offshore wind activities without the Proposed Action because emissions from other past, present, and reasonably foreseeable projects, in combination with air emissions generated during construction and O&M would not exceed applicable air emission standards. Thus, potential impacts to wetlands and other WOTUS from the incremental contribution to climate change attributed to the Proposed Action when combined with past, present, and other reasonably foreseeable projects are uncertain but are anticipated to qualify as long term **negligible** adverse. Alternatives C through F would have the same onshore activities and facilities as the Proposed Action; therefore, climate change impacts on wetlands and other WOTUS would be the same as those described for the Proposed Action: **negligible** adverse.

Benthic Habitat and Invertebrates

Table E2-3. Summary of Activities and the Associated Impact-Producing Factors for Benthic Habitat and Invertebrates

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases: Fuel/fluids/hazmat	See Table E1-4 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 nontoxic levels before they affect benthic resources. The corresponding impacts on benthic resources are rarely noticeable. Impacts, including mortality and decreased fitness, are localized and temporary and rarely affect invertebrate populations.	Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. Impacts are unlikely to affect invertebrate populations. See previous table cell and Table E1-4 on water quality for details.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.3 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Associated IPFs: Sub-IFPs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.3 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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 cable, line, 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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.3 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Anchoring	Regular vessel anchoring related to ongoing military, survey, commercial, and recreational activities continues 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. These impacts are greatest for sessile or slow-moving species (e.g., corals, sponges, and sedentary shellfish). 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 habitat.	No future activities were identified within the geographic analysis area other than ongoing activities.	See Sections 3.6.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Bycatch	Bycatch occurs in various gillnet and trawl fisheries in New England and the mid-Atlantic coast, with hotspots driven by fishing intensity (Lewison et al. 2014; NMFS 2018a).	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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 m) 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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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 invertebrates, potentially affecting distributions in	See table cell to the left.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no

Associated IPFs: Sub-IFPs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	a highly localized area. Light could also disrupt natural cycles (e.g., spawning), possibly leading to short-term impacts.		measurable effect on benthic habitat or invertebrates and are not analyzed.	measurable effect on benthic habitat or invertebrates and are not analyzed.
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 invertebrates, potentially affecting distributions in a highly localized area. Light could 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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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 seafloor profile alterations and 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. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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 benthic habitat and invertebrates, 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 benthic habitat and invertebrates.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Noise: Onshore/offshore construction	Noise from construction occurs frequently in the nearshores of populated areas in New England and the mid-Atlantic region but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. Detectable impacts of construction noise on benthic resources rarely, if ever, overlap from multiple sources. See also sub-IPF for Noise: Pile driving.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Detectable impacts of construction noise on benthic resources would rarely, if ever, overlap from multiple sources.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Noise: G&G	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb 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. Detectable impacts of G&G noise on benthic resources rarely, if ever, overlap from multiple sources.	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 seafloor, potentially resulting in injury or mortality to 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	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Associated IPFs: Sub-IFPs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
		intensity and extent of the resulting impacts are difficult to generalize, but are likely local and temporary. Detectable impacts of G&G noise on benthic resources would rarely, if ever, overlap from multiple sources.		
Noise: O&M	Some invertebrates could be able to hear the continuous underwater noise of operational WTGs. As measured at the BIWF, this low-frequency noise barely exceeds ambient levels at 164 feet (50 m) from the WTG base. Based on the results of Thomsen et al. (2015), sound pressure levels would be expected to be at or below ambient levels at relatively short distances (approximately 164 feet [50 m]) 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 could intermittently increase noise during their O&M over the next 35 years. Impacts would likely be small and local.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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 seafloor 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. Eggs, embryos, and larvae of invertebrates could also experience developmental abnormalities or mortality resulting from this noise, although thresholds of exposure are not known (Hawkins and Popper 2017; Weilgart 2018). 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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 to 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing 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 could continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity would increase modestly. The ability of ports to receive the increase could require port modifications, leading to local impacts.	**Offshore:** The development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Activities like dredging and the expansion or development of new overwater structures could lead to adverse effects on coastal and estuarine benthic habitats and invertebrates or benthic resources. However, any such impacts would be outside the geographic analysis area for benthic habitat and the nature and extent of these impacts on invertebrates cannot currently be quantified as no specific port improvement activities have	**Offshore:** Several regional ports could be used during Project construction and decommissioning, including ports in Baltimore, MD; New Bedford, MA; New London, CT; Norfolk, VA; Paulsboro, NJ; and Providence, RI, as well as Europe. The development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Port improvements could include activities like dredging and the development of new overwater structures that could adversely affect benthic resources or invertebrates within the geographic analysis

Associated IPFs: Sub-IFPs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
		Future channel-deepening activities would likely be undertaken. Existing ports have already affected benthic resources and invertebrates, and future port projects would implement BMPs to minimize impacts. Although the degree of impacts would likely be undetectable outside the immediate vicinity of the ports, adverse impacts for certain species and/or life stages could lead to impacts on benthic resources and invertebrates beyond the vicinity of the port.	been proposed. Therefore, these activities would have a **negligible** adverse impact on benthic resources and invertebrates. Any future port expansion would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects.	area, but no specific improvements are included in Alternatives B through F. Any future port expansion incentivized by the Project would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects. Therefore, these localized and cumulative habitat impacts would have **a negligible** adverse effect on benthic habitats or marine invertebrates during Project construction, O&M, and decommissioning.
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).	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Presence of structures: Hydrodynamic disturbance	Human-made 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 benthic resources and invertebrates 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 seafloor 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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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, buoys, 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 permanent as long as the structures remain.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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 and structure-oriented species thus benefit on a constant basis; however, the diversity could decline over time as early colonizers are replaced by successional communities dominated by blue mussels and anemones (Degraer et al. 2019: Chapter 7) and the new habitat can also be	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), and the diversity could 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 in the region, and species that rely	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Associated IPFs: Sub-IFPs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	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.	on this habitat would not likely experience population-level impacts (Greene et al. 2010; Guida et al. 2017).		
Presence of structures: Migration disturbances	Human structures in the marine environment (e.g., shipwrecks, artificial reefs, and oil platforms) can attract invertebrates that approach the structures during their migrations. To date, BOEM has not identified any published evidence to suggest that human structures pose a barrier to, or slow, migratory invertebrates.	The infrequent installation of future new structures in the marine environment over the next 35 years could attract invertebrates that approach the structures during their migrations. This could slow migrations. Migratory animals would likely be able to proceed from structures unimpeded.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Presence of structures: Transmission cable infrastructure	The presence of transmission 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 rows.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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, the EPA has established dredge spoil criteria and it regulates the disposal permits issued by the USACE; these discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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 and 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—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 could 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.	The USACE and/or private ports could 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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
Vessel traffic	While ongoing vessel activity could have some effect on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this	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	**Offshore:** Construction and operational vessel traffic from future wind farm development and decommissioning would not be expected to measurably affect marine	**Offshore:** Construction, O&M, and decommissioning of vessel cooling systems could entrain planktonic eggs and larvae of fish and invertebrates, leading to injury or

Associated IPFs: Sub-IFPs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	sub-IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	increase over the next 30 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.	invertebrates and benthic habitat structure and composition. Although construction and O&M of vessel cooling systems could entrain planktonic eggs and larvae of fish and invertebrates, leading to injury or mortality of some individuals, these effects are not expected to be measurable relative to natural mortality rates, which can range from 1 to 10% per day or higher (White et al. 2014). Therefore, these effects are unlikely to be significant at the population level. Vessel traffic would have no measurable effects on benthic habitat and benthic or pelagic invertebrates aside from underwater noise exposure and vessel anchoring, which are addressed separately above. Therefore, vessel traffic effects on benthic habitat and invertebrates from the construction, O&M, and decommissioning of planned and potential future offshore wind energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.	mortality of individuals. However, these short-term effects are not expected to be measurable relative to natural mortality rates and are therefore unlikely to be significant at the population level. Therefore, vessel traffic effects on invertebrates and benthic habitat would be **negligible** adverse for all Project alternatives and configurations. Although Alternatives C through F would decrease the total number of vessel trips and duration of vessel activity required for O&M and decommissioning relative to the Proposed Action, impacts would remain **negligible** adverse for all Project alternatives. The construction and O&M of all Project alternatives and other planned and potential future offshore wind energy projects would require the use of construction and operational vessels. This would increase the number of vessels operating in the invertebrate geographic analysis area for the foreseeable future. However, vessel-related entrainment mortality is unlikely to be significant at the population level for any invertebrate species. Therefore, vessel traffic cumulative effects on benthic habitat and invertebrates in combination with other planned and potential future offshore wind energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.
Climate change: Ocean acidification	Ongoing CO_2 emissions causing ocean acidification could contribute to reduced growth or the decline of benthic invertebrates that have calcareous shells, as well as reefs and other habitats formed by shells, over the course of the next 35 years.	No future activities were identified within the geographic analysis area other than ongoing activities.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.
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.	See Sections 3.6.1.1.1 and 3.6.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.	See Sections 3.6.2.2 through 3.6.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat or invertebrates and are not analyzed.

Finfish and Essential Fish Habitat

Table E2-4. Summary of Activities and the Associated Impact-Producing Factors for Finfish and Essential Fish Habitat

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases: Fuel/fluids/hazmat	See Table E1-4 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 E1-4 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.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
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 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.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Anchoring	Vessel anchoring related to ongoing military use and survey, commercial, and recreational activities continues to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. Impacts on finfish and EFH are greatest for sensitive EFH (e.g., eelgrass, hard bottom) and slow-moving species.	Impacts from anchoring could occur on a semiregular 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.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
EMFs	EMFs emanate continuously from installed telecommunication and electrical power transmission cables. Biologically significant impacts on finfish 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 within the southern New England area (CSA Ocean Sciences, Inc. and Exponent 2019).	During operation, future new cables would produce EMF. (See table cell to the left.) Submarine power cables in the geographic analysis area for this resource 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 (even for multiple cables within a single export cable corridor). Although the EMF would exist as long as a cable was in operation, impacts, on finfish and EFH would likely be difficult to detect.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
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, potentially affecting distributions in a highly	See table cell to the left.	Artificial light can attract finfish and can influence or disrupt biological functions (e.g., timing of cod spawning) (Rich and Longcore 2006) that are triggered by changes in daily and seasonal daylight cycles. Planned future activities include up to 3,008 offshore WTGs and OSS foundations. The construction and O&M of these structures would introduce new short-term and long-term	**Offshore:** Artificial lighting during construction, O&M, and decommissioning at the RWF would be associated with navigational and deck lighting on vessels from dusk to dawn. Lighting would be hooded and directed downward to avoid unnecessary illumination of the surrounding environment to the extent practicable. Reaction of finfish, including EFH species, to this artificial light is highly

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	localized area. Light could also disrupt natural cycles (e.g., spawning), possibly leading to short-term impacts.		sources of artificial light to the offshore environment in the form of vessel lighting and navigation and safety lighting on the structures, respectively. Orr et al. (2013) developed design and mitigation recommendations for reduction of biologically significant impacts from artificial light in offshore wind infrastructure. Based on these findings, BOEM (2021) has issued design guidance for avoiding and minimizing artificial lighting impacts from such activities and has concluded that adherence to these measures should effectively avoid adverse effects on fish. BOEM would require all future offshore energy projects to comply with this guidance. Given the minimal and localized nature of anticipated lighting impacts under this guidance, the related effects from proposed future activities on finfish and EFH in the geographic analysis area are likely to be **negligible** adverse.	species dependent and could include attraction and/or avoidance of the area. Artificial lighting could disrupt the migration patterns of fish, increase risk of predation and disrupt predator prey interactions, and alter species' richness and community composition in the affected area (Nightingale et al. 2006; Orr et al. 2013). However, these types of effects are most associated with bright permanent lights on nearshore and overwater structures. The Project would comply with BOEM (2021) issued design guidance for avoiding and minimizing artificial lighting impacts. Therefore, lighting effects on finfish and EFH would be short term to long-term **negligible** adverse for Alternatives B through F, with reduced impacts under Alternatives C through F due to a decrease in total duration of construction vessel activity. BOEM estimates a cumulative total of up to 3,110 offshore WTGs and OSS foundations for the Project plus all other future offshore wind projects in the finfish and EFH geographic analysis area. For reasons described in the preceding paragraph, the cumulative impacts associated with all Project alternatives when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse, mostly attributable to existing, ongoing activities.
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, potentially affecting distributions in a highly localized area. Light could 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.	See Light: Vessels for analysis.	See Light: Vessels for analysis of impacts.
New cable emplacement/ maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances are local and limited to the cable corridor. New cables are infrequently added near shore. Cable emplacement/maintenance activities disturb, displace, and injure finfish 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. The FCC has two pending submarine telecommunications cable applications in the North Atlantic. 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.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: Aircraft	Noise from aircraft reaches the sea surface on a regular basis. However, aircraft noise is not likely to impact finfish 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, aircraft noise is not likely to impact aircraft noise on finfish and EFH.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Noise: Onshore/Offshore construction	Noise from construction occurs frequently in nearshores of populated areas in New England and the mid-Atlantic region 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 shorelines is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: G&G and scientific surveys	Ongoing site characterization surveys and scientific surveys produce noise around sites of investigation. These activities can disturb finfish 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 seafloor, potentially resulting in injury or mortality to finfish 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.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: O&M	Some finfish and invertebrates could be able to hear the continuous underwater noise of operational WTGs. As measured at the BIWF, this low frequency noise barley exceeds ambient levels at 164 feet (50 m) from the WTG base. Based on the results of Thomsen et al. (2015), sound pressure levels would be expected to be at or below ambient levels at relatively short distances (approximately 164 feet [50 m]) 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 could intermittently increase noise during their O&M over the next 35 years. Impacts would likely be small and local.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
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 the seafloor can cause injury and/or mortality to finfish 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 (Hawkins and Popper 2017; Weilgart 2018). 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.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.

Associated IPFs: Sub-IPFs	**Ongoing Activities**	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Action Alternatives B through F**
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.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Noise: Vessels	While ongoing vessel noise could have some effect on behavior and masking, 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 table cell to the left.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing 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 could continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity would increase modestly. The ability of ports to receive the increase could require port modifications, leading to local impacts. Future channel-deepening activities would likely be undertaken. Existing ports have already affected finfish 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 could lead to impacts on finfish and EFH beyond the vicinity of the port.	The development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Activities like dredging and the expansion or development of new overwater structures could lead to adverse effects on finfish, including EFH species, and coastal and estuarine habitats. Resulting effects on finfish would vary depending on the types of species and habitats present. However, the nature and extent of these impacts cannot currently be quantified as no specific port improvement activities have been proposed. All future port improvements would be subject to independent environmental permitting and regulatory review. Any resulting effects on finfish would be evaluated as part of those efforts. Therefore, impacts to finfish and EFH would be **negligible** adverse.	**Offshore:** Several regional ports could be used during Project construction, including ports in Baltimore, MD; New Bedford, MA; New London, CT; Norfolk, VA; Paulsboro, NJ; and Providence, RI, as well as Europe. The development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Port improvements could include activities like dredging and the development of new overwater structures that could adversely affect finfish and EFH within the geographic analysis area, but no specific improvements are included in Alternatives B through F. Any future port expansion would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects. Therefore, Project-specific and cumulative port utilization impacts would be **negligible** adverse.
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- to long-term impacts.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Presence of structures: Hydrodynamic disturbance	Human-made 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 and EFH are typically undetectable. Indirect impacts of structures influencing primary	Tall vertical structures can increase seafloor 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.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	productivity and higher trophic levels are possible but are not well understood. New structures are periodically added.			
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 could 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 could increase. These impacts are local and could be permanent.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
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 hard-bottom and/or complex habitat; structure-oriented species thus benefit on a constant basis. 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 geographic analysis area over the next 20 to 35 years, would likely require hard protection atop portions of the route (see New cable emplacement/maintenance row). 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). 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).	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Presence of structures: Migration disturbances	Human-made structures in the marine environment (e.g., shipwrecks, artificial reefs, and oil platforms), can attract finfish 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 (Fabrizio et al. 2014; Moser and Shepherd 2009; 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 could attract finfish 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 (Fabrizio et al. 2014; Moser and Shepherd 2009; Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded.	See Section 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Presence of structures: Transmission cable infrastructure	See other sub-IPFs within the Presence of structures IPF. See Table E2-1 on Coastal Habitats and Fauna.	See other sub-IPFs within the Presence of structures IPF	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
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 and limited to the emplacement corridor. Sediment deposition could have negative impacts on eggs and larvae, including smothering and loss of fitness. Impacts could vary based on season/time of year.	No future activities were identified within the geographic analysis area for this resource other than ongoing activities.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Vessel traffic	Ongoing activities that contribute to this IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. However, no substantial changes are anticipated to existing vessel traffic volumes.	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 30 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. Vessel traffic is expected to continue at or near current levels.	Construction and O&M vessel cooling systems could entrain planktonic fish eggs and larvae, leading to injury or mortality of some finfish, including EFH individuals. However, these effects are not expected to be measurable relative to natural mortality rates, which can range from 1 to 10% per day or higher (White et al. 2014) and are therefore unlikely to be significant at the population level. Therefore, vessel traffic effects on finfish and EFH from the construction, O&M, and decommissioning of planned and potential future offshore wind energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.	Vessels used for Project construction, O&M, and decommissioning could entrain planktonic finfish eggs and larvae in their cooling systems, leading to injury or mortality of individuals. However, these effects are not expected to be measurable relative to natural mortality rates and are therefore unlikely to be significant at the population level. Therefore, vessel traffic effects on finfish and EFH from Project construction, O&M, and decommissioning would be **negligible** adverse. The construction and O&M of Alternatives B through F and other planned and potential future offshore wind energy projects would require the use of construction and operational vessels. This would increase the number of vessels operating in the finfish and EFH geographic analysis area for the foreseeable future. While the number of vessels operating in the geographic analysis area is large, the number of individual eggs and larvae exposed to entrainment-related mortality effects from individual vessels is negligible relative to natural mortality rates. Therefore, vessel traffic cumulative effects on finfish and EFH from the construction, O&M, and decommissioning of Alternatives B through F in combination with other planned and potential future offshore wind energy projects would be **negligible** adverse relative to baseline conditions in the affected environment.
Climate change: Ocean acidification	Continuous carbon dioxide emissions causing ocean acidification could contribute to reduced growth or the decline of finfish and EFH 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.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
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 distributions of finfish 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).	See above.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
Climate change: Warming and sea level rise, altered migration patterns	See above.	See above.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.
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	See above.	See Sections 3.13.1.1.1 and 3.13.1.2.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs	See Sections 3.13.2.2 through 3.13.2.5 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	of ocean waters over the next 35 years, influencing the frequencies of various diseases of finfish.		associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.	associated with onshore activities would have no measurable effect on finfish or EFH and are not analyzed.

Marine Mammals

Table E2-5. Summary of Activities and the Associated Impact-Producing Factors for Marine Mammals

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases: Fuel/fluids/hazmat	See Table E1-4 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 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; Takeshida et al. 2017). Additionally, accidental releases could result in impacts on marine mammals due to effects to prey species (see Table E2-4).	Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases described for ongoing activities.	**Offshore:** BOEM prohibits the discharge or disposal of solid debris into offshore waters during any activity associated with the construction and operation of offshore energy facilities (30 CFR 250.300). The USCG similarly prohibits the dumping of trash or debris capable of posing entanglement or ingestion risk (MARPOL, Annex V, Public Law 100−220 (101 Stat. 1458)). Baulch and Perry (2014) identified ingested debris as the likely cause of mortality in 22% of beached marine mammal carcasses. Approximately 50% of marine mammal species worldwide have been documented ingesting marine litter (Werner et al. 2016). While development of future offshore wind facilities and associated marine vessels could be a source of accidental releases of trash and debris, BOEM and USCG requirements would effectively avoid and minimize impacts such that the resulting effects to marine mammals would be **negligible** adverse. BOEM also requires applicants to develop spill response and containment plans to quickly address accidental spills of fuels, lubricants, and other contaminants. A total of approximately 23 million gallons of coolants, fuels, oils, and lubricants could be stored within WTG foundations and OSSs across all projected offshore wind projects along the Atlantic coast. A large spill of toxic materials (fuels, lubricants, and other contaminants) could potentially injure or kill several individual marine mammals and adversely affect habitat suitability and would require extensive mitigation to offset. All future offshore wind projects would be required to comply with regulatory requirements related to the prevention and control of accidental spills administered by the USCG and the BSEE. Oil spill response plans are required for each project and would provide for rapid spill response, cleanup, and other measures that would help to minimize potential impact on affected resources. Given the low probability of a large spill event, impacts to marine mammals from this IPF are likely to be **negligible** adverse.	**Offshore:** Construction vessels and offshore structures pose a theoretical source of marine debris and entanglement risk and accidental discharges of petroleum products and other toxic substances. Marine debris is a known source of adverse effects to marine mammals (Laist 1997; NOAA-MDP 2014a, 2014b). Revolution Wind would follow strict oil spill prevention and response procedures during all Project phases; would comply with all debris and pollution requirements; and has developed a detailed spill response and containment plan as a Project EPM. These regulatory requirements and the EPM would effectively avoid releases of abandoned marine debris and would avoid and minimize impacts from accidental spills such that adverse effects on marine mammals are unlikely to occur. In the unlikely event that an accidental spill should occur, individual marine mammals could be injured or killed; habitat suitability could be adversely affected; and extensive mitigation would be required. However, due to the low likelihood of such an event, the temporary nature of the impacts, and established EPMs, effects on marine mammals from this impact mechanism would be **negligible** adverse for Alternatives B through F. Existing and planned future offshore wind-energy development could result in the accidental release of water quality contaminants or trash/debris, which could theoretically lead to an increase in debris and pollution in the marine mammal geographic analysis area (see Section 3.15.1.1 for characterization of existing marine pollution conditions). Compliance with debris and pollution requirements would effectively minimize releases of trash and debris. Given these restrictions, the risk to marine mammals from trash and debris from Alternatives B through F in combination with those from other planned and potential future activities is **negligible** adverse. Moreover, Alternatives B through F would similarly include inspection offshore structures and removal of derelict fishing gear and other accumulated debris. This

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				would provide a **minor** benefit by removing potentially harmful marine debris from the environment.
Accidental releases: Trash and debris	Trash and debris could be accidentally discharged through fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; and cable, line, 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 tract, 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 could increase. Trash and debris could continue to be accidentally released through fisheries use and other offshore and onshore activities. There could 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 tract, disease, injury, and malnutrition (Baulch and Perry 2014).	See Accidental releases: Fuel/fluids/hazmat for analysis.	See Accidental releases: Fuel/fluids/hazmat for analysis.
EMFs	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 DC cables than with AC cables (Normandeau Associates, Inc. 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 at a sufficient 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. Further, 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.	**Offshore:** Under the No Action Alternative, up to 10,024 miles of cable would be added in the geographic analysis area, producing EMF in the immediate vicinity of each cable during operations. BOEM anticipates that the proposed offshore energy projects would use HVAC transmission, but HVDC designs are possible and could occur. EMF effects on marine mammals from these future projects would vary in extent and magnitude depending on overall cable length, the proportion of buried vs. exposed cable segments, and project-specific transmission design (e.g., HVAC or HVDC, transmission voltage, etc.). However, measurable EMF effects are generally limited to within inches to tens of feet of cable corridors, and standard design guidance for offshore wind energy transmission cable installation (i.e., avoiding cable crossings and maintaining a minimum separation) would limit additive EMF effects from adjacent cables. BOEM would additionally require these future submarine power cables to have appropriate shielding and be at a sufficient	**Offshore:** Exponent (2021) modeled EMF levels that could be generated by the RWEC, OSS-link cable, and IACs. They estimated induced magnetic field levels ranging from 147 to 1,071 mG on the bed surface above the buried and exposed RWEC and OSS-link cable and 57 to 522 mG above the IACs (see the EMF summary table in Section 3.6.2.3.2). Induced field strength would decrease rapidly with distance from the source, dropping below 100 mG within 3.3 feet of the seafloor directly above the cables. Induced magnetic field strength would fall effectively to 0 mG within 25 feet of the centerline of each cable segment. The only exception would occur at the RWEC landing location, where the two cable corridors would approach to within 10 feet. Measurable magnetic field effects would extend between 25 to 50 feet from the outer edge of the combined cable path. The magnetic field effects generated by exposed segments of the IAC, RWEC, and OSS-link cable are comparable in magnitude to the Earth's natural magnetic field, which is on the order of 517 mG within the RWF. Background magnetic field conditions would fluctuate by 1 to 10 mG

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			burial depth to minimize potential EMF effects from cable operations. At least seven existing submarine power and communications cables are present in the vicinity of the RI/MA WEA. These cables would presumably continue to operate and generate EMF effects under the No Action Alternative. While the type and capacity of those cables is not specified, the associated baseline EMF effects can be inferred from available literature. Electrical telecommunications cables are likely to induce a weak EMF on the order of 1 to 6.3 µV/m within 3.3 feet (1 m) of the cable path (Gill et al. 2005). Fiber-optic communications cables with optical repeaters would not produce EMF effects. Additionally, literature suggests that most marine species cannot sense low-intensity electric or magnetic fields generated by the HVAC power transmission cables commonly used in offshore wind energy projects (Gill et al. 2005; Kilfoyle et al. 2018). EMF effects from continued operations of existing submarine power cables would produce similar **negligible** adverse effects on marine mammals for the duration of cable operations because of the localized nature of the effects and limited anticipated exposure.	from the natural field effects produced by waves and currents. The maximum induced electrical field experienced by any organism close to the exposed cable would be no greater than 0.7 mV/m (Exponent 2021). BOEM has conducted literature reviews and analyses of potential EMF effects from offshore renewable energy projects (CSA Ocean Sciences Inc. and Exponent 2019; Inspire Environmental 2019; Normandeau et al. 2011). These and other available reviews and studies (Gill et al. 2005; Kilfoyle et al. 2018) suggest that most marine species cannot sense low-intensity electric or magnetic fields generated by the HVAC power transmission cables commonly used in offshore wind energy projects. Normandeau et al. (2011) concluded that marine mammals are unlikely to detect magnetic field intensities below 50 mG, suggesting that these species would be insensitive to EMF effects from Project electrical cables. Project-related EMFs would drop below this threshold and would become undetectable within 3.3 feet (1 m) of the seafloor, except for RWEC cable segments lying on the bed surface. The area exposed to magnetic field effects greater than 50 mG would be small, extending less than 5 feet above the bed surface immediately over the exposed cable segment. The 50-mG detection threshold is theoretical and an order of magnitude lower than the lowest observed magnetic field strength resulting in observed behavioral responses (Normandeau et al. 2011). These factors indicate that the likelihood of marine mammals encountering detectable EMF effects is low, and any exposure would be below levels associated with measurable biological effects. Therefore, EMF effects on marine mammals would be **negligible** adverse under Alternatives B through F. Due to the reduced total length of IAC under Alternatives C through F as compared to the Proposed Action, the EMF effects under Alternatives C through F would be similar in nature but proportionally less than under the Proposed Action. Due to the higher capacity of the turbines in Alternative F, there is potential for greater operational noise impacts around each individual turbine, although specifics of these impacts are not certain. BOEM anticipates that most planned facilities would use HVAC transmission, but some could use HVDC. BOEM would require all future projects to use cable designs and EPMs to minimize EMF impacts on the environment. While the range of EMF impacts would vary by project, they are expected to be similar in magnitude to those described for the Proposed Action. Standard design practices for offshore energy cables would avoid cable

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				crossings and maintain a minimum separation of several hundred feet between parallel cable paths where practicable (CSRIC 2014; Sharples 2011; TÜV SÜD PMSS 2014). This would minimize additive EMF effects from multiple cables. On this basis, cumulative EMF effects on marine mammals resulting from Alternatives B through F combined with existing, planned, and reasonably foreseeable activities would be **negligible** adverse due to the localized nature of effects and limited anticipated exposure.
Bycatch	Bycatch is a significant population stressor for smaller cetaceans and pinnepeds. NOAA examined the bycatch of 10 species of cetaceans and pinnepeds from the Mid-Atlantic bottom trawl fishery. Mean annual serious injury and mortality estimates for eight of the 10 species were below their potential biological removal (PBR) levels. The exceptions were gray and harp seals, for which PBRs are unknown. Bycatch occurs in various gillnet and trawl fisheries in New England and the mid-Atlantic coast, with hotspots driven by marine mammal density and fishing intensity (Lewison et al. 2014; NMFS 2018a).	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.	A range of monitoring activities have been proposed to evaluate the short-term and long-term effects of existing and planned offshore wind development on biological resources and are also likely for future wind energy projects on the OCS. Some of these monitoring activities are likely to affect marine mammals through the potential for bycatch and/or injury by sample collection gear. Biological monitoring uses the same types of methods and equipment employed in commercial fisheries, meaning that impacts would be similar in nature but reduced in extent in comparison impacts from current and likely future fishing activity. Monitoring activities are commonly conducted by commercial fishers under contract who would otherwise be engaged in fishing activity. As such, research and monitoring activities related to offshore wind would not necessarily result in an increase in bycatch-related impacts on marine mammals, although the distribution of those impacts could change. Therefore, any bycatch-related impacts on invertebrates would be **negligible** to **minor** adverse and short term in duration.	Revolution Wind is proposing to implement the FRMP as part of Alternatives B through F (Revolution Wind and Inspire Environmental 2021). The FRMP employs a variety of survey methods to evaluate the effect of RWF construction and operation on benthic habitat structure and composition and on marine species. The following survey methods could impact marine mammals: Ventless trap surveys to evaluate changes in the distribution and abundance of lobster and Jonah crab in the RWF and adjacent reference areas and Jonah crab, lobster, whelk (Buccinidae), and finfish along the RWEC corridor and adjacent reference areas; these areas would be surveyed 12 times per month for 7 months each for 2 years prior to and at least 2 years following completion of Project construction (4 years total) Otter trawl surveys to assess abundance and distribution of target fish and invertebrate species within the RWF could impact a variety of invertebrate species as bycatch, four times per year for 2 years prior to and at least 2 years following completion of Project construction These surveys involve similar methods to and would complement other survey efforts conducted by various state, federal, and university entities supporting regional fisheries research and management. Survey fisheries gear (otter trawl surveys, ventless traps, and the anchoring lines and buoys used to secure acoustic telemetry equipment) could pose an entanglement risk to marine mammals. Post-ROD ventless trap surveys would employ the use of both weak link and weak rope technologies that are consistent with recommendations from NMFS. As such, impacts to marine mammals are

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				expected to be negligible based upon the limited number of associated buoy lines and the implementation of risk reduction measures such as no wet storage of fishery monitoring gear; no buoy lines floating at the surface; all sampling gear would be hauled at least once every 30 days; all gear would be removed from the water at the end of each sampling season; all groundlines would be constructed of sinking line; and knot-free buoy lines would be encouraged. For trawl surveys, large whale species have the speed and maneuverability to avoid oncoming mobile gear (NMFS 2016), and due to the few proposed trawl surveys and short tow times, impacts on marine mammals are anticipated to be **negligible** adverse. Acoustic telemetry receiver systems pose a negligible risk of harm to marine mammals. Based on the type of equipment and the fact that a small number of receivers deployed (up to 19 total) would be distributed over a large area, BOEM considers the effects of this Project element on marine mammals to be negligible. Similarly, moored and autonomous PAM systems would use the best available technology to reduce any potential risks of entanglement. PAM system deployment would avoid and minimize impacts. Therefore, the effects of this type of survey equipment on marine mammals would be **negligible** adverse.
Light	Light sources include marine vessels; offshore buoys and towers; and onshore structures, such as buildings and ports. Onshore structures emit a great deal of light on an ongoing basis, greater than offshore structures. 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 could also disrupt natural cycles (e.g., spawning), possibly leading to short-term 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.	**Offshore:** The addition of up to 3,008 new offshore structures in the geographic analysis area with long-term hazard and aviation lighting, as well as lighting associated with construction vessels, would increase artificial lighting. Orr et al. (2013) concluded that the operational lighting effects from wind farm facilities to marine mammal distribution, behavior, and habitat use were uncertain but likely negligible if recommended design and operating practices are implemented. BOEM (2021) would require wind farm developers to comply with current design guidance for avoiding and minimizing artificial lighting effects. On this basis, BOEM anticipates artificial lighting impacts from future wind farm development and other offshore activities would result in **negligible** adverse effects on marine mammals for the duration of the offshore activity.	**Offshore:** Construction of the RWF and RWEC would introduce mobile and intermittent artificial light sources on construction vessels. The RWF would also introduce stationary artificial light sources in the form of navigation, safety, and work lighting. Revolution Wind would follow BOEM (2021) guidance for construction and structural lighting and would use only the minimum type and amount of lighting required by regulation (see Table F-1 in Appendix F). Therefore, BOEM anticipates that short- to long-term lighting effects from RWF and RWEC construction, operations, and decommissioning on marine mammals would be **negligible** adverse for the Proposed Action. The effects of this IPF would be similar under Alternatives C through F but reduced in extent and to the duration of construction activities. The Proposed Action when combined with planned future activities would develop up to 3,110 offshore WTGs and OSS foundations in the geographic analysis area. The construction and O&M of these structures would introduce new short-term and long-term sources of artificial light to the offshore environment in the form of vessel lighting and navigation and safety lighting on the structures, respectively. Given the minimal and localized

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				nature of anticipated lighting effects, the cumulative effects from Alternatives B through F and existing and planned future activities on marine mammals would be **negligible** adverse, mostly attributable to existing, ongoing activities.
New cable emplacement/ maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would 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 could result in temporary, short-term impacts on marine mammal prey species (see Table E2-4).	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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 could result in temporary, short-term impacts on some marine mammal prey species (see Table E2-4).	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
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 could respond with behavioral changes,	Future low-altitude aircraft activities such as surveys and navy training operations could result in short-term responses of marine mammals to aircraft noise. If flights are at a sufficiently low altitude, marine mammals could respond with behavior changes, including short surface durations, abrupt dives, and percussive behaviors (i.e.,	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	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 m) 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.	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.	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Noise: Turbines	Marine mammals would be able to hear the continuous underwater noise of operational WTGs. As measured at the BIWF, this low frequency noise barely exceeds ambient levels at 164 feet (50 m) from the WTG base. Based on the results of Thomsen et al. (2015) and Kraus et al. (2016), sound pressure levels 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.	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
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 seafloor 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 could negatively affect marine mammals during foraging, orientation, migration, predator detection, social interactions, or other activities (Southall et al. 2007). Noise exposure associated	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	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 would be conducted in accordance with a project-specific IHA to minimize impacts on marine mammals.			
Noise: Cable laying/trenching	N/A	Cable laying impacts resulting from future non–offshore wind activities would be identical to those described for future offshore wind projects.	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Noise: Vessels	Ongoing activities that contribute to this sub-IPF include commercial shipping, recreational, and fishing vessels; scientific and academic research vessels; and 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 most oceanic regions. While vessel noise could 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 m) 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, low-frequency cetaceans 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 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.	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing 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 could affect marine mammals, but response would be expect 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 would increase modestly. The ability of ports to receive the increase in larger ships would 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	The development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Port improvements could lead to an increase in vessel traffic during construction (see Section 3.16), O&M, and decommissioning. The resulting change in vessel traffic in the geographic analysis area cannot be predicted because, while some ports have been identified as possibilities for expansion, no specific project plans have been proposed. Therefore, impacts would be **negligible** adverse. Any future port expansion and associated increase in vessel traffic would be subject to	Several regional ports could be used during Project construction, including ports in Baltimore, MD; New Bedford, MA; New London, CT; Norfolk, VA; Paulsboro, NJ; and Providence, RI, as well as Europe. The development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects, but no specific improvements are included in Alternatives B through F. Any future port expansion would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects. However, these localized habitat impacts are

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
		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 could 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).	independent NEPA analysis and regulatory approvals requiring full consideration of potential effects on marine mammals regionwide.	unlikely to affect marine mammals within the geographic analysis area. Therefore, port utilization impacts associated with the Project would be **negligible** adverse under all Project alternatives. Future actions, should they occur, could involve activities like dredging, increases in vessel activity and underwater noise, and the expansion or development of new structures. These activities could lead to adverse effects on coastal and estuarine habitats used by marine mammals and their prey species. These projects could result in cumulative effects on marine mammals, but the extent and significance of these effects cannot be evaluated because no project proposals have been developed. No port improvements have been proposed as part of Alternatives B through F and therefore cumulative impacts would be **negligible** adverse. The environmental effects resulting from any future port expansions would be evaluated in independent NEPA analysis, ESA and MMPA compliance documents, and other regulatory approvals for each project.
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 could result in long-term, high-intensity impacts but with low exposure due to localized and geographic spacing of artificial reefs. Currently bridge foundations and the BIWF could be considered artificial reefs and could 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.	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
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 BIWF WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (NMFS 2015; Taormina et al. 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 seals and small odontocetes compared to the surrounding soft bottoms.	The presence of structures associated with non–offshore wind development in nearshore coastal waters has 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 would 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 ESP foundations) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Causon and Gill 2018; Taormina	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
		et al. 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 could be some impacts resulting from the existing BIWF, but given that there are only five WTGs, no measurable impacts are occurring.	Not contemplated for non–offshore wind facility sources.	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
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.	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
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.	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.
Traffic: Vessel collisions	Current activities that are contributing to this sub-IPF include port traffic levels, fairways, traffic separation schemes, 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 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, 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).	See Section 3.15.1.1 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on benthic habitat and are not analyzed.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of offshore impacts. Onshore Project activities would not result in impacts to marine resources. Therefore, IPFs associated with onshore activities would have no measurable effect on marine mammals and are not analyzed.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Sediment deposition and burial	The USACE and/or private ports could undertake dredging projects periodically. Where dredged materials are disposed, marine species could be affected. However, such areas are typically recolonized naturally in the short term. Most species in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.	No future activities were identified within the geographic analysis area for marine mammals other than ongoing activities.	Seafloor disturbance during the installation of transmission cables, sea-to-shore transition construction, and dredging activities would result in elevated suspended sediment concentrations in the water column. Based on modeled and observed TSS impacts for the Proposed Action and other regional wind farm projects (Elliot et al. 2017; RPS 2021; Vinhateiro et al. 2018), and maximum water column TSS concentrations could range from several hundred to several thousand mg/L in close proximity to the disturbance and would dissipate below 100 mg/L, usually within minutes to hours of the disturbance, depending on the types of sediments affected. In locations with predominantly sand or coarser sediments, water column effects would be limited to short-term TSS pulses below 100 mg/L extending a few hundred feet downcurrent within approximately 20 feet of the seafloor and dissipating to background conditions within approximately 1 to 2 hours after disturbance. Available information on marine mammal sensitivity to TSS indicates that water quality impacts would have negligible effects on marine mammals. First, periodic TSS concentrations on the order of 100 mg/L at or near the seafloor are within the range of baseline variability. Marine mammals that forage on or near the seafloor are unlikely to be affected by a short-term increase in TSS that is comparable to existing conditions. For example, researchers have observed that visually impaired grey and harbor seals are able to navigate and locate prey just as effectively as their fully sighted counterparts (McConnell et al. 1999; Newby et al. 1970; Todd et al. 2015), indicating that short-term visual impairment would have no measurable effect on foraging ability. While research on TSS sensitivity in dolphins and large whales is generally lacking, these species developed the ability to echolocate by evolving in environments having variable and often low visibility (Tyack and Miller 2002). This suggests that a short-term reduction in visibility would have no effect on communication, foraging success, and predator avoidance and would not result in displacement or other observable changes in behavior. These factors indicate that marine mammal exposure to water quality effects resulting from construction of future offshore wind farms would be limited. Those species that are exposed to elevated TSS would be unlikely to experience measurable effects on behavior, foraging success, or communication. On this basis, water quality effects on marine mammals resulting from future offshore	RPS (2021) modeled the magnitude and extent of anticipated TSS concentrations resulting from RWF and RWEC construction. Maximum water column TSS concentrations could exceed 500 mg/L in close proximity to the disturbance. The majority of water column effects would be limited to short-term TSS pulses below 100 mg/L, occurring in plumes extending approximately 6 to 20 feet off the seafloor and 580 to 4,134 feet downcurrent. Dredging used to level the seabed and achieve greater burial depths for RWEC installation would produce TSS plumes with concentrations up to 100 mg/L extending from the seabed to the surface extending from 3,067 to 5,838 feet downcurrent. In most locations, TSS concentrations would dissipate to background conditions within approximately 1 to 2 hours after disturbance; however, in selected locations—specifically at the sea-to-shore transition construction area—TSS concentrations greater than 100 mg/L could linger for up to 36 hours. These modeled estimates are similar to those developed for BIWF construction. The observed extent of TSS impacts at the BIWF turned out to be considerably lower than the modeled estimates (Elliot et al. 2017), indicating that the potential impacts described here are likely conservative. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short term and within the range of baseline variability. Based on available information (see No Action Alternative at left) a short-term reduction in visibility would have no meaningful effects on communication, foraging, and predator avoidance, particularly given that measurable TSS impacts would be limited to within 10 to 12 feet of the seafloor in the open ocean waters where marine mammals are most likely to occur. These factors indicate that marine mammal exposure to water quality effects resulting from construction of all Project alternatives would be **negligible** adverse under Alternatives B through F because of the limited sensitivity of marine mammals to TSS and the temporary nature of the impact. Alternatives C through F would result in a shorter overall length of IAC installation, proportionally reducing the extent and duration of suspended sediment impacts relative to the Proposed Action. Those species that are exposed to elevated TSS would be unlikely to experience measurable effects on behavior, foraging success, or communication. Seafloor disturbance during O&M activities would be limited under all Project alternatives, but reduced in extent under Alternatives C through F. As noted above,

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			wind farm construction would be **negligible** adverse and short term in duration.	the cables are unlikely to require repair or maintenance, but up to 10% of cable protection could need to be replaced over the life of the Project. Replacement of the cable protection could result in localized, temporary increases in TSS. However, consistent with impacts of cable installation, suspended sediment plumes would be limited to within 10 to 12 feet of the seafloor in the open ocean waters where marine mammals are most likely to occur. Potential effects of removal of the cable during decommissioning would be similar in nature to those anticipated for cable installation or replacement of cable protection. Thus, sediment deposition and burial effects on marine mammals resulting from Project O&M and decommissioning under Alternatives B through F would be temporary **negligible** adverse. BOEM estimates a cumulative total of up to 30,885 acres of seafloor disturbance for Alternatives B through F plus all other future offshore wind projects in the geographic analysis area. As discussed above, TSS effects on marine mammals are likely to be negligible adverse because of limited potential exposure to elevated TSS. No population-level effects on marine mammals are expected from reduced water quality. Therefore, Alternatives B through F when combined with past, present, and reasonably foreseeable activities would result in **negligible** adverse cumulative effects on marine mammals.
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.	See Section 3.15.1.1 for analysis.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of impacts.
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 decline of invertebrates that have calcareous shells.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.	See Section 3.15.1.1 for analysis.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of impacts.
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.	See Section 3.15.1.1 for analysis.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of impacts.
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 (MacLeod 2009; Nunny and Simmonds 2019; Record et al. 2019).	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.	See Section 3.15.1.1 for analysis.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
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 the likely indirect nature of climate change's impact on these diseases. Climate change could 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).	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.	See Section 3.15.1.1 for analysis.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of impacts.
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 sea walls and other obstructions are added, blocking seals access to shore.	No future activities were identified within the marine mammal geographic analysis area other than ongoing activities.	See Section 3.15.1.1 for analysis.	See Sections 3.15.2.2 and 3.15.2.3 for analysis of impacts.

Sea Turtles

Table E2-6. Summary of Activities and the Associated Impact-Producing Factors for Sea Turtles

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases: Fuel/fluids/hazmat	See Table E1-4 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 (Bembenek-Bailey et al. 2019; Camacho et al. 2013; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases could result in impacts on sea turtles due to effects on prey species (see Table E2-4).	See Table E1-4 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 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 (Bembenek-Bailey et al. 2019; Camacho et al. 2013; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases could result in impacts on sea turtles due to effects on prey species (see Table E2-4).	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
Accidental releases: Trash and debris	Trash and debris could be accidentally discharged through fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey	Trash and debris could be accidentally discharged through fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	activities; cable, line, 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 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; Schuylar 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 could include dietary dilution, chemical contamination, depressed immune system function, and 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).	activities; cable, line, 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; Schuylar 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).		
Anchoring	Vessel anchoring related to ongoing military use and survey, commercial, and recreational activities continues to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor.	Impacts from anchoring could occur on a semiregular basis over the next 30 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 contact causing mortality of sea turtles. All impacts would be localized; turbidity would be temporary; impacts from contact would be recovered in the short term.	Future offshore wind projects could disturb up to 2,672 acres of seafloor from anchoring/mooring activities and the installation of associated undersea cables during offshore wind energy development, causing an increase in suspended sediment. This disturbance would be both localized and temporary in duration. Entanglement risks to sea turtles from vessel anchoring and cable emplacement are not anticipated. Only larger construction and O&M vessels would anchor to the seafloor, using large heavy anchor chains. No lines or rigging are anticipated for cable installation, and transmission cables and jet plow umbilicals are large in diameter, relatively inflexible, and under constant tension. The likelihood of sea turtle entanglement under these conditions is discountable. In general, impacts to benthic habitats are unlikely to directly affect sea turtles but could indirectly affect these species through impacts on their prey. As discussed in Section 3.6, BOEM anticipates that impacts to benthic habitats and invertebrates would likely range from minor to moderate adverse. Certain sea turtle species, such as loggerheads, that feed on benthic invertebrates could experience short-term reductions in prey availability that are limited in extent, potentially offset by long-term increases in prey abundance from maturing reef effects. Thus, effects of anchoring and new cable emplacement/maintenance on sea turtles under the No Action Alternative would be **negligible** adverse.	Offshore: Sea turtles near the Project would likely be foraging, and prey items could include benthic species affected by vessel anchoring and cable emplacement/maintenance. The associated disturbance would be temporary; however, some benthic habitat conversion would also occur, as described in in Section 3.6. Project construction and installation would temporarily affect up to 6,632 acres of available foraging habitat until preconstruction species assemblages are recolonized and recovered. Benthic communities that inhabit dynamic bed (i.e., soft-bottom) habitats typically recover rapidly from construction-related disturbance, usually within 1 year (Dernie et al. 2003; UKBERR 2008), while some organisms associated with complex benthic habitat, like sponges and hydroids, could take a decade or longer to fully recover (Auster and Langton 1999; Collie et al. 2005; Lukens and Selberg 2004; Tamsett et al. 2010). The affected area is also subject to periodic bed disturbance by commercial fishing (CH2M HILL 2018), indicating that construction-related bed disturbance is not expected to measurably alter environmental baseline conditions. Because impacts to foraging habitat are mostly temporary and localized, the impact of Project activities associated with seafloor disturbance on sea turtles would be **negligible** adverse under Alternatives B through F but incrementally reduced under Alternatives C through F (a comparison of the benthic habitat disturbance footprints

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				under the different configurations of Alternatives C through E and the Proposed Action is provided in Table 3.6-8, Table 3.6-9, and Table 3.6-10 in Section 3.6). Entanglement risks to sea turtles from vessel anchoring and cable emplacement are not anticipated. Only larger construction and O&M vessels would anchor to the seafloor, using large heavy anchor chains. Per the COP, no divers would be used and no lines or rigging are anticipated for cable installation and maintenance. Transmission cables and jet plow umbilicals are large in diameter, relatively inflexible, and under constant tension throughout installation. Potential anchoring impacts during O&M and decommissioning would be similar to the construction phase but reduced due to fewer anchored vessels. As stated in Section 3.5.2 of the COP, the Project does not anticipate that the IAC, OSS-link cable, and RWEC would require significant maintenance. The cables themselves are unlikely to require repair, but up to 10% of cable protection could need to be replaced over the life of the Project. Effects to sea turtles from cable protection maintenance would result primarily from underwater noise, disturbance, and collision risk associated with O&M vessel activity. The IAC, OSS-link cable, and RWEC would be removed from the seafloor during Project decommissioning. Alternatives C through F would result in a reduced total length of IAC and a reduced extent of anchoring impacts relative to the Proposed Action. This would incrementally reduce the extent of O&M- and decommissioning-related impacts on sea turtles resulting from Project construction and would therefore be **negligible** adverse under Alternatives B through F because of the temporary and localized nature of the potential impacts. BOEM estimates a cumulative total of 5,803 acres of anchoring and mooring-related disturbance and 25,082 acres of cabling-related disturbance for the Proposed Action combined with all other future offshore wind projects within the geographic analysis area. Impacts from Alternatives C through F would be reduced in extent than the Proposed Action. The duration and magnitude of these effects would vary depending on the types of habitats impacted. Impacts on soft-bottom benthic habitats and associated sea turtle forage species would be expected to fully recover within 18 to 24 months, whereas impacts on complex benthic habitats could take a decade or more to fully recover. While increases in foraging effort or displacement due to turbidity could occur to individual sea turtles, these temporary effects are not anticipated to

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				lead to population-level effects on sea turtle populations. Vessel anchoring and cable emplacement during construction, O&M, and decommissioning are not anticipated to involve equipment, lines, or rigging that could pose a potential entanglement risk to sea turtles. Therefore, Alternatives B through F when combined with past, present, and reasonably foreseeable projects would result in **negligible** adverse cumulative impacts to sea turtles.
			Onshore: The construction and installation, O&M, and eventual decommissioning of onshore project facilities and related activities associated with planned and potential future offshore wind energy projects would not be expected to result in measurable impacts on the marine environment. Therefore, the onshore components of planned and future projects are likely to have no measurable effects on sea turtles and would therefore be **negligible** adverse.	**Onshore:** Onshore Project activities would not result in impacts to marine resources regardless of alternative. Therefore, onshore activities and facilities would have no measurable effect on sea turtles and would therefore be **negligible** adverse.
Bycatch	Impacts from bycatch are a primary threat to sea turtles (NOAA 2018). A reduction in bycatch has been achieved by the requirement for the use of bycatch mitigation measures. A comparison pre- versus post-regulation mean annual bycatch data for Mid-Atlantic fisheries (otter trawl, gillnet, scallop trawl, scallop dredge, Virginia pound net) showed sea turtle bycatch was reduced from 2,400 incidents to 1,700 and mortality was reduced from 1,000 to 470 based on data over the period 1990 to 2007 (Finkbeiner et al. 2011). In the Atlantic, bycatch occurs in various gillnet and trawl fisheries in New England and the Mid-Atlantic coast, with hotspots driven by marine mammal density and fishing intensity (Lewison et al. 2014; NMFS 2018a).	No future activities were identified within the geographic analysis area for this resource other than ongoing activities	A range of monitoring activities has been proposed to evaluate the short-term and long-term effects of existing and planned offshore wind development on biological resources and are also likely for future wind energy projects on the OCS. Some of these monitoring activities are likely to affect sea turtles through the potential for bycatch and/or injury by sample collection gear. Biological monitoring uses the same types of methods and equipment employed in commercial fisheries, meaning that impacts to sea turtles would be similar in nature but reduced in extent in comparison to impacts from current and likely future fishing activity. Monitoring activities are commonly conducted by commercial fishers under contract who would otherwise be engaged in fishing activity. As such, research and monitoring activities related to offshore wind would not necessarily result in an increase in bycatch-related impacts on sea turtles, although the distribution of those impacts could change. Therefore, any bycatch-related impacts on invertebrates would be **negligible to minor** adverse and short term in duration.	Revolution Wind is proposing to implement the FRMP as part of Alternatives B through F (Revolution Wind and Inspire Environmental 2021). The FRMP employs a variety of survey methods to evaluate the effect of RWF construction and operation on benthic habitat structure and composition and on marine species. The following survey methods could impact sea turtles: Ventless trap surveys to evaluate changes in the distribution and abundance of lobster and Jonah crab in the RWF and adjacent reference areas and Jonah crab, lobster, whelk (Buccinidae), and finfish along the RWEC corridor and adjacent reference areas; these areas would be surveyed 12 times per month for 7 months each for 2 years prior to and at least 2 years following completion of Project construction (4 years total) Otter trawl surveys to assess abundance and distribution of target fish and invertebrate species within the RWF trawls could impact a variety of invertebrate species as bycatch and would occur four times per year for 2 years prior to and at least 2 years following completion of Project construction. These surveys involve similar methods to and would complement other survey efforts conducted by various state, federal, and university entities supporting regional fisheries research and management. Survey fisheries gear (otter trawls, ventless traps, and the anchoring lines and buoys used to secure acoustic telemetry equipment) could pose an entanglement risk to sea turtles. However, this risk must be considered in the context of ongoing commercial fisheries activity. The

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				FRMP would contract commercial fishing vessels to conduct surveys, using commonly available commercial fishing gear. These contract vessels would likely be engaged in the commercial fishery if not involved in the FRMP, at least at an equivalent, if not greater, level of fishing effort. Therefore, the FRMP would not be likely to measurably change the quantity of fishing gear on the mid-Atlantic OCS or the amount of fishing effort that sea turtles are exposed to by gear type. Moreover, the FRMP would adhere to risk reduction measures such as no fishing monitoring gear would be in wet storage; no buoy lines would float at the surface; all sampling gear would be hauled at least once every 30 days; all gear would be removed from the water at the end of each sampling season; all groundlines would be constructed of sinking line; and knot-free buoy lines would be encouraged. When considered in combination, the anticipated impacts of the FRMP on sea turtles are anticipated to be **negligible** adverse. Acoustic telemetry receiver systems pose a negligible risk of harm to sea turtles. Based on the type of equipment, deployment near the seafloor, and the small number of receivers deployed (up to 19 in total) over a large area, BOEM considers the effects of this Project element on sea turtles to be **negligible** adverse. Similarly, moored and autonomous PAM systems would use the best available technology to avoid and minimize impacts on the environment. Based on their size and configuration of their mooring systems, PAM buoys pose an insignificant entanglement risk to sea turtles. Therefore, the effects of this type of survey equipment on sea turtles would likewise be **negligible** adverse under Alternatives B through F.
EMFs	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 could be able to detect magnetic fields while they are foraging on the bottom near the cables and up to potentially 82 feet (25 m) in the water column above the cable. Juvenile and adult sea turtles could 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	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 (BOEM 2007: Section 5.2.7). 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. Further, 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.	Under the No Action Alternative, the future development of planned wind energy projects would result in up to 10,024 miles of new submarine electrical transmission cables in the geographic analysis area for sea turtles. Each cable would generate EMF effects within the immediate proximity. The available evidence indicates that sea turtles are magnetosensitive and orient to the Earth's magnetic field for navigation. Although they could be able to detect magnetic fields as low as 0.05 mG, they are unlikely to detect magnetic fields below 50 mG (Normandeau et al. 2011; Snoek et al. 2016). Potential EMF effects would be reduced by cable shielding and burial to an appropriate depth (typically 4–6 feet). Standard design guidance for offshore wind energy transmission cable installation avoids cable crossings where practicable and recommends maintaining a minimum separation of at least several hundred feet between Project	**Offshore:** There would be no EMF produced during construction of the offshore Project structures. The Project would generate EMF along the length of the IACs and offshore RWEC for the life of the Project until decommissioning. These effects would be most intense at locations where the RWEC cannot be buried and is laid on the bed surface covered by a stone or concrete armoring blanket. Approximately 8.8 miles of the RWEC cable, 0.9 mile of the OSS-link, and 15.5 miles of the IAC could be unburied and would require surface armoring. Exponent (2021) modeled EMF levels that could be generated by the RWEC, OSS-link cable, and IAC. It estimated induced magnetic field levels ranging from 147 to 1,071 mG on the bed surface above the buried and exposed RWEC and OSS-link cable and 57 to 522 mG above the IAC (see Section

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	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).		features and existing transmission and communication cables to avoid damaging existing infrastructure and for safety during installation (CSRIC 2014; Sharples 2011; TÜV SÜD PMSS 2014). This separation distance would also avoid additive EMF effects from adjacent cables. Although artificial EMF effects on sea turtles are not well studied, the affected areas would be localized around unburied cable segments and limited to within 3 to 7.5 m of the cable surface (CSA Ocean Sciences Inc. and Exponent 2019). Deviations in migration therefore would have a negligible impact on energy expenditure in sea turtles. EMF effects from future offshore wind development would similarly be **negligible** adverse because of the limited anticipated exposure.	3.6). Induced field strength would decrease rapidly with distance from the source, dropping below 100 mG within 3.3 feet of the seafloor directly above the cable. Induced magnetic field strength would fall effectively to 0 mG within 25 feet of the centerline of each cable segment. The only exception would occur at the RWEC landing location, where the two cable corridors would approach to within 10 feet. Measurable magnetic field effects would extend between 25 to 50 feet from the outer edge of the combined cable path. BOEM has conducted literature reviews and analyses of potential EMF effects from offshore renewable energy projects (CSA Ocean Sciences Inc. 2021; Inspire Environmental 2019; Normandeau et al. 2011). These and other available reviews and studies (Gill et al. 2005; Kilfoyle et al. 2018) suggest that most marine species cannot sense very low-intensity electric or magnetic fields at the typical AC power transmission frequencies associated with offshore renewable energy projects. Normandeau et al. (2011) indicate that sea turtles are magnetosensitive and orient to the Earth's magnetic field for navigation, but they are unlikely to detect magnetic fields below 50 mG. The majority of RWEC and IACs would be buried 4 to 6 feet below the bed surface, reducing the magnetic field in the water column below levels detectable to turtles. The transmission cables could produce magnetic field effects above the 50-mG threshold at selected locations where full burial is not possible; these areas would be localized and limited in extent. Magnetic field strength at these locations would decrease rapidly with distance from the cable and drop to 0 mG within 25 feet. Peak magnetic field strength is below the theoretical 50-mG detection limit along the majority of cable length, only exceeding this threshold above the short cable segments laid on the bed surface. Those EMF effects would dissipate below the 50 mG threshold 3.3 feet (1 m) of the seafloor, except for RWEC cable segments lying on the bed surface. This indicates that turtles would only be able to detect induced magnetic fields within a few feet of cable segments lying on the bed surface. These cable segments would be relatively short (less than 100 feet long) and widely dispersed. Exponent (2021) concluded that the shielding provided by burial and the grounded metallic sheaths around the cables would effectively eliminate any induced electrical field effects detectable to turtles. Given the limited extent of measurable magnetic field levels and limited potential for mobile species like sea turtles to encounter field levels above detectable thresholds, the effects of Project-related

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				EMF exposure on sea turtles would be **negligible** adverse for the life of the Project for the Proposed Action. Alternatives C through F would result in similar EMF impacts to those described for the Proposed Action, but those impacts would be reduced in extent and the total area exposed would vary depending on the alternative and configuration selected (see Tables 3.6-23, 3.6-24, and 3.6-25 in Section 3.6). Heat from the buried RWEC and IACs could affect some benthic organisms that represent forage for turtles, but little is known about the potential change to substrate temperatures that transmission cables might have on the benthos (Taormina et al. 2018). Benthic effects are not expected to impact leatherback turtles as benthic prey are not typically included in their diet. Effects to algal cover (green sea turtle forage) and crustaceans, gastropods, crabs, and bivalves (loggerhead sea turtle forage) could conceivably affect sea turtle foraging opportunities. However, because cables would be buried to a depth of 4 to 6 feet and/or covered with concrete protection, changes in temperature of the substrate at the surface of the seafloor is not anticipated to increase markedly. The potential effects of cable heat to the availability of turtle forage would be **negligible** adverse under Alternatives B through F. Project EMF effects would combine with those generated by the 10,024 miles of new and existing transmission cables from the other new offshore wind facilities planned on the mid-Atlantic OCS as well as other existing transmission cables. Submarine power cables would be installed with appropriate shielding and at a burial depth to reduce potential EMF at the substrate surface. The RWEC and IACs would maintain a minimum separation of at least several hundred feet from other known cables to avoid inadvertent damage during installation and additive EMF effects from adjacent cables (CSRIC 2014; Sharples 2011; TÜV SÜD PMSS 2014). Additionally, exposure to detectable levels of EMF would be limited to within 25 feet of the small number of areas where cable segments cannot be buried to the anticipated depth. This represents an extremely small percentage of the geographic analysis area for sea turtles and is unlikely to lead to biologically significant effects on sea turtle movement, migration, or foraging patterns. Therefore, the cumulative impacts associated with Alternatives B through F when combined with past, present, and reasonably foreseeable activities would represent a long-term **negligible** adverse impact on sea turtles.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				Onshore: Onshore Project activities would not result in impacts to marine resources regardless of alternative. Therefore, onshore activities and facilities would have no measurable effect on sea turtles and would therefore be **negligible** adverse.
Light: Vessels	Ocean vessels such as ongoing commercial vessel traffic, recreational and fishing activity, and scientific and academic research traffic have an array of lights, including navigational, deck, 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.	**Offshore:** Nighttime lighting associated with offshore structures and vessels could represent a source of attraction, avoidance, or other behavioral responses in sea turtles. Although responses to light have been studied in various species and life stages of sea turtles in nesting beach environments, the effects of offshore lighting remain uncertain. Shoreline development is the predominant existing artificial lighting source in the nearshore component of the geographic analysis area, whereas vessels, mainly fishing vessels, are the predominant artificial lighting source offshore. Future wind energy development would contribute additional light sources to the offshore component of the geographic analysis area, including a temporary increase in light from vessels used during construction and the long-term use of navigational lighting on new WTGs and OSSs. An estimated 3,008 foundations are forecasted for future wind energy construction. Each structure would have minimal white flashing navigational lighting as well as red flashing FAA hazard lights in accordance with BOEM's (2021) lighting and marking guidelines. Although the potential effects of offshore lighting on juvenile and adult sea turtles is uncertain, WTG lighting is anticipated to have a **negligible** adverse effect on sea turtles based on the lack of observed effects on sea turtles from decades of oil and gas platform operations in the Gulf of Mexico, which can have considerably more lighting than offshore WTGs (BOEM 2021).	**Offshore:** Lights would be required on vessels and heavy equipment during construction. Most scientific studies on lighting effects on sea turtles were conducted at nesting sites, which do not occur in the RWF and RWEC. Gless et al. (2008) reported that previous studies showed that loggerhead turtles were attracted to lights from longline fishing vessels. Gless et al. (2008) conducted a laboratory study to see if juvenile leatherbacks responded to lights in the same way as loggerheads. Their study showed that leatherbacks either failed to orient or oriented at an angle away from the lights and concluded that there is no convincing evidence that marine turtles are attracted to vessel lights. Limpus (2006) indicates that navigation/anchor lights on top of vessel masts are not impactful but that bright deck lights should be shielded if possible to reduce impacts to sea turtles. Project EPMs (see Table F-1 in Appendix F) stipulate that construction vessel lightingwould be limited to the minimum necessary to ensure safety and to comply with applicable regulations. Additionally, BOEM (2021) has issued design guidance for avoiding and minimizing artificial lighting impacts from offshore energy facilities and associated construction vessels and has concluded that adherence to these measures should effectively avoid adverse effects on sea turtles. Considering the EPMs and the fact that construction vessel activity is unlikely to measurably alter baseline vessel light levels, temporary construction lighting effects on sea turtles would be **negligible** adverse. The RWF would include a variety of operational lighting, including navigational lighting for mariners, obstruction lighting for aviators, and vessel/work lighting for O&M (BOEM 2021). Orr et al. (2013) indicated that lights on wind generators flash intermittently for navigation or safety purposes and do not present a continuous light source. Limpus (2006) suggested that intermittent flashing lights with a very short "on" pulse and long "off" interval are nondisruptive to marine turtle behavior, irrespective of the color. Limpus (2006) also indicated that navigation/anchor lights on top of vessel masts are unlikely to adversely affect sea turtles but that bright deck lights should be shielded if possible to reduce impacts to sea turtles.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				Sea turtles' typical behavior of remaining predominantly submerged would additionally limit the exposure of individuals to operational lighting. BOEM (2021) has issued design guidance for avoiding and minimizing artificial lighting impacts from offshore energy facilities and has concluded that adherence to these measures should effectively avoid adverse effects on fish. RWF adherence to design guidelines would ensure operational lighting effects on sea turtles would be minimal, temporary, and therefore **negligible** adverse. The Proposed Action would result in negligible incremental impacts to sea turtles through the installation of 102 lighted structures (100 WTGs and two OSSs). This represents approximately 3% of the projected increase in offshore lighting projected under the No Action Alternative. BOEM estimates a cumulative total of 3,110 offshore WTGs and OSS foundations for the Proposed Action plus all other future offshore wind projects in the geographic analysis area. All future wind farm projects would be expected to follow BOEM design guidance for lighting of offshore structures and avoiding and minimizing artificial lighting impacts from offshore energy facilities and associated construction vessels (BOEM 2021; Orr et al. 2013). Adherence to these measures should effectively avoid adverse effects on aquatic organisms. BOEM would require all future offshore energy projects to comply with this guidance. Nighttime lighting associated with offshore structures and vessels could represent a source of attraction, avoidance, or other behavioral responses in sea turtles. However, BOEM assumes that all offshore wind projects would be sited offshore, away from nesting beaches, and would not disorient nesting females or hatchling sea turtles. Because other planned and potential future offshore wind energy projects would be expected to adhere to the same measures to avoid adverse lighting impacts, the Proposed Action when combined with past, present, and reasonably foreseeable activities would also represent a **negligible** adverse cumulative impact on sea turtles. Alternatives C through F would include the same, or similar, extent of light emissions as those described for the Proposed Action but would be reduced based on the reduction in the number of WTGs and other operational lighting elements, resulting in a **negligible** adverse impact. Project lighting represents no more than a 3% projected increase in offshore lighting compared to the No Action Alternative. BOEM estimates a cumulative total of 3,066 to 3,103 offshore WTGs and OSS foundations for Alternatives C through F plus all other future offshore

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				wind projects in the geographic analysis area. Thus, the impacts of operational lighting are also considered **negligible** adverse.
			Onshore: The construction and installation, O&M, and eventual decommissioning of onshore project facilities and related activities associated with planned and potential future offshore wind energy projects would not be expected to result in measurable impacts on the marine environment. Therefore, the onshore components of planned and future projects are likely to have no measurable effects on sea turtles and would therefore be **negligible** adverse.	**Onshore:** Construction of onshore Project facilities and associated activities would not result in measurable impacts on the marine environment regardless of alternative. Therefore, impacts of onshore activities and facilities to sea turtles would be the same as those for the No Action Alternative: **negligible** adverse.
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 operations in the Gulf of Mexico, which can have considerably more lighting than offshore WTGs, has not resulted in any known impacts on sea turtles (BOEM 2021).	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.	See Light: Vessels above for offshore and onshore analysis.	See Light: Vessels above for offshore and onshore analysis.
New cable emplacement/ maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would 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 could cause individuals to alter normal movements and behaviors. However, these changes are expected to be too small to be detected (NOAA 2020b). 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 2020b). Turbidity associated with increased sedimentation could result in short-term, temporary impacts on sea turtle prey species (see Table E2-4).	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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 could result in short-term, temporary impacts on some sea turtle prey species (see Table E2-4).	See Anchoring above for offshore and onshore analysis.	See Anchoring above for offshore and onshore analysis.
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 could 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 surveys 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 could 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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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	Same as ongoing activities, with the addition of possible future oil and gas exploration surveys.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	within the ensonified area (NSF and USGS 2011). The potential for PTS and TTS is considered possible in proximity to G&G surveys using 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.			
Noise: HRG	Possibly included in site characterization surveys and scientific surveys are high-resolution geophysical (HRG) surveys. HRG surveys could be conducted using one or two airguns as the acoustic source, but they generally use electromechanical sources such as side-scan sonars, shallow- and medium-penetration sub-bottom profilers, and single- or multibeam echosounders. Non-airgun HRG sources are often used in combination in order to acquire necessary data during a single deployment. HRG surveys are sometimes conducted using autonomous underwater vehicles equipped with multiple acoustic sources (NMFS 2018b). HRG surveys are typically on a time scale of weeks and higher frequency HRG survey noise resulting from cable route surveys could be less intense than G&G noise from site investigation surveys in WEAs. Impacts include 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). These impacts would be negligible as turtles would be expected to avoid 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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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-kHz range (Tougaard et al. 2020). As measured at the BIWF, low-frequency operational noise barely exceeds ambient levels at 164 feet (50 m) 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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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 seafloor 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 to turtles:	No future activities were identified within the geographic analysis area for sea turtles other than ongoing activities.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	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)			
Noise: Cable laying/trenching	N/A	Cable laying impacts resulting from future non–offshore wind activities would be identical to those described for future offshore wind projects.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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) suggest that sea turtles' ability to detect approaching vessels is primarily vision-dependent, not acoustic. Sea turtles could 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.	See Section 3.16. Any offshore projects that require the use of ocean vessels could 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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing 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 could 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 would increase modestly. The ability of ports to receive the increase in larger ships would 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 could 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).	The development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Port improvements could lead to an increase in vessel traffic during construction (see Section 3.16), O&M, and decommissioning. The resulting change in vessel traffic in the geographic analysis area cannot be predicted because, while some ports have been identified as possibilities for expansion, no specific project plans have been proposed. Therefore, impacts would be **negligible** adverse. Any future port expansion and associated increase in vessel traffic would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential effects on sea turtles regionwide.	**Offshore:** Several regional ports could be used during Project construction, including ports in Baltimore, MD; New Bedford, MA; New London, CT; Norfolk, VA; Paulsboro, NJ; and Providence, RI, as well as Europe. The development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects, but no specific improvements are included in Alternatives B through F. Therefore, impacts would be **negligible** adverse. Any future port expansion would be subject to independent NEPA analysis and regulatory approvals requiring full consideration of potential environmental effects. Future actions, should they occur, could involve activities like dredging and the expansion or development of new structures that could lead to adverse effects on coastal and estuarine habitats used by sea turtles and their prey species. These projects could result in cumulative effects on sea turtles, but the extent and significance of these effects cannot be evaluated because no project proposals have been developed. Therefore, impacts would be **negligible** adverse. However, the environmental effects resulting from any future port expansions would be evaluated in independent NEPA analysis, ESA compliance documents, and other regulatory approvals for each project.
				Onshore: Onshore Project activities would not result in impacts to marine resources regardless of alternative. Therefore, onshore activities and facilities would have no measurable effect on sea turtles and would therefore be **negligible** adverse.

Associated IPF: Sub-IPFs	**Ongoing Activities**	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Action Alternatives B through F**
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 BIWF could be considered artificial reefs and could 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 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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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 and BIWF WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (NMFS 2015; Taormina et al. 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 sea turtles compared to the surrounding soft bottoms.	The presence of structures associated with non–offshore wind development in nearshore 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 would continue to provide foraging opportunities for sea turtles, with measurable benefits to some individuals.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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 could be some impacts resulting from the existing BIWF, but given that there are only five WTGs, no measurable impacts are occurring.	Not contemplated for non–offshore wind facility sources.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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 and limited to the emplacement corridor. Data are not available regarding effects of suspended sediments on adult and juvenile sea turtles, although elevated suspended sediments could cause individuals to alter normal movements and behaviors. However, these changes are expected to be too small to be detected (NOAA 2020b). 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 2020b). Turbidity associated with increased	The impact on water quality from 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 could result in short-term, temporary impacts on some sea turtle prey species.	As previously noted, up to 10,024 miles of cable would be added in the geographic analysis area. Cable placement and other related construction activities would disturb the seafloor, creating plumes of fine sediment that would disperse and resettle in the vicinity. Data are not available regarding impacts of suspended sediments on adult and juvenile sea turtles, although elevated suspended sediments could cause individuals to alter normal movements and behaviors. However, these changes would be limited in extent, short term in duration, and likely too small to be detected (NOAA 2020b). Seafloor disturbance during construction of future offshore wind projects could affect foraging success for some prey species; however, given that impacts would be short term and generally localized to the cable corridor, no population-level effects on sea turtles would be expected. Overall, anticipated effects from	**Offshore:** Construction of the RWF and offshore RWEC is expected to result in elevated levels of suspended sediment in the immediate proximity of bed-disturbing activities like pile driving, placement of scour protection, and trenching and burial of the RWEC and IAC. The majority of water column effects would be limited to short-term TSS pulses below 100 mg/L. Higher TSS concentrations exceeding 100 mg/L would occur in areas where seafloor sediments have a greater proportion of mud and silt. TSS plumes caused by construction disturbance would dissipate quickly, with concentrations above 100 mg/L lasting no longer than 6 hours at any location (RPS 2021). A summary of the anticipated extent of water column TSS and substrate burial effects is provided in Section 3.6. These effects would be short term because TSS levels are predicted to return to

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	sedimentation could result in short-term, temporary impacts on sea turtle prey species.		sediment deposition and burial on sea turtles would be **negligible** adverse.	normal within minutes to hours of activity completion, depending on the magnitude of disturbance and sediments disturbed. Direct physical effects from TSS exposure are unlikely because sea turtles breathe air and do not share the physiological sensitivities of susceptible organisms like fish and invertebrates. Turtles could alter their behavior in response to elevated suspended sediment levels (e.g., moving away from an affected area). They could also experience behavioral stressors (e.g., reduced ability to forage and avoid predators). However, turtles are highly mobile and can avoid short-term suspended sediment impacts that are limited in severity and range. Given the anticipated extent of potential suspended sediment impacts expected to result from the Project, sea turtle mobility to avoid exposure, and low sea turtle sensitivity to this stressor, effects to sea turtles from elevated suspended sediment levels would be **negligible** adverse. Alternatives C through F would result in similar impacts to sediment deposition and burial to the Proposed Action but reduced in extent and therefore **negligible**. Many sea turtle species routinely inhabit nearshore and estuarine environments with periodically high natural turbidity levels; therefore, short-term exposure to elevated suspended sediment is unlikely to measurably inhibit foraging (Michel et al. 2013). As discussed in Section 3.6, habitat disturbance and resettled sediment are natural ecosystem processes, and impacts on prey and foraging success for sea turtles would also be **negligible** adverse for Alternatives B through F. Seafloor disturbance during O&M activities would be limited. As noted previously, the cables are unlikely to require repair or maintenance, but up to 10% of cable protection could need to be replaced over the life of the Project. Replacement of the cable protection could result in localized, temporary increases in TSS. However, consistent with impacts of cable installation, suspended sediment plumes would be limited to within 10 to 12 feet of the seafloor in the open ocean waters where marine mammals are most likely to occur. Potential effects of removal of the cable during decommissioning would be similar in nature to those anticipated for cable installation or replacement of cable protection. Those species that are exposed to elevated TSS would be unlikely to experience measurable effects on behavior, foraging success, or mobility. Sediment deposition and burial effects on sea turtles resulting from Alternatives B through F Project O&M and decommissioning would be temporary **negligible** adverse. BOEM estimates a cumulative total of up to 30,885 acres of seafloor disturbance for the Proposed Action plus all other future offshore wind projects in the geographic analysis area. Alternatives C through F would result in impacts similar to the Proposed Action, but the magnitude of those impacts would be reduced based on the smaller footprint proposed for these alternatives. As discussed above, TSS effects on sea

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				turtles are likely to be negligible adverse because of limited potential exposure to elevated TSS. No population-level effects on sea turtles are expected from reduced water quality. Therefore, Alternatives B through F when combined with past, present, and reasonably foreseeable activities would result in **negligible** adverse cumulative effects on sea turtles.
Traffic: Vessel collisions	Current activities contributing to this sub-IPF include port traffic levels, fairways, traffic separation schemes, 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 could 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).	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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, and drowned nests as well as loss or degradation of nesting beaches. Offshore impacts, including sedimentation of nearshore 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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.
Climate change: Warming and sea level rise; storm severity, frequency, sediment erosion, deposition	Sediment erosion and/or deposition in coastal waters has 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.	See Section 3.19.1.1 for analysis.	See Sections 3.19.2.2 and 3.19.2.3 for analysis.

Demographics, Employment, and Economics

Table E2-7. Summary of Activities and the Associated Impact-Producing Factors for Demographics, Employment, and Economics

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Energy generation/ security	In 2017, Massachusetts energy production totaled 125.2 trillion British thermal units (Btu), of which 72.4 trillion Btu was from renewable sources, including geothermal, hydroelectric, wind, solar, and biomass (U.S. Energy Information Administration 2018). In 2019, Rhode Island energy production totaled 8.8 trillion Btu from renewable resources, including biofuels, wood and waste, and noncombustible renewables. In the same year, Connecticut energy production totaled 211.9 trillion Btu, of which 37.2 trillion Btu was from renewable sources (U.S. Energy Information Administration 2021).	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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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 Bedford Marine Commerce Terminal was upgraded	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 be able to host larger deep draft vessels as they continue to increase in size.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	by the port specifically to support the construction of offshore wind energy facilities.			
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 be able to host larger deep draft vessels as they continue to increase in size.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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 could be known as fish aggregating devices (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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
Presence of structures: Viewshed	No existing offshore structures are within the viewshed of the WEA except buoys.	Reasonably foreseeable activities (non–offshore wind) would not result in additional offshore structures.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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 economy.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Traffic: Vessel collisions	The region's substantial marine traffic could 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 are anticipated.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
Traffic: Vehicle	Onshore development activities support local population growth, employment, and economies. Disturbances can cause temporary, localized traffic delays and restricted access to adjacent properties.	Onshore development projects would be ongoing in accordance with local government land use plans and regulations.	See Section 3.11.1.1 for analysis.	See Sections 3.11.2.2 and 3.11.2.3 for analysis of impacts.
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.	Because future offshore wind energy facilities would produce less GHG emissions than fossil fuel–combusting power generation facilities with similar capacities, these facilities would reduce the adverse effects of climate change on the demographic and economic health of coastal communities in the geographic analysis area. These beneficial impacts would be long term, but they would be **negligible** adverse given the magnitude of global GHG emissions and their adverse demographic, employment, and economic impacts.	During operations, the Proposed Action would have a beneficial impact to demographic, employment, or economic conditions in the geographic analysis area by contributing to a broader combination of actions to reduce future impacts from climate change over the long term. These beneficial impacts would be long term, but they would be **negligible** adverse given the magnitude of global GHG emissions and their adverse demographic, employment, and economic impacts for all design configurations analyzed under the Proposed Action. Collectively, the Proposed Action when combined with past, present, and reasonably foreseeable projects would have long-term **major** adverse impacts on demographic, employment, and economic conditions in the geographic analysis area, primarily through the associated risks of flooding, extreme heat, and storm damage. Alternatives C through F would be similar to that for the Proposed Action: long term beneficial **negligible** during operations and cumulatively long term **major** adverse for all design configurations analyzed.

Environmental Justice

No IPFs with solely negligible impacts were identified.

Table E2-8. Summary of Activities and the Associated Impact-Producing Factors for Environmental Justice

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
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 cable, line, and pipeline laying. According to the 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	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue a similar trend to ongoing uses. Impacts are unlikely to affect water quality.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	Federation Limited (2021), 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 would be expected to brief and localized from accidental releases.			
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 the EPA has established dredge spoil criteria and regulates the disposal permits issued by the USACE. The impact on water quality from sediment suspension during these future activities would be short term and localized.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
Air emissions: Construction/ Decommissioning	Ongoing population growth and new development within the geographic analysis area is likely to increase traffic, with a resulting increase in emissions from motor vehicles. Some new industrial development could 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 could include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations would 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 reuse industrial space.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
Air emissions: O&M	Ongoing population growth and new development within the geographic analysis area is likely to increase traffic, with a resulting increase in emissions from motor vehicles. Some new industrial development could 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 could include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations would 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 reuse industrial space.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
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.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
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.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. Future new cables would disturb the seafloor and cause temporary increases in suspended sediment, resulting in infrequent, localized, and short-term impacts over the next 35 years.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
Noise: O&M	Offshore O&M of existing wind energy projects generates negligible amounts of noise.	There are no reasonably foreseeable offshore facilities that would generate noise from O&M.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
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,	No future activities were identified within the geographic analysis area other than ongoing activities.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	local, and extend only a short distance beyond the work area.			
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.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF consist of 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.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
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.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
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.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
Presence of structures: 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.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
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.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
Presence of structures: Viewshed	There are no existing offshore structures within the viewshed of the WEA except buoys.	Reasonably foreseeable activities (non–offshore wind) would not result in additional offshore structures.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
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 employment.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.
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. Factors that make environmental justice populations particularly vulnerable to the adverse health, safety, and economic impacts of climate change-–related events such as heat waves, heavy	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.	See Section 3.12.1.1 for analysis.	See Sections 3.12.2.2 and 3.12.2.3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	flooding, and droughts include where they live, language barriers, their health, and their limited financial resources to cope with these effects (Cho 2020; EPA 2017). The frequency and intensity of climate-related events such as heat waves and heavy flooding are becoming more frequent and more intense across most land regions, and this trend is expected to continue (IPCC 2021).			

Cultural Resources

No IPFs with solely negligible impacts were identified.

Table E2-9. Summary of Activities and the Associated Impact-Producing Factors for Cultural Resources

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases: Fuel/fluids/hazmat	See Table E1-4 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 impacted 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.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
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 cultural 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	Future activities with the potential to result in accidental releases consist of 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.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	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.			
Anchoring	The use of vessel anchoring and gear (i.e., wire ropes, cables, chains 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 marine cultural resources such as shipwrecks and debris fields.	Future activities with the potential to result in anchoring/gear utilization consist of 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.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2. 7 for analysis of impacts.
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 consist of 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.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
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.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
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 met towers. Marine activity would also occur within the marine viewshed of the geographic analysis area.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
Presence of structures: Onshore construction	Onshore construction activities can impact terrestrial cultural resources by damaging and/or removing resources.	Future activities that could result in terrestrial land disturbance impacts consist of onshore residential, commercial, industrial, and military development activities in and near Quonset Point, Rhode Island. Onshore construction would continue at current rates.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
New cable emplacement/ maintenance	Current offshore construction activity is limited to submarine fiber-optic and electrical transmission cables, including six existing power cables in the geographic analysis area.	Future activities with the potential to result in seafloor disturbances similar to offshore impacts consist of 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 marine cultural resources, including shipwrecks and formerly subaerially exposed pre-contact Native American cultural sites.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
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.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
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.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
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, shellfishing, and fowling activities.	The rate of change to migratory animal patterns would increase as a result of climate change.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
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.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
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 cultural 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.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.
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	Sea level rise and storm severity/frequency would increase due to the effects of climate change.	See Section 3.10.1 for analysis.	See Sections 3.10.2.2 through 3.10.2.7 for analysis of impacts.

Associated IPF: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	architectural resources, while sea level rise would inundate archaeological, architectural, and TCP resources.			

Recreation and Tourism

Table E2-10. Summary of Activities and the Associated Impact-Producing Factors for Recreation and Tourism

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Anchoring	Anchoring occurs due to ongoing military, survey, commercial, and recreational activities.	Impacts from anchoring would continue and could 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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts.
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts.
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts.
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts.
Noise: O&M	Limited to BIWF	Not applicable.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts.
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts during offshore activities.
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts.
Noise: Vessels	Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this sub-IPF consist of 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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts during offshore activities.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also	Ports would need to perform maintenance and upgrade facilities over the next 35 years to ensure that they can	**Offshore:** Existing ports used for staging and construction of planned future projects could influence recreational	**Offshore:** Existing ports in the geographic analysis area that would be used for Project staging and construction

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	experiencing continual upgrades and maintenance. The New Bedford Marine Commerce Terminal was upgraded by the port specifically to support the construction of offshore wind energy facilities.	still receive the projected future volume of vessels visiting their ports and be able to host larger deep draft vessels as they continue to increase in size.	opportunities or access. However, these ports are primarily industrial in character and are not intended to support recreational activity as a primary use. If used secondarily for recreation, any port improvements could result in short-term delays and crowding during construction but would result in increased berths and amenities for recreational vessels, improved navigational channels, or opportunities to separate recreational boating from commercial shipping in the long term. Because impacts to offshore recreation and tourism related to current marine industrial activities at existing ports would not experience significant changes, regardless of offshore wind industry development (BOEM 2016), only **negligible** adverse impacts on recreation and tourism could occur.	consist of the Port of Montauk, Port Jefferson, Port of Providence, Port of Davisville at Quonset Point, Point of Galilee, Port of New London, and New Bedford Marine Commerce Terminal. However, these ports are primarily industrial in character and are not intended to service recreational activity. Therefore, the Proposed Action would have a long-term **negligible** adverse impact on recreation and tourism due to port utilization within the geographic analysis area. Impacts of Alternatives C through F would be similar to the Proposed Action. As previously noted, existing ports used for O&M of the Project could influence recreational opportunities or access. However, these ports are primarily industrial in character and are not intended to support recreational activity as a primary use. Because impacts to offshore recreation and tourism related to current marine industrial activities at existing ports would not experience significant changes, regardless of offshore wind industry development (BOEM 2016), negligible adverse impacts on recreation and tourism could occur. Impacts during decommissioning would be similar to the impacts during construction and installation. Although Alternatives C through F would reduce the number of WTGs and associated IACs, the impact would be negligible adverse. Port activity would result in increased short-term construction traffic and long-term operational traffic to the No Action Alternative, which could coincide with recreational activity in the vicinity, depending on transportation type (e.g., vessels, rail, or road vehicle). However, activities related to the Proposed Action at port facilities would occur within the boundaries of existing ports or other repurposed industrial facilities where recreational users would not be expected to occur. Project activities at ports would be similar to those already taking place at these facilities and would be consistent with state and local agency guidelines regarding land use, access, noise and air quality, and other impacts on nearby neighborhoods. Alternatives C through F would reduce the number of WTGs and associated IACs, but Project impacts on this IPF would be similar to the Proposed Action, Therefore, Alternatives B through F when combined with past, present, and reasonably foreseeable activities would have **negligible** adverse cumulative impacts on recreation and tourism.
			Onshore: Impacts to onshore recreation and tourism related to current marine industrial activities at existing ports would not result in significant changes, regardless of	**Onshore:** The proposed O&M facility (located in the Port of Brooklyn, Port of Davisville at Quonset Point, Port of Galilee, Port Jefferson, or Port of Montauk) would be located within an existing industrial port. No new building

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			offshore wind industry development (BOEM 2016). Therefore, impacts would be **negligible** adverse.	construction would occur at the Port of Galilee or Port of Brooklyn; use of these ports is assumed to be limited to existing facilities maintained by the ports. However, a new building with up to 1,000 square feet of office space and up to 11,000 square feet of equipment storage space could be constructed at the Port of Davisville at Quonset Point or the Port of Montauk. A BOEM study suggests that impacts on recreation and tourism related to current marine industrial activities at existing ports would not experience significant long-term changes, regardless of offshore wind industry development (BOEM 2016). However, the study notes that although the Atlantic coast already possesses the necessary infrastructure to support offshore wind, the industry is still evolving (BOEM 2016), and communication, flexibility, and scalability are needed to ensure port selection would not impact tourism or recreation. Based on BOEM's findings, negligible temporary adverse impacts to recreation or tourism activities from port use are anticipated during construction. O&M facilities and activity would be indistinguishable from other industrial or commercial businesses and maritime activities that typically occur at proposed port locations. As these ports do not provide recreation as a primary service, O&M would have negligible adverse impacts on onshore recreation and tourism. Project facilities and port activity would be indistinguishable from other industrial or commercial businesses and maritime activities that typically occur at proposed port locations. As these ports do not provide recreation as a primary service, Alternatives B through F when combined with past, present, and reasonably foreseeable projects would result in temporary **negligible** adverse cumulative impacts to onshore recreation and tourism.
Port utilization: Maintenance/ Dredging	No major ports are within the geographic analysis area. Periodic maintenance is necessary for harbors within the geographic analysis area.	Ongoing maintenance and dredging of harbors within the geographic analysis area would continue as needed. No specific projects are known.	See Port Utilization: Expansion for analysis of offshore and onshore impacts.	See Port Utilization: Expansion for analysis of offshore and onshore impacts.
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts during offshore activities.
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts during offshore activities.
Presence of structures: Fish aggregation	Structures, including tower foundations, scour protection around foundations, and various means of hard protection	Reasonably foreseeable activities (non–offshore wind) would not result in additional offshore structures.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts during offshore activities.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	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.			
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts during offshore activities.
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts during offshore activities.
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.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts during offshore activities.
Presence of structures: Viewshed	The only existing offshore structures within the viewshed of the Project are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components of the Project would be limited to met towers. Marine activity would also occur within the marine viewshed.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts.
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 in 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 economy.	See Section 3.18.1.1 for analysis.	See Sections 3.18.2.2 and 3.18.2.3 for analysis of impacts.

Visual Resources

No IPFs with solely negligible impacts were identified.

Table E2-11. Summary of Activities and the Associated Impact-Producing Factors for Visual Resources

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Light: Vessels	Light associated with military, commercial, or construction vessel traffic can temporarily affect coastal viewsheds when the addition of intrusive, modern lighting changes the physical environment (setting). 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.	Future activities with the potential to result in vessel lighting impacts consist of 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	See Section 3.20.1.1 for analysis.	See Sections 3.20.2.2 and 3.20.2.3 for analysis.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
		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 can result in impacts, particularly if the light source affects uninterrupted nighttime skies or periods of darkness. Any tall structure (e.g., commercial building, radio antenna, large satellite dish) 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.	See Section 3.20.1.1 for analysis.	See Sections 3.20.2.2 and 3.20.2.3 for analysis.
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 met towers. Marine activity would also occur within the viewshed of the geographic analysis area.	See Section 3.20.1.1 for analysis.	See Sections 3.20.2.2 and 3.20.2.3 for analysis.

Commercial Fisheries and For-Hire Recreational Fishing

No IPFs with solely negligible impacts were identified.

Table E2-12. Summary of Activities and the Associated Impact-Producing Factors for Commercial Fisheries and For-Hire Recreational Fishing

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases: Fuel/fluids/hazmat	See Table E1-4 for a quantitative analysis of these risks. Ongoing releases are frequent and chronic. Accidental releases and discharges of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	See Table E1-4 for a quantitative analysis of these risks. Gradually increasing vessel traffic over the next 35 years would increase the risk of accidental releases. Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
Accidental releases: Trash and debris	Trash and debris could be accidentally discharged through fisheries use, dredged material ocean disposal, marine minerals extraction, marine transportation, navigation and traffic, survey activities and cables, and lines and pipeline laying. Accidental releases of trash and debris are expected to be low probability events.	No future activities were identified within the geographic analysis area other than ongoing activities.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.1 for analysis of offshore impacts.
Anchoring	Impacts from anchoring occur due to ongoing military, survey, commercial, and recreational activities. The short-term, localized impact to this resource is the presence of a navigational hazard (anchored vessel) to fishing vessels.	Impacts from anchoring could occur on a semiregular 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 the anchored vessel) navigational hazard to fishing vessels.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
Light	Impacts include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights.	Future activities with the potential to result in lighting impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.1 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light 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.	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.		
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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
Noise: Construction, trenching, O&M	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 shorelines 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 could 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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
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 seafloor, 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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
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	No future activities were identified within the geographic analysis area other than ongoing activities.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	through water and/or the seafloor 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.			
Noise: Vessels	Vessel noise is anticipated to continue at levels similar to current levels. While vessel noise could have some impact on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this sub-IPF consist of 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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing 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 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 could 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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
Presence of structures: Navigation hazard and allisions	Structures within and near the cumulative lease areas that pose potential navigation hazards consist of 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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
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 habitats 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 could be considered adverse, beneficial, or neither. Commercial and for-hire recreational fishing can occur near these structures. For-hire recreational fishing is more popular because commercial mobile fishing gear is more likely to snag on structures.	New cables, installed incrementally in the geographic analysis area over the next 20 to 35 years, would likely require hard protection atop portions of the route (see the 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 could 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 (Greene et al. 2010; Guida et al. 2017). These impacts are expected to be local and could be long term.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
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 could 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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
Presence of structures: Space use conflicts	Current structures do not result in space use conflicts.	No known reasonably foreseeable structures are proposed for location in the geographic analysis area that could affect commercial fisheries and for-hire recreational fishing.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
Presence of structures: Cable infrastructure	The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between the mainland and islands. Seven submarine cable corridors cross cumulative lease areas. Shoreline developments are ongoing and consist of 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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
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 could 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	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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	the vessels need to avoid both the structure and each other. The risk for collisions is ongoing but infrequent.			
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 could 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.	See Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.
Regulated fishing effort	Commercial and recreational regulations for finfish and shellfish implemented and enforced by NOAA Fisheries 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 would 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 would likely 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 Section 3.9.1.1 for analysis of offshore impacts.	See Sections 3.9.2.2 and 3.9.2.3 for analysis of offshore impacts.

Land Use and Coastal Infrastructure

Table E2-13. Summary of Activities and the Associated Impact-Producing Factors for Land Use and Coastal Infrastructure

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
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 involving 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.	See Section 3.14.1.1 for analysis.	See Sections 3.14.2.2 and 3.14.2.3 for analysis of impacts.
EMFs	EMFs continuously emanate from existing telecommunication and electrical power transmission cables. New cables generating EMFs are infrequently installed in the geographic analysis area. The extent of impacts is likely less than 50 feet (15.2 m) 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 land use and coastal infrastructures other than ongoing activities.	The onshore transmission lines used to connect power generated by future offshore wind projects to the electrical grid would generate detectable EMF effects within a short distance of cable corridors. Most, if not all, future onshore transmission cables would run belowground in buried cable ducts, reducing EMF exposure relative to aboveground electrical infrastructure. Based on modeled EMF levels for currently planned projects (Exponent 2018, 2020), typical EMF levels at approximately 3 feet (1 meter) immediately above the buried cable would range from 73 to 300 mG. Field strength would diminish rapidly with distance, decreasing to near 0 mG within 25 to 50 feet of the cable centerline. These potential effects must be placed in context with typical levels of EMF exposure experienced in everyday life. The National Institutes of Health (NIH 2002) determined that approximately 95% of the U.S. population has an average daily EMF exposure of approximately 4 mG from electrical systems and devices at home and work. Localized EMF levels in proximity to electrical power infrastructure are considerably higher. Typical magnetic fields within 50 feet of power distribution lines range from 10 to 20 mG for main feeders and 3 to 10 mG for laterals under typical loads, reaching as high as 40 to 70 mG under peak loads depending on the amount of current being carried (NIH 2002). Anticipated onshore EMF from offshore wind energy transmission cables would be comparable to, if not lower than, baseline EMF levels generated by existing aboveground electrical infrastructure. Future offshore wind projects would likely generate EMF levels similar to those for the Project. International Commission on Non-Ionizing Radiation Protection (ICNIRP) and International Committee on Electromagnetic Safety (ICES) guidance set exposure levels between 2,000 and 9,040 mG for the general population, although exact levels vary from state to state. The addition of wind energy transmission cables would result in slightly elevated onshore EMF levels.	**Offshore:** There would be no EMF produced during construction of the offshore Project structures. Offshore elements of the Proposed Action such as the WTGs, IAC, and OSS-link cable would generate EMF during operation. The cables produce a magnetic field, both perpendicularly and in a lateral direction around the cables. The calculated magnetic field at a height of 3.3 feet (1 m) above the seafloor is highest directly above the buried cables (IACs, 17 mG; RWECs, 41 mG; and RWEC landfall cables, 39 mG) and decreases rapidly with distance. EMF is reduced to less than 6 mG within 30 feet of the IACs, RWECs, and RWEC landfall cables. All calculated field levels are well below the ICNIRP reference level of 2,000 mG and the ICES exposure reference level of 9,040 mG for exposure of the general public. Therefore, effects would be **negligible** adverse. Impacts would be lower, but still similar, for Alternatives C through F due to the reduction of the number of WTGs and possible reduction of miles of IAC. Reasonably foreseeable future actions would also generate offshore EMF due to the use of similar Project components. However, it is anticipated that reasonably foreseeable future actions would also use similar construction and operations techniques, which includes shielding and protecting cables that are laid directly on the seafloor. Shielded electrical transmission cables do not directly emit electrical fields into surrounding areas but are surrounded by magnetic fields that can cause induced electrical fields in moving water. Due to the rapid dissipation of EMFs surrounding the cables and incorporation of protection measures, there would be a **negligible** adverse cumulative impact on land use and coastal infrastructure for Alternatives B through F. Impacts would be lower, but still similar, for Alternatives C through F due to the reduction of the number of WTGs and possible reduction of miles of IAC. **Onshore:** There would be no EMF produced during construction of the onshore Project structures.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			However, EMF levels decrease very rapidly with distance from the cables. For an 880-MW transmission cable, peak EMF would be 73 mG at the cable but would decrease to 2 mG at 25 feet from the cable. This is well below international EMF standards. The presence of slightly elevated levels of EMF from future offshore wind activities would have no effect on land use and coastal infrastructure because elevated EMF would not alter land use patterns, change land uses, or have any other effect on land use and coastal infrastructure. On this basis, the effects of EMF on land use under the No Action Alternative would be long term **negligible** adverse, as there would be no effect on land use and coastal infrastructure.	Between the TJBs and OnSS, the onshore transmission cables would be installed in a double-circuit underground duct bank. Modeling of the magnetic field levels associated with the operation of these cables calculates the magnetic field at peak loading directly over the duct banks at 73 mG or lower for the maximum 880-MW capacity of the RWF. This is well below the ICNRIP reference level of 2,000 mG and the ICES exposure reference level of 9,040 mG for the general public (Exponent 2020). Lower magnetic fields would be produced if the power generated by the RWF is less than 880 MW. Based on modeled EMF levels for the Proposed Action (Exponent 2020), typical EMF levels at approximately 3 feet (1 m) immediately above the buried cable would be a maximum of 73 mG. Field strength would diminish rapidly with distance, decreasing to near 0 mG within 25 to 50 feet of the cable centerline. These potential effects must be placed in context with typical levels of EMF exposure experienced in everyday life. The NIH (2002) determined that approximately 95% of the U.S. population has an average daily EMF exposure of approximately 4 mG from electrical systems and devices at home and work. Localized EMF levels in proximity to electrical power infrastructure are considerably higher. Typical magnetic fields within 50 feet of power distribution lines range from 10 to 20 mG for main feeders and 3 to 10 mG for laterals under typical loads, reaching as high as 40 to 70 mG under peak loads, depending on the amount of current being carried (NIH 2002). Therefore, the relative level of EMF from the onshore duct bank would be low compared to other electrical infrastructure. The underground transmission cables onshore would not be a direct source of any electric field aboveground due to cable construction, duct bank, and burial underground (vhb 2022). As EMFs would remain well below established thresholds and there would be no direct source of aboveground EMFs, it is anticipated that there would be no impact on land use and coastal infrastructure due to EMFs from O&M of onshore Project facilities. Decommissioning would result in no EMF impacts, similar to construction. Therefore, there would be a **negligible** adverse EMF impact on land use and coastal infrastructure from O&M and decommissioning of onshore elements of Alternatives B through F. Reasonably foreseeable future actions would likely generate EMF levels similar to those for the Project. On this basis, the cumulative effects of EMF on land use under all Project alternatives would be **negligible** adverse

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				as there would be no effect on land use and coastal infrastructure and Alternatives B through F have identical onshore facilities and activities.
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.	See Section 3.14.1.1 for analysis.	See Sections 3.14.2.2 and 3.14.2.3 for analysis of impacts.
New cable emplacement/maintenance	Onshore buried transmission cables are present in the area near the Project onshore and offshore improvements. Onshore activities would only occur where permitted by local land use authorities, which would avoid long-term land use conflicts.	No known proposed onshore structures are reasonably foreseeable and proposed to be located in the geographic analysis area for land use and coastal infrastructure.	See Section 3.14.1.1 for analysis of onshore impacts. Offshore cable activities would not impact onshore land use or infrastructure.	See Sections 3.14.2.2 and 3.14.2.3 for analysis of onshore impacts. Offshore cable activities would not impact onshore land use or infrastructure.
Noise	Ongoing noise from construction occurs frequently near the shores of populated areas in New England and the mid-Atlantic region but infrequently offshore. Noise from construction near shorelines is expected to gradually increase over the next 30 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 geographic analysis area other than ongoing activities.	See Section 3.14.1.1 for analysis.	See Sections 3.14.2.2 and 3.14.2.3 for analysis of impacts.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. The MCT at the Port of New Bedford is a completed facility developed by the port specifically to support the construction of offshore wind 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 be able to host larger deep draft vessels as they continue to increase in size.	Various ports would be improved to support future offshore wind projects (see Appendix E). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. Therefore, ports would experience long-term beneficial impacts such as greater economic activity and increased employment due to demand for vessel maintenance services and related supplies; vessel berthing, loading and unloading; warehousing and fabrication facilities for offshore wind components; and other business activity related to offshore wind. State and local agencies would be responsible for minimizing the potential adverse impacts of these future port expansions by managing port resources and traffic control to ensure continued access to ports and adjacent land uses. There could be increased traffic and noise associated with increased port use that could impact land uses by increasing congestion and noise. However, all traffic, noise, and other adverse impacts would be under regulatory thresholds as ports would be required to comply with local land use and zoning regulations. On this basis, the effects of port	**Offshore:** Land uses impacted by the construction of offshore components would include chosen port facilities used for shipping, storing, and fabricating Project components and for crew transfer, cargo logistics, and storage. Revolution Wind would use one or more ports to offload shipments of components, prepare them for installation, and load components onto vessels for delivery and installation. Selected ports could require improvements or upgrades to meet Project needs (see Table 3.3.10-1 of the COP), but no specific port improvements have been proposed as part of the Proposed Action. The COP states that to the extent that upgrades or modifications at an existing port facility could occur, Revolution Wind expects that those upgrades or modifications would serve to support the U.S. offshore wind industry in general. This is especially true as a number of states continue to procure, support, and fund such development. Thus, whether or not upgrades are required, port facilities are expected to serve multiple offshore wind projects and potentially also offshore wind-related and other maritime industries. BOEM (2016) analyzed potential impacts to ports that could require upgrades to accommodate offshore wind projects or that are in the process of completing upgrades in anticipation of increased port use associated with

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			utilization on land use under the No Action Alternative would be long term **negligible** adverse.	offshore wind projects. BOEM noted that land use and transportation impacts primarily include land-based space conflicts with current or planned uses of adjacent areas and landside traffic delays or conflicts associated with construction. BOEM (2016) also identified potential water-based space conflicts with other uses of port waterways such as dredging, pile driving, and fill placement. The ports under consideration for construction staging are industrial in character, designated by local zoning and land use plans for heavy industrial activity, and typically adjacent to other industrial or commercial land uses and major transportation corridors. Therefore, it is expected that port improvements or upgrades would be subject to local zoning and land use regulations and that any upgrades to ports would undergo independent permitting and regulatory compliance processes. The development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects; however, no specific port improvements are identified as part of the Project. All future port improvements would be subject to independent environmental permitting and regulatory review and would be consistent with local land use and zoning regulations. As such, any future port improvements supporting offshore wind development would be consistent with, and therefore would not hinder, other nearby land use or use of coastal infrastructure. Overall, construction and installation of offshore components would have minor beneficial impacts to land use and coastal infrastructure by supporting designated uses at ports and supporting port improvements and/or redevelopment. Improvements such as road widening and signalization would provide transportation flow benefits over the long term. Because port expansion and upgrades are not part of the Proposed Action and would undergo separate permitting and regulatory review, there would be a negligible adverse port utilization impact on land use and coastal infrastructure from construction and installation of offshore elements of the Proposed Action. Alternatives C through F would slightly reduce impacts to port utilization due to reduction of the number of WTGs and possible reduction of miles of IAC. However, impacts would be similar to the Proposed Action: **negligible** adverse. Offshore O&M facilities would include the RWEC, IAC, OSS interconnection cable, and OSS electrical components. While these offshore components would tie

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				into onshore Project components that could affect land use, the offshore activities and facilities themselves would not directly impact land use. Offshore facilities that tie into onshore facilities could result in increased activity within any of the listed onshore port areas zoned for business and industrial uses. However, this would reinforce the designated land use and provide a source of investment in the coastal infrastructure. Activities at ports, as in the preceding paragraph, would be consistent with the existing and designated uses at other ports and would comply with local zoning and land use regulations. Therefore, there would be a long-term **minor** beneficial and a **negligible** adverse port utilization impact on land use and coastal infrastructure from O&M and decommissioning of offshore elements of the Proposed Action. Impacts would be similar for Alternatives C through F, although slightly reduced, so the impact determination would be the same as the Proposed Action. Port upgrades and vessel activity associated with the Proposed Action could result in incremental impacts through an increase in economic and employment opportunities as well as reduced port access, increased delays and congestion, or increased collision risk. Project port activity and upgrades (via dredging and in-water work) could also coincide with other forecasted projects. Quonset Point is scheduled to undergo remediation at the former NIKE Battery PR-58 and Disaster Village Training Area in 2021. In late 2020, the Rhode Island congressional delegation and the general treasurer joined the Rhode Island Department of Environmental Management in launching a $5.2 million project to make improvements at the Port of Galilee. The project would be located at the North Bulkhead section of the port where heavy-duty commercial fishing piers would be demolished and replaced, bulkhead asphalt repaired, and electrical supply upgraded (Block Island Times 2020). If the Port of Galilee is chosen to support Revolution Wind O&M activities, there would be no Project-related upgrades at the Port of Galilee. Port Jefferson has completed a master plan and an upper port revitalization plan, which is a blight study and urban renewal plan pursuant to New York State law. It involved rezoning certain areas and supporting major housing and mixed-use projects within the town (Village of Port Jefferson 2019). No specific non-Project improvements are proposed for Montauk Harbor, but NYSERDA issued an offshore wind master plan that notes Montauk Harbor as having the potential to be used or developed into

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				facilities capable of supporting offshore wind projects (NYSERDA 2017). Port activities could be delayed or area transportation routes could experience longer delays as a result of the overlap in construction activities. All activities would, however, be in accordance with land use goals and plans and would be subject to local land use and zoning regulations. Construction and operations improvements associated with the Project and other offshore wind energy development would occur within the boundaries of existing port facilities or repurposed industrial facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for development of waterfront infrastructure as well as economic opportunities (see Section 3.11). State and local agencies would also be responsible for minimizing the impacts of these future development plans by ensuring continued access to ports and adjacent land uses and minimizing or avoiding noise, air quality, and other impacts on nearby neighborhoods. Therefore, when considered in combination with past, present, and other reasonably foreseeable projects, the Proposed Action would have **negligible** adverse cumulative impacts on land use and coastal infrastructure. Alternatives C through F would slightly reduce impacts to port utilization, but impacts would remain the same as the Proposed Action: **negligible** adverse.
				Onshore: The Project is evaluating the use of the Port of Davisville at Quonset Point, Port of Galilee, Port Jefferson, and Port of Montauk to support O&M of the Project (see Table 3.3-24 in the COP). O&M buildings at or near some or all of these ports would be used for wind farm monitoring and equipment storage for multiple offshore wind projects—the RWF, SFWF, and Sunrise Wind Farm—and as such have utility that is independent of the Project. If the Port of Galilee or Port of Brooklyn are chosen as O&M facility locations, use of these ports would be limited to existing facilities maintained by these ports. Use of the other ports listed above would include using existing facilities as well as constructing additional facilities to support the RWF and other wind farms. An existing upland building, called the Research Way O&M Building, is located approximately 6 miles from Port Jefferson at 22 Research Way in Setauket-East Setauket, New York. It is located within an office park that also hosts technology companies and health care providers among other businesses. The building was recently purchased by Northeast Offshore, LLC, and internal

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				upgrades to establish office and warehouse space are planned. The planned work requires no governmental authorizations other than local building permits and would consist entirely of interior renovations to create workspaces. No external modifications or expansions are planned other than any necessary repairs to maintain the existing external appearance. The only other external planned work being discussed is maintenance of the parking lot, landscaping, and, potentially, signage. The Research Way facility would also be capable of serving multiple projects as well as general Orsted and Eversource business needs. A new building with up to 1,000 square feet of office space and up to 6,000 square feet of equipment storage would be constructed at the Port of Montauk. This facility could also serve as an O&M base for multiple offshore wind projects. The ports under consideration for construction staging are industrial in character, designated by local zoning and land use plans for heavy industrial activity, and typically adjacent to other industrial or commercial land uses and major transportation corridors. Activities associated with onshore construction of the Project would generate noise, vibration, and vehicular traffic and would temporarily alter views at one or more ports listed in Table 3.3.10-1 of the COP. Port improvements would result in combustion emissions from construction vehicles and equipment and could result in fugitive particulate emissions from soil movement. These impacts would be typical for construction in and operation of industrial ports. Noise, vibration, vehicular traffic increases, and vehicular emission generation would be short term. Potential landside transportation impacts would be minimized through construction hour restrictions, improvements such as road widening and signalization, and appropriate route selection (BOEM 2016). Activity and development from the Project would not occur at levels above those typically experienced or expected at these facilities, would not hinder other nearby land use or use of coastal infrastructure, and would comply with local land use and zoning regulations. Overall, construction and installation of onshore components would have **minor** beneficial impacts to land use and coastal infrastructure by supporting designated uses at ports and port improvements and/or redevelopment. Improvements such as road widening and signalization would provide transportation flow benefits over the long term. Alternatives B through F include identical onshore facilities and activities and impacts.

Associated IPFs: Sub-IPFs	**Ongoing Activities**	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Action Alternatives B through F**
				Project O&M would involve routine daily activities at O&M facilities that are consistent with the zoned uses for those specific parcels. O&M facilities would include offices, warehouses, and associated accessory uses, which are consistent with the range of land uses associated with the ports listed in Table 3.3.10-1 of the COP. The increased activity within any of the listed port areas zoned for business and industrial uses would reinforce the designated land use and provide a source of investment in the coastal infrastructure. O&M activities would be limited to temporary, periodic use of vehicles and equipment; associated impacts would be consistent with zoned and designated uses for commercial and industrial port facilities. The presence of O&M facilities and related O&M activities would contribute to the economic vitality of ports. O&M of onshore components would therefore have minor beneficial impacts to land use and coastal infrastructure by supporting designated uses at ports and supporting port improvements and/or redevelopment that would benefit other projects and port uses beyond those necessary for the Project (see Section 3.11). Therefore, there would be a long-term **minor** beneficial and a **negligible** adverse port utilization impact on land use and coastal infrastructure from O&M and decommissioning of onshore elements of Alternatives B through F. Development of an offshore wind industry on the mid-Atlantic OCS could incentivize the expansion or improvement of regional ports to support planned and future projects. Potential future activities could include upgrades to port facilities that would have long-term beneficial impacts to other users over a long time period. All future port improvements would be subject to independent environmental permitting and regulatory review and are not part of the Project. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on port utilization for Alternatives B through F.
Presence of structures: Viewshed	The only existing offshore structures within the offshore viewshed of the Project 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 offshore viewshed.	Future offshore wind activities would add 3,008 additional structures within the geographic analysis area. Future offshore wind activities would also result in onshore placement of structures. Structures would be built in accordance with state and local land use, zoning, and building regulations and therefore would have minimal land use and coastal infrastructure impacts. While the presence of additional onshore structures	**Offshore:** The installation and operation of up to 102 offshore structures for the Proposed Action and construction of the IAC, OSS-link cable, and RWEC would not result in any impacts to land use and coastal infrastructure because these impacts would occur offshore and would not overlap with onshore land uses. Therefore, there would be a **negligible** adverse impact from the presence of structures on land use and coastal

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			could impact land uses by reducing the amount of land available for other uses and generating short-term construction impacts, all structures would be built in accordance with state and local zoning and building regulations and would therefore have a minimal impact on land use and coastal infrastructure. On this basis, the effects of the presence of structures on land use under the No Action Alternative would be long term **negligible** adverse.	infrastructure from O&M and decommissioning of offshore elements of Alternatives B through F. Similarly, when considered in combination with past, present, and other reasonably foreseeable projects, the Proposed Action would have no effect on land use and coastal infrastructure; therefore, the cumulative impact would be **negligible** adverse. Alternatives C through F would result in incrementally smaller impacts, but not measurably reduce land use and coastal infrastructure impacts compared to the Proposed Action.
				Onshore: Onshore structures that would be constructed as part of the Project include the onshore transmission cable, ICF, and OnSS. The OnSS would require temporary disturbance (construction footprint) of up to 7.1 acres to facilitate construction. This includes an operational footprint of 3.8 acres. The ICF would require a temporary construction footprint of approximately 4.0 acres, which includes the 1.6-acre operational footprint. The ICF would be constructed adjacent to the existing Davisville Substation, in the zoned Quonset Business Park District. Installation of the ICF could increase visibility of the existing substation to nearby residences along Camp Avenue. However, construction would take place adjacent to the existing Davisville Substation, in lots surrounded by mature trees. Construction activities associated with onshore facilities is expected to take approximately 1 year and includes clearing and grading, excavating, installing foundations, and constructing the facility. There are no nighttime visually sensitive areas (public parks, beaches, or other public recreational facilities) near the OnSS and ICF that would be impacted by nighttime construction lighting (see Section 3.20). The visual impacts of the ICF would be minimized through the installation of vegetation to provide year-round screening from nearby Camp Avenue, Circuit Drive, and Roger Williams Way; appropriate substation siting; low-profile design; and minimal lighting, all of which would be directed downward (vhb 2021). As designed, the interconnection facility would generate sound below existing, ambient sound levels (vhb 2022). According to federal, state, and local noise standards, there would be no impact as a result of the operation of the ICF. All Project-related construction would take place within areas zoned for industrial and commercial development and would be subject to land use and zoning regulations that limit impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				Therefore, the presence of structures would result in a **negligible** adverse impact on land use and coastal infrastructure from construction and installation of onshore elements of all Project alternatives. O&M activities would include periodic inspections and repairs at the ICF and cable access manholes, which would require minimal use of worker vehicles and construction equipment. Periodic maintenance and repairs would have temporary impacts on access to adjacent land uses. All onshore structures that are part of Alternatives B through F and any necessary modifications to structures would be consistent with land use and zoning regulations. Therefore, the impact from the presence of structures on land use and coastal infrastructure would be **negligible** adverse. Reasonably foreseeable future actions would have similar impacts to Alternatives B through F in terms of the presence of structures. Therefore, cumulative impacts associated with the Project when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on land use and coastal infrastructure for all Project alternatives.

Navigation and Vessel Traffic

No IPFs with solely negligible impacts were identified.

Table E2-14. Summary of Activities and the Associated Impact-Producing Factors for Navigation and Vessel Traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
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 could 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 a moderate increase commensurate with any increase in tankers visiting ports. Deep draft vessel visits to major port visits are expected to increase as well, increasing the potential for an emergency need to anchor and creating navigational hazards for other vessels. Recreational activity and commercial fishing activity would likely stay largely the same related to this IPF.	See Section 3.16.1.1 for analysis.	See Sections 3.16.2.2 and 3.16.2.3 for analysis of impacts.
Port utilization: Expansion	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also	Ports would need to perform maintenance and upgrades to ensure that they can still receive the projected future	See Section 3.16.1.1 for analysis.	See Sections 3.16.2.2 and 3.16.2.3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	experiencing 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.	volume of vessels visiting their ports and 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.	See Section 3.16.1.1 for analysis.	See Sections 3.16.2.2 and 3.16.2.3 for analysis of impacts.
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 fishing near artificial reefs because 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.	See Section 3.16.1.1 for analysis.	See Sections 3.16.2.2 and 3.16.2.3 for analysis of impacts.
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.	See Section 3.16.1.1 for analysis.	See Sections 3.16.2.2 and 3.16.2.3 for analysis of impacts.
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.	See Section 3.16.1.1 for analysis.	See Sections 3.16.2.2 and 3.16.2.3 for analysis of impacts.
New cable emplacement/ maintenance	Within the geographic analysis area for navigation and vessel traffic, existing cables could require access for maintenance activities. Infrequent cable maintenance activities could cause temporary increases in vessel traffic and navigational complexity.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. 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.	See Section 3.16.1.1 for analysis.	See Sections 3.16.2.2 and 3.16.2.3 for analysis of impacts.
Traffic: Aircraft, vessels, collisions	See Table E2-15 (Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Military and National Security Uses) for a discussion of search and rescue (SAR) aircraft and vessels with respect to traffic. SAR helicopters are the main aircraft that could 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. As noted in Table E2-15, no future non–offshore wind stationary structures were identified within the offshore analysis area. Therefore, because vessel traffic volume associated with future non–offshore wind is not expected to increase appreciably, neither should SAR operations.	See Section 3.16.1.1 for analysis.	See Sections 3.16.2.2 and 3.16.2.3 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	See also the sub-IPF for Presence of structures: Navigation hazard	See also the sub-IPF for Presence of structures: Navigation hazard		

Other Uses: Military and National Security

Table E2-15. Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Military and National Security Uses

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities. Impacts are unlikely to affect military and national security uses.	Fuels and oils would be required for construction, installation, O&M, and decommissioning of future offshore wind activities. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. OSRPs would be required for all future offshore wind projects, which includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Releases during construction of future offshore wind activities during all phases of project construction would generally be localized and short term, resulting in little change to water quality. Therefore, this IPF would have a **negligible** adverse impact on military and national security uses because there would be no effect on this resource.	**Offshore:** Fuels and oils would be required for offshore construction and installation equipment, vessels, and infrastructure over the 18-month construction period. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. As described in Section 3.21.1.2, the likelihood of a spill due to construction and installation activities and weather events is low (once per 1,000 years). An OSRP has been prepared for the Project and includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Therefore, this IPF would have a **negligible** adverse impact on military and national security uses. Alternatives C through F would reduce the number of WTGs and their associated IACs, which would have an associated reduction in associated vessel and equipment use. This decrease in WTGs would result in a reduction of possible accidental releases and discharges, but the level of impact would not measurably change relative to the Proposed Action. **Onshore:** Same as offshore impacts.
Anchoring	Impacts from anchoring occur due to ongoing military use and survey, commercial, and recreational activities.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic.	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.
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.	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.
Light	Impacts from lighting on military and national security include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit	Future activities with the potential to result in 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	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	substantially more light on an ongoing basis. Impacts are expected to be minimal.	traffic would continue at the current intensity along the Northeast coast, with a slight increase due to population growth and development over time. Light from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.		
Noise	Noise impacts are expected from construction and vessel traffic. Construction occurs frequently in nearshores 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. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.	While future offshore wind activities without the Proposed Action would result in construction and decommissioning noise and limited operational noise, noise is not expected to impact military and national security as all noise would be lower than regulatory thresholds and would occur in geographic areas in which the military does not typically operate. Therefore, the effects of noise on military and national security under the No Action Alternative would be **negligible** adverse.	**Offshore:** While construction and installation, O&M and decommissioning of offshore elements of the Proposed Action would result in construction noise, noise is not expected to impact military and national security as all noise would be lower than regulatory thresholds. Alternatives C through F would reduce the number of WTGs and their associated IACs, which would have an associated reduction in noise associated with vessel and equipment use, but otherwise, the level of impact would not measurably change relative to the Proposed Action. Therefore, the effects of noise on military and national security under Alternatives B through F would be **negligible** adverse. The Project combined with reasonably foreseeable future actions would result in an increase in construction and decommissioning noise in the RI/MA WEA. However, noise impacts would be distributed across a large geographic area and would not likely occur at the same time. Noise is not anticipated to impact military or national security. Therefore, because Project activities combined with reasonably foreseeable activities would result in a minimal increase in noise offshore that is not expected to impact military and national security uses, the cumulative impacts would be **negligible** adverse. **Onshore:** Same as offshore impacts.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in navigation patterns at nearby airports. The increased activity could cause potential conflicts with military aircraft and vessels.	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 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, changes in port usage by some fishing or recreational vessel operators, and changes in navigation patterns.	There could be a very minimal increase in vessel use at ports associated with the No Action Alternative. The number of construction vessels would increase due to future offshore wind activities without the Proposed Action, which could result in delays and congestion at ports that could lead to potential conflicts with military aircraft and vessels due to increased activity in the vicinity of the airports listed in the Affected Environment. Port improvements and construction activities in or near ports could require alteration of navigation patterns at nearby airports, which could impact military uses. Navigational hazards and collision risks at ports and in transit routes would be reduced as construction is completed, and all navigation hazards and collision risks would be gradually eliminated during decommissioning as offshore WTGs are removed. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists	**Offshore:** Alternatives B through F would require construction and O&M vessels, which could result in minor delays and congestion at ports. This could lead to potential conflicts with military aircraft and vessels due to increased port activity. Although no port improvements are currently planned as part of Alternatives B through F, if port upgrades are required, port improvements and construction activities in or near ports could require alteration of navigation patterns at nearby airports, which could impact military uses. Navigational hazards and collision risks at ports and in transit routes would be reduced as construction and O&M is completed. Vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. However, port utilization is not expected to increase beyond what is currently allowed under land use regulations. Therefore, port utilization is expected to

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on military and national security.	have a **negligible** adverse effect on military and national security. Although Alternatives C through F would result in a slight reduction of port utilization due to a reduction of the number of WTGs and their associated IACs, impacts on this resource would be similar to the Proposed Action. Project activities combined with reasonably foreseeable activities would result in a minimal increase in port utilization that would be accounted for through port improvements and capacity planning. Therefore, the cumulative impacts of noise on military and national security would be **negligible** adverse.
				Onshore: Same as offshore impacts.
Presence of structures: Allisions	Existing stationary facilities that present allision risks include the five offshore wind turbines associated with the BIWF, 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 could be added close to the shoreline.	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.
Presence of structures: Fish aggregation	Existing stationary facilities that act as FADs include offshore wind turbines associated with the BIWF.	No future non–offshore wind additional stationary structures that would act as FADs were identified within the geographic analysis area.	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.
Presence of structures: Navigation hazard	Existing stationary facilities within the geographic analysis area that present navigational hazards consist of the five WTGs in the BIWF; onshore wind turbines; communication towers; dock facilities; and other onshore and offshore 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.	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.
Presence of structures: Space use conflicts	Existing stationary facilities within the geographic analysis area that present a navigational hazard include the five WTGs in the BIWF; onshore wind turbines; communication towers; dock facilities; and other onshore and offshore 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.	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.
Presence of structures: Transmission cable infrastructure	Seven submarine cable corridors cross cumulative lease areas.	Submarine cables would remain in current locations with infrequent maintenance continuing along those cable routes for the foreseeable future.	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.
Traffic: Vessels, collisions	Current vessel traffic in the region is described in Section 3.16.1. 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 Section 3.16.1.	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.
Traffic: Aviation	Onshore and offshore military and national security use areas could have designated surface and subsurface boundaries and special use airspace. Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection	Although no future non–offshore wind stationary structures were identified within the offshore analysis area, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be	See Section 3.17.1.3 for analysis.	See Sections 3.17.2.4 and 3.17.2.9 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments. Warning Area W-105A is a special use airspace area primarily used by the U.S. Air Force located offshore Massachusetts and Rhode Island, and overlapping the RI and MA lease areas.	expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non–offshore wind is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.		
Climate Change	Climate change has resulted in a measurable increase in annual precipitation on the East Coast, which could impact military and national security-related aviation and air traffic due to more inclement weather incidents.	Sea level rise and storm severity/frequency would increase due to the effects of climate change.	Climate change has resulted in a measurable increase in annual precipitation on the East Coast, which could impact military and national security–related aviation and air traffic due to more inclement weather incidents. Future offshore wind activities could result in construction activities that increase GHG emissions. Increased GHG emissions could contribute to climate change impacts during construction. However, the construction of future offshore wind facilities could ultimately help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources, resulting in a net decrease in GHG emissions from energy generation. On this basis, the effects of climate change on military and national security under the No Action Alternative would be **negligible** adverse.	Similar to the No Action Alternative, the construction and installation, O&M, and decommissioning of Alternatives B through F could contribute to climate change impacts during construction. However, the Project could also ultimately help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources, resulting in a net decrease in GHG emissions from energy generation. On this basis, the effects of climate change on military and national security under Alternatives B through F would be **negligible** adverse.

Other Uses: Aviation and Air Traffic

Table E2-16. Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Aviation and Air Traffic

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases and discharges	Accidental releases and discharges would be ongoing and anticipated to occur in low frequencies. This IPF would therefore not overlap with aviation and air traffic uses and areas.	No future activities were identified within the geographic analysis area other than ongoing activities.	Accidental releases and discharges would not overlap with aviation and air traffic uses and areas and therefore would result in a **negligible** adverse impact.	**Offshore:** The effects of this IPF from Alternatives B through F would not impact aviation and air traffic because accidental releases and discharges would not overlap with aviation and air traffic uses. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.
				Onshore: Same as offshore impacts.
Anchoring and new cable emplacement/maintenance	Anchoring activities would be ongoing and anticipated to occur in low frequencies. This IPF would therefore not overlap with aviation and air traffic uses and areas.	No future activities were identified within the geographic analysis area other than ongoing activities.	Future offshore wind activities would require adding new cables and maintaining them as part of future wind projects. The offshore effects of anchoring and new cable emplacement/maintenance would have no bearing on aviation or air traffic, as these uses do not overlap. Onshore construction and maintenance of cables associated with future offshore wind activities would occur in areas that are not likely to overlap with aviation uses. The use of onshore construction equipment would	**Offshore:** Onshore construction, maintenance, and decommissioning of cables associated with future offshore wind activities would occur in areas that are not likely to overlap with aviation uses. The use of onshore construction equipment would not interfere with air traffic. On this basis, the effects of anchoring and new cable emplacement/maintenance on aviation and air traffic under Alternatives B through F would be **negligible** adverse.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			not interfere with air traffic. On this basis, the effects of anchoring and new cable emplacement/maintenance on aviation and air traffic under the No Action Alternative would be **negligible** adverse.	**Onshore:** Same as offshore impacts.
Light	Impacts from lighting on aviation and air traffic include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis. Impacts are expected to be minimal.	Future activities with the potential to result in 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 from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.	See Section 3.17.1.1 for analysis.	See Sections 3.17.2.2 and 3.17.2.7 for analysis of impacts.
Noise	Noise impacts are expected from construction and vessel traffic. Construction occurs frequently in nearshores of populated areas in New England and the Mid-Atlantic but infrequently offshore. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Noise is not expected to impact aviation and air traffic.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.	While future offshore wind activities without the Proposed Action would result in construction and decommissioning noise and limited operational noise, noise is not expected to impact aviation and air traffic. Therefore, the effects of noise on aviation and air traffic under the No Action Alternative would be **negligible** adverse.	**Offshore:** All Project-associated noise would comply with regulatory noise thresholds and noise is not expected to impact aviation and air traffic. Alternatives C through F could result in a slight reduction to construction and operational noise but otherwise would be similar to the Proposed Action. Therefore, the effects of noise on aviation and air traffic under Alternatives B through F would be **negligible** adverse. Reasonably foreseeable future actions would occur over a dispersed geographic area and would not generate noise high enough to impact aviation uses. Therefore, the cumulative impacts would also be **negligible** adverse.
				Onshore: There would be onshore noise impacts associated with the construction of Alternatives B through F. Construction would be limited to daylight hours, and noise impacts would consist of noise generated from heavy equipment performing clearing, grading, excavating, installing foundations, and heavy lifting of substation components. Noise modeling shows that noise is expected to remain below Town of North Kingstown noise ordinance levels. Because there is no permanent noise-generating equipment associated with the onshore transmission cable, operational noise of the underground cables is expected have no impacts to aviation and air traffic. The OnSS and ICF, as designed, would generate sound similar to or below existing ambient sound levels; therefore, operational noise levels would not have an impact on aviation and air traffic. It is expected that reasonably foreseeable future actions would have similar noise impacts to Alternatives B through F. Therefore, impacts associated with the Project

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				when combined with past, present, and reasonably foreseeable future activities would be **negligible** adverse on aviation and air traffic.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in navigation patterns at nearby airports. The increased activity could cause potential impacts to aviation and air traffic.	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 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 navigation patterns at nearby airports.	See Section 3.17.1.1 for analysis.	See Sections 3.17.2.2 and 3.17.2.7 for analysis of impacts.
Presence of structures: Navigation hazard	Existing aboveground stationary facilities within the geographic analysis area that present navigational hazards include the five WTGs in the BIWF, onshore wind turbines, communication towers, dock facilities, and other onshore and offshore 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.	See Section 3.17.1.1 for analysis.	See Sections 3.17.2.2 and 3.17.2.7 for analysis of impacts.
Presence of structures: Space use conflicts	Existing aboveground stationary facilities within the geographic analysis area that could cause space use conflicts for aircraft consist of the five WTGs associated with the BIWF, onshore wind turbines, communication towers, and other onshore and offshore 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.	See Section 3.17.1.1 for analysis.	See Sections 3.17.2.2 and 3.17.2.7 for analysis of impacts.
Traffic: Aviation	Onshore and offshore military and national security use areas could have designated surface and subsurface boundaries and special use airspace. Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments. Warning Area W-105A is a special use airspace area primarily used by the U.S. Air Force located offshore Massachusetts and Rhode Island, and overlapping the RI and MA lease areas.	Although no future non–offshore wind stationary structures were identified within the offshore analysis area, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non–offshore wind is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	See Section 3.17.1.1 for analysis for offshore impacts. This IPF would not impact onshore uses.	See Sections 3.17.2.2 and 3.17.2.7 for analysis of impacts for offshore impacts. This IPF would not impact onshore uses.
Traffic: Vessels	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.	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 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic.	See Section 3.17.1.1 for analysis.	See Sections 3.17.2.2 and 3.17.2.7 for analysis of impacts.
Climate change	Climate change has resulted in a measurable increase in annual precipitation on the East Coast, which could	Sea level rise and storm severity/frequency would increase due to the effects of climate change.	Future offshore wind activities could result in construction activities that increase GHG emissions. Increased GHG emissions could contribute to climate	**Offshore:** Alternatives B through F could result in GHG emissions during Project construction, O&M, and decommissioning phases as well as offset negative effects

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	impact military and national security–related aviation and air traffic due to more inclement weather incidents.		change impacts. Climate change has resulted in a measurable increase in annual precipitation on the East Coast, which could impact aviation and air traffic due to more inclement weather incidents. However, the construction of future offshore wind facilities would ultimately help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources. On this basis, the effects of climate change on aviation and air traffic under the No Action Alternative would be **negligible** adverse.	of climate change by redistributing some of the East Coast's energy generation to renewable sources. Therefore, the effects of climate change on aviation and air traffic under Alternatives C through F would be **negligible** adverse.
				Onshore: Same as offshore impacts.

Other Uses: Cables and Pipelines

Table E2-17. Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Cables and Pipelines

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	The effects of this IPF from the No Action Alternative would not impact undersea cables because accidental releases and discharges would result in water quality impacts that do not impact undersea cables. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** The effects of this IPF from Alternatives B through F would not impact undersea cables because accidental releases and discharges would result in water quality impacts that do not impact undersea cables. Alternatives C through F would require fewer construction, O&M, and decommissioning vessel trips, reducing the risk of accidental releases and discharges, but there would be no measurable change on effects between all Project alternatives. Therefore, this IPF would result in a **negligible** adverse impact and **negligible** adverse cumulative impact under Alternatives B through F because there would be no effect on this resource.
				Onshore: Same as offshore impacts.
Anchoring and new cable emplacement/maintenance	Impacts from this IPF occur due to ongoing military use and survey, commercial, and recreational activities. These disturbances would be limited to local areas but do not overlap with cables and pipeline activities.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	The presence of future offshore wind energy cables could preclude future submarine cable placement within any given development footprint, requiring future cables to route around these areas. However, the placement and presence of these cables would not prohibit the placement of additional cables and pipelines. Following standard industry procedures, cables and pipelines can be crossed without adverse impacts. The risk of allision to cable maintenance vessels could increase as more offshore wind energy projects are constructed. However, given the infrequency of required maintenance at any given location along a cable route, this risk is expected to be low. Impacts on submarine cables would be eliminated during decommissioning of offshore wind farms if export cables associated with those projects are removed.	**Offshore:** The installation of the RWEC would cross submarine cables that run through the regional waters. Most submarine cables pass through Green Hill, Rhode Island. In addition, there are NOAA nautical chart cable and pipeline areas that denote where such infrastructure could be located. Because Revolution Wind would use standard techniques during installation, O&M, and decommissioning to prevent damage to cables, adverse impacts would be **negligible** adverse. The effects of this IPF would be the same or slightly reduced from the Proposed Action under Alternatives C through F. Up to 4,209 miles of cables are expected to be installed between 2021 and 2030 in the RI/MA WEA as part of reasonably foreseeable future actions. However, the placement and presence of these cables would not

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			Therefore, the effects of anchoring and new cable emplacement/maintenance on undersea cables under the No Action Alternative would be **negligible** adverse.	prohibit the placement of additional cables and pipelines. Impacts on undersea cables would be eliminated during decommissioning of offshore wind farms if export cables associated with those projects are removed. Therefore, Project activities combined with reasonably foreseeable activities would result in a **negligible** adverse impact on undersea cables. **Onshore:** Same as offshore impacts.
Light	Impacts from lighting include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Impacts are expected to be minimal.	Future activities with the potential to result in 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.	Future offshore wind activities without the Proposed Action would result in an increase in permanent aviation warning lighting on WTGs offshore. All existing stationary structures would have navigation marking and lighting in accordance with FAA, USCG, and BOEM guidance to minimize allision risks. Implementation of navigational lighting and marking per FAA and BOEM requirements and guidelines would further reduce the risk of vessel collisions during installation or maintenance of undersea cables. This would result in a general increase of lights in the geographic analysis area, which could have a small negative impact on vessels performing cable construction or maintenance by increasing navigational complexity. However, given that no new cables associated with non–wind energy actions are anticipated, the effects of light on undersea cable construction or maintenance under the No Action Alternative would be **negligible** adverse.	**Offshore:** Lighting for construction, operations, and decommissioning under all Project alternatives would not impact undersea cables because light has no impact on undersea cables. Alternatives C through F would result in smaller Project footprints and fewer lighted offshore structures than the Proposed Action, but the reduction of impacts would not be measurable. This IPF would result in **negligible** adverse impacts because there would be no effect on this resource. **Onshore:** Same as offshore impacts.
Noise	Ongoing noise from construction occurs frequently nearshores of populated areas in New England and the Mid-Atlantic but infrequently offshore. Noise from construction near shorelines is expected to gradually increase over the next 30 years in line with human population growth along the coast of the geographic analysis area.	No future activities were identified within the geographic analysis area other than ongoing activities.	The effects of this IPF from the No Action Alternative would not impact undersea cables because noise has no impact on existing undersea cables or the construction or maintenance of undersea cables. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** Project construction, operations, and decommissioning noise would not impact undersea cables because noise has no impact on undersea cables. Alternatives C through F would result in smaller Project footprints and fewer offshore structures than the Proposed Action, but the reduction of impacts would not be measurable. This IPF would result in **negligible** adverse impacts because there would be no effect on this resource. **Onshore:** Same as offshore impacts.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in port usage. The increased activity could cause potential navigational complexity.	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 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.	There could be a very minimal increase in vessel use at ports associated with the No Action Alternative. Vessels used for undersea cable installation and maintenance of existing or future non–wind energy cables could conflict with vessels used for construction, O&M and decommissioning of future offshore wind actions by increasing congestion and delays at ports. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Port utilization is also not expected to	**Offshore:** Vessels used for the Project could impact installation and O&M of other undersea cables by increasing congestion and delays at ports. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Port utilization is also not expected to increase beyond what is currently allowed under land use regulations; therefore, port utilization that supports Alternatives B through F would have **negligible** adverse impacts on existing and future undersea cables.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			increase beyond what is currently allowed under land use regulations; therefore, port utilization that supports future offshore wind activities would not impact the construction, operation, and maintenance of existing and future undersea cables. Therefore, there would be **negligible** adverse impacts from increased port utilization for the construction, operation, and maintenance of existing and future undersea cables.	**Onshore:** Same as offshore impacts.
Presence of structures: Allisions and navigation hazards	Structures within and near the geographic analysis area that pose potential allision hazards include the five BIWF WTGs; met 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.	See Section 3.17.1.5 for analysis.	See Sections 3.17.2.6 and 3.17.2.11 for analysis of impacts.
Presence of structures: Space use conflicts	Submarine cables cross the geographic analysis area and are associated with a larger network of submarine cables that are present along the OCS.	Reasonably foreseeable non–offshore wind structures have not been identified in the geographic analysis area.	See Section 3.17.1.5 for analysis.	See Sections 3.17.2.6 and 3.17.2.11 for analysis of impacts.
Presence of structures: Transmission cable infrastructure	Seven submarine cable corridors cross cumulative lease areas.	Reasonably foreseeable non–offshore wind structures have not been identified in the geographic analysis area.	See Section 3.17.1.5 for analysis.	See Sections 3.17.2.6 and 3.17.2.11 for analysis of impacts.
Traffic: Aviation	Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments.	Although no future non–offshore wind stationary structures were identified within the offshore analysis area, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non–offshore wind is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	Future offshore wind activities could result in increased air traffic due to the use of helicopters and other aircraft during construction, installation, O&M, and decommissioning of future wind projects. While the exact increase in future project-related flights is unknown, it is anticipated that future offshore wind activities would result in a small increase in flight traffic. Future offshore wind projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. With implementation of FAA-approved flight plans, impacts of the No Action Alternative on undersea cables would be **negligible** adverse.	**Offshore:** Aviation and air traffic impacts from offshore construction, O&M, and decommissioning of the Project would not coincide with areas in which undersea cables are located. While Alternatives C through F would require fewer Project-related helicopter trips due to the reduction in number of offshore elements, the effects of this IPF on undersea cables and pipelines would be **negligible** adverse under all Project alternatives. **Onshore:** Same as offshore impacts.
Traffic: Vessels	No substantial changes are anticipated to 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.	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 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic.	See Section 3.17.1.5 for analysis.	See Sections 3.17.2.6 and 3.17.2.11 for analysis of impacts.
Climate change	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters and sea level rise.	No future activities were identified within the geographic analysis area other than ongoing activities.	The effects of this IPF from the No Action Alternative would not impact undersea cables because undersea cables and cable placement are not impacted by ongoing or future climate change impacts. This IPF would result in	**Offshore:** The impacts of this IPF would not impact undersea cables for Alternatives B through F because climate change impacts do not have a measurable effect on undersea cables. This IPF would result in **negligible**

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			a **negligible** adverse impact because there would be no effect on this resource.	adverse impacts because there would be no effect on this resource.
				Same as offshore impacts.

Other Uses: Radar Systems

Table E2-18. Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Radar Systems

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	The effects of this IPF from the No Action Alternative would not impact land-based radar because accidental releases and discharges would be limited in scope to the offshore and onshore areas occupied by future offshore wind activities and would not result in increased radar interference. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** The effects of this IPF from Alternatives B through F would not impact land-based radar because accidental releases and discharges from the Project would be limited to the areas in which construction, O&M, and decommissioning are taking place and would not be located near land-based radar systems, nor would land-based radar systems be affected by accidental releases and discharges. While Alternatives C through F would require fewer Project-associated vessel trips, incrementally reducing the risk of accidental releases and discharges, the effects under all Project alternatives would be similar. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.
				Onshore: Same as offshore impacts.
Anchoring and new cable emplacement/maintenance	Impacts from this IPF occur due to ongoing military use and survey, commercial, and recreational activities. These disturbances would be limited to local areas and are not expected to increase radar interference.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	Offshore energy facility new cable emplacement and maintenance of cables would involve increased vessel traffic, which could create increased radar interference. However, the impacts are expected to be small and short term because anchoring and cable emplacement/maintenance activities are short-term activities that require few vessels. On this basis, the effects of anchoring and new cable emplacement/maintenance on land-based radar under the No Action Alternative would be **negligible** adverse.	**Offshore:** Cable construction associated with Alternatives B through F could result in increased vessel traffic, which could create increased radar interference. However, the impacts are expected to be small and short term in duration because anchoring and cable emplacement activities are short term and infrequent activities that require few vessels. Impacts under Alternatives C through F would be slightly reduced due to smaller Project footprints and fewer offshore structures, but effects would be similar under all Project alternatives. On this basis, the effects of anchoring and new cable emplacement/maintenance on land-based radar under Alternatives B through F during Project construction, O&M, and decommissioning would be **negligible** adverse. Up to 2,148 acres could be affected by anchoring/mooring activities during offshore wind energy development within the geographic analysis area in addition to Alternatives B through F. However, the impacts are expected to be small and short term. Therefore, the cumulative impacts associated with Alternatives B through F when combined with past,

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				present, and reasonably foreseeable activities would be similar to those impacts described under the No Action Alternative and would be **negligible** adverse. **Onshore:** Same as offshore impacts.
Light	Impacts from lighting include light associated with military, commercial, or construction vessel traffic but are not expected to result in radar interference.	No future activities were identified within the geographic analysis area other than ongoing activities.	The effects of this IPF from the No Action Alternative would not impact land-based radar because light from future offshore wind activities would not affect radar systems. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** Light from construction, O&M, and decommissioning of Alternatives B through F would not affect radar systems. This IPF would result in a **negligible** adverse effect on the operation and effectiveness of land-based radar systems because there would be no effect on this resource. The cumulative effects of this IPF do not impact land-based radar and are therefore **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse. **Onshore:** Same as offshore impacts.
Noise	Noise impacts are expected from construction and vessel traffic but are not expected to result in radar interference.	No future activities were identified within the geographic analysis area other than ongoing activities.	The effects of this IPF from the No Action Alternative would not impact land-based radar because noise from future offshore wind activities would not affect radar systems. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore:** Airborne noise from construction of the Proposed Action would have a **negligible** adverse effect on land-based radar systems because noise from future offshore wind activities would not affect radar systems. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse. **Onshore:** Same as offshore impacts.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in navigation patterns at nearby airports. Impacts are expected to be minimal.			**Offshore:** Various ports would be improved to support the Proposed Action (see Section 3.14). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. The number of construction vessels associated with the Proposed Action would increase, which could result in vessel congestion at ports, but this would be a short-term effect. An increase in vessel traffic could result in increased radar interference. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Because port utilization is not expected to increase beyond what is currently allowed under land use regulations, port utilization is expected to have a **negligible** adverse effect on land-based radar. Although Alternatives C through F

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse. **Onshore:** Same as offshore impacts.
Presence of structures: Navigation hazards	Wind developments in the direct line-of-sight with, or extremely close to, radar systems can cause clutter and interference. Existing wind developments in the area include scattered onshore wind turbines and five WTGs in the BIWF.	Reasonably foreseeable non–offshore wind structures proposed for construction in the lease areas that could affect radar systems have not been identified.	See Section 3.17.1.2 for analysis.	See Sections 3.17.2.3 and 3.17.2.8 for analysis of impacts.
Traffic: Aviation	Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments.	Although no future non–offshore wind stationary structures were identified within the offshore analysis area, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non–offshore wind is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	Future offshore wind activities without the Proposed Action could result in increased air traffic due to the use of helicopters and other aircraft during construction, installation, O&M, and decommissioning of future wind projects. While the exact increase in future project-related flights is unknown, it is anticipated that future offshore wind activities would result in a small increase in flight traffic. Future offshore wind projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. With implementation of FAA-approved flight plans, impacts of the No Action Alternative on land-based radar would be **negligible** adverse.	**Offshore:** The Proposed Action would result in an increase in air traffic related to construction and installation of offshore Project elements. Two helicopter trips per day are anticipated per day during construction, with a total flight time of 8,832 hours, or approximately 4,416 hours per year over the 2-year construction period. Extrapolating from nationwide statistics cited in Section 3.17.2.2.1, helicopter flights for Project construction would represent a 63% increase in annual helicopter flight hours and a 7% increase in general aviation flight hours in the geographic analysis area during Project construction. O&M of the Proposed Action would result in a 0.01% increase in general aviation in the geographic analysis area. A helicopter route plan would be developed to meet industry guidelines and best practices in accordance with FAA guidance. The addition of one to two helicopter trips per day would have a **negligible** adverse impact on land-based radar in the geographic analysis area. The Proposed Action would result in an average 1% increase in general aviation in the geographic analysis area over a 32-year construction, installation, O&M, and decommissioning period, with reasonably foreseeable future actions anticipated to have similar impacts in scale and duration. On the basis of a 1% increase in general aviation in the geographic analysis area, the cumulative effects of this IPF on land based radar would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse. **Onshore:** Same as offshore impacts.
Traffic: Vessels	No substantial changes are anticipated to vessel traffic volumes. The geographic analysis area would continue to	Absent other information, and because total vessel transits in the area have remained relatively stable since	See Section 3.17.1.2 for analysis.	See Sections 3.17.2.3 and 3.17.2.8 for analysis of impacts.

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	have numerous ports and extensive marine traffic related to shipping, fishing, and recreation.	2010, BOEM does not anticipate vessel traffic to greatly increase over the next 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic		
Climate change				**Offshore:** The Proposed Action could result in construction, O&M and decommissioning activities that increase GHG emissions. Increased GHG emissions could contribute to climate change impacts. However, the beneficial impacts to climate change would be increased due shifting energy sources from nonrenewable to renewable sources, which would help offset additional future additional negative effects of climate change. Climate change impacts from the Proposed Action would not impact land-based radar because the construction, operation, and maintenance of land-based radar systems is not affected by climate change that can be linked to the Proposed Action. Therefore, the effects of climate change on land-based radar under the Proposed Action would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
				Onshore: Same as offshore impacts.

Other Uses: Scientific Research and Surveys

Table E2-19. Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Scientific Research and Surveys

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	Fuels and oils would be required for construction and installation, O&M, and decommissioning of future offshore wind activities. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. OSRPs would be required for all future offshore wind projects, which includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Releases during construction of future offshore wind activities during all phases of project	**Offshore:** Fuels and oils would be required for Proposed Action offshore construction and installation, O&M, and decommissioning equipment, vessels, and infrastructure. In the event of a spill or release, offshore water quality would be degraded. As described in Section 3.21.1.2, the likelihood of a spill due to construction and installation activities and weather events is low (once per 1,000 years). However, water quality could be temporarily impacted in the vicinity of the spill. This could alter results of scientific surveys that are water quality dependent. An OSRP has been prepared for the Project and includes processes for rapid spill response, containment, cleanup,

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			construction would generally be localized and short term, resulting in little change to water quality. In the event of a spill, water quality could be temporarily impacted, which could alter water quality in the vicinity of the spill. This could alter results of scientific surveys that are water quality dependent. However, an OSRP has been prepared for the Project and includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Therefore, the effects of accidental releases and discharges on scientific research and surveys from future offshore wind activities without the Proposed Action would be **negligible** adverse.	and other measures that would help minimize impacts on water quality from spills. Therefore, the effects of accidental releases and discharges on scientific research and surveys from the Proposed Action would be **negligible** adverse. Reasonably foreseeable activities could also result in accidental releases and discharges, although those projects would be subject to the same minimization measures as the RWF. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse. **Onshore:** The construction and installation of onshore Project components would not impact scientific research and surveys because accidental releases and discharges would be limited to an onshore construction footprint and scientific research and surveys would occur offshore. This IPF would result in a **negligible** adverse impact.
Anchoring and new cable emplacement/maintenance	Impacts from this IPF occur due to ongoing military use and survey, commercial, and recreational activities. These activities potentially increase navigational complexity and vessel traffic but are expected to minimally impact scientific research and surveys.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	See Section 3.17.1.4 for analysis.	See Sections 3.17.2.5 and 3.17.2.10 for analysis of impacts.
Light	Impacts from lighting on scientific research and surveys include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis. Impacts are expected to be minimal.	Future activities with the potential to result in 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 from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.	See Section 3.17.1.4 for analysis.	See Sections 3.17.2.5 and 3.17.2.10 for analysis of impacts.
Noise	Noise impacts are expected from construction and vessel traffic. Construction occurs frequently in nearshores 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	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when	Construction and installation of future offshore wind projects would result in temporary increases in construction and decommissioning noise. There would be low levels of operational noise as part of future offshore wind projects. Construction noise has the potential to	**Offshore and Onshore:** Construction and installation of the Proposed Action would result in a temporary increase in construction noise. O&M and decommissioning of the Proposed Action would result in long-term, permanent low levels of operational noise and temporary noise

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
	are local and temporary. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	implemented. The number and location of such routes are uncertain.	interfere with scientific research and surveys if such surveys are sensitive to noise impacts. However, construction noise levels are expected to be below regulatory thresholds and would be short term in duration. Operational noise impacts are expected to be very minimal and would also be below regulatory thresholds. Therefore, noise would have a **negligible** adverse impact on scientific research and surveys.	during decommissioning. These noise sources have the potential to interfere with scientific research and surveys if such surveys are sensitive to noise impacts. However, because NMFS anticipates that construction and O&M of the Project would result in curtailment of scientific research and surveys in the geographic analysis area, noise would have a **negligible** adverse impact on scientific research and surveys. Reasonably foreseeable activities would also increase noise in the area, which could interfere with scientific research and surveys. However, reasonably foreseeable future actions would also result in curtailment of scientific research and surveys in the RI/MA WEA as additional wind projects are constructed. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in port usage. The increased activity could increase navigational complexity and vessel traffic.	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 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.	Various ports would be improved to support future offshore wind development within the geographic analysis area (see Section 3.14). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. The number of construction vessels would increase due to future offshore wind activities without the Proposed Action, which could result in delays and congestion at ports that could lead to potential conflicts with scientific research vessels due to increased port activity. Navigational hazards and collision risks at ports and in transit routes would be reduced as construction is completed, and all navigation hazards and collision risks would be gradually eliminated during decommissioning as offshore WTGs are removed. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on scientific research and surveys.	**Offshore and Onshore:** Various ports would be improved to support the Proposed Action (see Section 3.14). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would support state strategic plans and local land use goals for the development of waterfront infrastructure. Because port utilization is not expected to increase beyond what is currently allowed under land use regulations, port utilization that supports the Proposed Action would not impact scientific research and surveys. The number of construction and operational vessels would increase due to the Proposed Action, which could result in delays and congestion at ports that could lead to conflicts with scientific and research vessels. However, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have a **negligible** adverse effect on scientific research and surveys. Reasonably foreseeable future actions would also result in improvements at various ports to support future offshore wind projects (see Appendix E). These improvements would occur within the boundaries of existing port facilities, would be similar to existing activities at the existing ports, and would also support

Associated IPFs: Sub-IPFs	**Ongoing Activities**	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Action Alternatives B through F**
				state strategic plans and local land use goals for the development of waterfront infrastructure. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
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 BIWC WTGs, and the two Coastal Virginia Offshore Wind (CVOW) WTGs. Other lease areas within the geographic analysis area are not yet developed and are in various stages of permitting.	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.	See Section 3.17.1.4 for analysis.	See Sections 3.17.2.5 and 3.17.2.10 for analysis of impacts.
Traffic: Aviation	Military air traffic use the area and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments.	Although no future non–offshore wind stationary structures were identified within the offshore analysis area, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non–offshore wind is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	Future offshore wind activities without the Proposed Action could result in increased air traffic due to the use of helicopters and other aircraft during construction and installation, O&M, and decommissioning of future wind projects. While the exact increase in future project-related flights is unknown, it is anticipated that future offshore wind activities would result in a small increase in flight traffic. Future offshore wind projects would be required to engage the FAA in flight planning to avoid impacts to civilian, commercial, government, and military aviation operations. With implementation of FAA-approved flight plans, impacts of the No Action Alternative on scientific research and surveys would be **negligible** adverse.	**Offshore and Onshore:** Construction and installation of the Proposed Action would result in a 7% increase in general aviation in the geographic analysis area. O&M of the Proposed Action would result in a 0.01% increase in general aviation in the geographic analysis area. Please refer to Section 3.17 for analysis of the Project's construction and installation impacts. On the basis of the estimated increase in general aviation in the geographic analysis area, the effects of this IPF on scientific research and surveys under the Proposed Action would be **negligible** adverse, as the 7% increase in general aviation flight hours is not anticipated to impact air-based scientific research and surveys. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Traffic: Vessels	No substantial changes are anticipated to the vessel traffic volumes. The geographic analysis area would continue to have numerous ports and extensive marine traffic related to shipping, fishing, and recreation.	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 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic.	See Section 3.17.1.4 for analysis.	See Sections 3.17.2.5 and 3.17.2.10 for analysis of impacts.
Climate change	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters and sea level rise.	No future activities were identified within the geographic analysis area other than ongoing activities.	The ongoing effects of global climate change are expected to adversely affect many marine resources that are the subject ongoing survey and research efforts. Climate	**Offshore and Onshore:** The ongoing effects of global climate change are expected to adversely affect many marine resources that are the subject of ongoing survey

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			change could influence the planning and objectives of future scientific research and surveys but would not be expected to have a measurable effect on their implementation. Therefore, the effects of this IPF on scientific surveys and research would be **negligible** adverse.	and research efforts. Climate change could influence the planning and objectives of future scientific research and surveys but would not be expected to have a measurable effect on their implementation. Therefore, the effects of this IPF on scientific surveys and research would be **negligible** adverse. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.

Other Uses: Offshore Energy Uses

Affected environment: The OCS near the Project is currently experiencing active leasing and exploration in support of offshore wind energy development. Appendix E provides a list of known and anticipated offshore wind project and wind energy leases existing in the area that could lead to additional wind farm development. BOEM anticipates that developers could continue to propose offshore wind energy projects near the Project. The trend in increased wind farm development is anticipated to continue on the OCS. Several tidal energy projects have been implemented in the region and several are in the planning stages (see Appendix E of the COP). Tidal energy projects are typically located in the nearshore environment where landforms constrict tidal water passage, thereby increasing the velocity of tidal currents. These landforms exist in Narragansett Bay within the geographic analysis area; however, more detailed studies are needed to assess sites and determine economic viability for tidal energy uses (Robichaud et al. 2012). The Town of Edgartown has pursued developing a tidal energy site in the Muskeget Channel between Martha's Vineyard and Nantucket Island since 2007. It has operated as a test site and is usable for a wide range of testing. To date, over $2 million has been expended on resource, benthic, sediment, marine mammal, and other studies. The Bourne Tidal Test Site is located on Cape Cod Canal has been used for small tidal energy demonstration projects (New England Marine Energy Development System 2017).

Table E2-20. Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Offshore Energy Uses

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue a similar trend to ongoing activities.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of offshore wind is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future offshore wind on marine uses.	**Offshore** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, accidental releases and discharge associated with the RWF would not impact other offshore energy projects; This IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Anchoring and new cable emplacement/ maintenance	Impacts from this IPF occur due to ongoing military use and survey, commercial, and recreational activities. These activities potentially increase navigational complexity and vessel traffic.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of offshore wind is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future offshore wind on marine uses.	**Offshore** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, anchoring and new cable emplacement/maintenance associated with the RWF would not impact other offshore energy projects; This IPF would result in a **negligible** adverse

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Light	Impacts from lighting on offshore energy uses include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Future activities with the potential to result in 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 from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for standalone cumulative analysis because the impact of offshore wind is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future offshore wind on marine uses.	**Offshore** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, light impacts associated with the RWF would not impact other offshore energy projects; This IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Noise	Noise impacts are expected from construction and vessel traffic. Construction occurs frequently in nearshores 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. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of offshore wind is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future offshore wind on marine uses.	**Offshore** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, noise associated with the RWF would not impact other offshore energy projects; This IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in navigation patterns at nearby airports. The increased activity could cause potential conflicts with other offshore energy uses.	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 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, changes in port usage by some fishing or recreational vessel operators, and changes in navigation patterns.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of offshore wind is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future offshore wind on marine uses.	**Offshore** If construction time frames with other offshore wind energy project overlap, there could be increased impacts to construction ports. Such impacts are not anticipated to affect construction timelines or alter the layouts of other renewable energy projects. For this reason, impacts are deemed **negligible** adverse for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
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 BIWF WTGs, and the two CVOW WTGs. Other lease areas within the geographic analysis area are not yet developed and are in various stages of permitting.	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.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of offshore wind is already evaluated as part of all other IPFs and uses.	**Offshore** Because offshore energy projects occur within individual lease areas, there would be no opportunity for the RWF to directly overlap or substantially interfere with other renewable energy projects. Therefore, this IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
			The reader is referred to other subsections for evaluation of the impacts of future offshore wind on marine uses.	would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Traffic: Aviation	Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments.	Although no future non–offshore wind stationary structures were identified within the offshore analysis area, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non–offshore wind is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of offshore wind is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future offshore wind on marine uses.	**Offshore** Construction and installation of the Proposed Action would result in a 7% increase in general aviation in the geographic analysis area. O&M of the Proposed Action would result in a 0.01% increase in general aviation in the geographic analysis area. On the basis of the estimated increase in general aviation in the geographic analysis area, the effects of this IPF on offshore energy uses under the Proposed Action would be **negligible** adverse for the Proposed Action. Although Alternatives C through F would require fewer construction vessel and helicopter trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Traffic: Vessels	No substantial changes are anticipated to vessel traffic volumes. The geographic analysis area would continue to have numerous ports and extensive marine traffic related to shipping, fishing, and recreation.	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 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of offshore wind is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future offshore wind on marine uses.	**Offshore** If construction or O&M time frames with other offshore wind energy project overlap, there could be increased navigation risk due to an increase in vessels in the geographic analysis area. Such impacts are not anticipated to affect construction timelines or alter the layouts of other renewable energy projects. For this reason, adverse impacts to other renewable energy projects are deemed **negligible** adverse for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Climate change	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters and sea level rise.	No future activities were identified within the geographic analysis area other than ongoing activities.	Construction and operation of offshore energy projects are expected between 2021 and 2030. This use is not carried forward for stand-alone cumulative analysis because the impact of offshore wind is already evaluated as part of all other IPFs and uses. The reader is referred to other subsections for evaluation of the impacts of future offshore wind on marine uses.	**Offshore** Climate change impacts from the Proposed Action would not have a measurable effect on other offshore energy uses. This IPF would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.

Other Uses: Marine Mineral Resources and Dredged Material Disposal

Affected environment: BOEM's Marine Minerals Program manages non-energy minerals (primarily sand and gravel) in federal waters of the OCS and leases access to these resources to target shoreline erosion, beach renourishment, and restoration projects. At this time, there are no active or requested BOEM leases near the Project. The closest active BOEM lease is offshore of New Jersey, approximately 162 miles from the Project (BOEM 2018). One USACE borrow area (7A) is located offshore the town of Wainscott, in the vicinity of the RWEC.

The EPA designates and manages dredged material disposal sites, and the USACE permits the disposal of material in the sites. One active disposal site, the Rhode Island Sound Disposal Site, is located in the geographic analysis area approximately 3 miles east of Block Island, Rhode Island, and 10 miles west of the western boundary of the proposed RWF. No inactive or closed disposal sites are located in the geographic analysis area.

Increased shoreline erosion and coastal damage from storms has led to increased demand for sand resources in recent years.

Table E2-21. Summary of Activities and the Associated Impact-Producing Factors for Other Uses: Marine Mineral Resources and Dredged Material Disposal

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
Accidental releases and discharges	Accidental releases and discharges of fuels and fluids occur during vessel usage for dredge material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable line and pipeline laying activities.	Future accidental releases from offshore vessel usage, spills, and consumption would likely continue on a similar trend to ongoing activities.	Fuels and oils would be required for construction, installation, O&M, and decommissioning of future offshore wind projects. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. OSRPs would be required for all future offshore wind projects, which includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. Releases during construction of future offshore wind projects during all phases of project construction would generally be localized and short term, resulting in little change to water quality. In the event of a spill, marine mineral resources could potentially be impacted if such resources are susceptible to harm from contaminants, although the impacts would be very minimal. Therefore, the effects of vessel traffic on marine mineral resources and dredged material disposal under the No Action Alternative would be **negligible** adverse.	**Offshore and Onshore:** Fuels and oils would be required for Proposed Action offshore construction and installation, O&M, and decommissioning equipment, vessels, and infrastructure. In the event of a spill or release during construction and installation activities, offshore water quality would be degraded. As described in Section 3.21.1.2, the likelihood of a spill due to construction and installation activities and weather events is low (once per 1,000 years). An OSRP has been prepared for the Project and includes processes for rapid spill response, containment, cleanup, and other measures that would help minimize impacts on water quality from spills. A release during construction and installation of the Proposed Action would generally be localized and short term, resulting in little change to water quality. In the event of a spill, marine mineral resources could potentially be impacted if such resources are susceptible to harm from contaminants, although the impacts would be very minimal. Therefore, the effects of accidental releases and discharges on marine mineral resources and dredged material disposal under the Proposed Action would be **negligible** adverse. Reasonably foreseeable activities could also result in accidental releases and discharges, although those projects would be subject to the same minimization measures as the RWF. Therefore, the cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would be **negligible** adverse. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint and duration of construction activities, but effects would also be **negligible** adverse.

Associated IPFs: Sub-IPFs	**Ongoing Activities**	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Action Alternatives B through F**
New cable emplacement/maintenance	Impacts from this IPF occur due to ongoing military use and survey, commercial, and recreational activities. Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors.	Impacts from anchoring could occur on a semiregular basis over the next 35 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Cable emplacement/maintenance would be infrequent and short term.	Future offshore cable installation could prevent future marine mineral extraction activities where project footprints overlap with extraction areas (typically within 8 miles of the shoreline). Therefore, only a portion of new offshore wind cables could potentially overlap extraction areas. Additionally, future projects would avoid identified borrow areas by consulting with the BOEM Marine Minerals Program and the USACE before approving offshore wind cable routes. Therefore, the effects of anchoring and new cable emplacement/maintenance under the No Action Alternative would be **negligible** adverse.	**Offshore and Onshore:** Because marine mineral resources and EPA dredged material disposal sites are located outside the geographic analysis area, Project anchoring and new cable emplacement/maintenance would result in a **negligible** adverse impact for the Proposed Action. Although Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall duration of construction activities relative to the Proposed Action, impacts would also be **negligible** adverse.
Light	Impacts from lighting on offshore energy uses include light associated with military, commercial, or construction vessel traffic. Ocean vessels have an array of lights, including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Future activities with the potential to result in 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 from onshore structures is expected to gradually increase in line with human population growth along the coast, with minimal offshore impacts.	The effects of this IPF from the No Action Alternative would not impact marine mineral resources and dredged material disposal because light from future offshore wind activities would not affect marine mineral resources and dredged material disposal sites or activities. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore and Onshore:** The effects of this IPF from the Proposed Action to marine mineral resources and dredged material disposal would be **negligible** adverse because marine mineral resources and EPA dredged material disposal sites are located outside the geographic analysis area. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint, duration of construction activities, but effects would also be **negligible** adverse.
Noise	Noise impacts are expected from construction and vessel traffic. Construction occurs frequently in nearshores 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. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to this IPF consist of commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Noise from construction near shorelines is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.	The effects of this IPF from the No Action Alternative would not impact marine mineral resources and dredged material disposal because noise from future offshore wind activities would not affect marine mineral resources and dredged material disposal. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore and Onshore:** The effects of this IPF from the Proposed Action to marine mineral resources and dredged material disposal would be **negligible** adverse because marine mineral resources and EPA dredged material disposal sites are located outside the geographic analysis area. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint, duration of construction activities, but effects would also be **negligible** adverse.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also experiencing continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in navigation patterns at nearby airports. The increased activity could cause increased navigational complexity and increased vessel traffic.	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 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, changes in port usage by some fishing or recreational vessel operators, and changes in navigation patterns.	The effects of this IPF from the No Action Alternative would be **negligible** adverse on marine mineral resources and dredged material disposal because port utilization and potential increased vessel traffic resulting from the No Action Alternative are not expected to overlap with BOEM lease areas or EPA dredged material disposal sites.	**Offshore and Onshore:** Various ports would be improved to support the Proposed Action (see Section 3.14). The number of construction and maintenance vessels associated with the Proposed Action would increase which could result in vessel congestion at ports and potential collision risk with marine mineral resource or dredging vessels leaving or returning to ports, but this would be a minimal increase in vessel traffic. Also, vessel traffic would also be spread among multiple ports to ensure sufficient capacity exists at each port and in each waterway. Therefore, port utilization is expected to have

Associated IPFs: Sub-IPFs	Ongoing Activities	Future Non–Offshore Wind Activities Intensity/Extent	Future Offshore Wind Activities Intensity/Extent	Action Alternatives B through F
				a **negligible** adverse effect on marine mineral resources and dredged material disposal. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint and duration of construction activities, but effects would also be **negligible** adverse.
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 BIWF WTGs, and the two CVOW WTGs. Other lease areas within the geographic analysis area are not yet developed and are in various stages of permitting.	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.	Future offshore WTGs and OSSs could prevent future marine mineral extraction activities where project footprints overlap with extraction areas. However, this is unlikely as mineral extraction typically occurs within 8 miles of the shoreline. Therefore, there would be no risk of overlap with offshore structures, and their presence would have a **negligible** adverse effect on this resource.	**Offshore and Onshore:** There are no BOEM OCS sand and mineral lease areas and no identified sand resource blocks within the RWF and offshore RWEC; therefore, the Project and other reasonably foreseeable activities would have no impacts from structures or cable placement on these marine mineral resources. Similarly, because Project activities would not overlap any active dredged material disposal sites, the Project would have a **negligible** adverse impact on dredged material disposal. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint, duration of construction activities, but effects would also be **negligible** adverse.
Traffic: Aviation	Military air traffic use the area, and government and other private aircraft could occasionally fly over the WEA for data collection and SAR operations. Aircraft are also used for scientific and academic surveys in marine environments.	Although no future non–offshore wind stationary structures were identified within the offshore analysis area, aircraft would continue to be used to conduct scientific research studies as well as wildlife monitoring and preconstruction surveys. SAR operations could be expected to increase with any increase in vessel traffic. However, because vessel traffic volume associated with future non–offshore wind is not expected to increase appreciably, neither should SAR operations. Commercial air traffic could also be expected to increase with current trends.	The effects of this IPF from the No Action Alternative would not impact marine mineral resources and dredged material disposal because aviation and air traffic are air- and land-based impacts that do not overlap with marine mineral resources and dredged material disposal uses. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource.	**Offshore and Onshore:** The effects of this IPF from the Proposed Action would not impact marine mineral resources and dredged material disposal because aviation and air traffic are air- and land-based impacts that would not impact underwater marine mineral resources and dredged material disposal. This IPF would result in a **negligible** adverse impact because there would be no effect on this resource. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint, duration of construction activities, but effects would also be **negligible** adverse.
Traffic: Vessels	No substantial changes are anticipated to the vessel traffic volumes. The geographic analysis area would continue to have numerous ports and extensive marine traffic related to shipping, fishing, and recreation.	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 30 years. Even with increased port visits by deep draft vessels and consistent generation of new vessel traffic by proposed barge routes and dredging demolition sites, this is still a relatively small adjustment when considering the whole of New England vessel traffic	Construction and operational vessel traffic from future offshore wind development is expected to increase. This could create conflicts with vessels undergoing marine mineral extraction and dredged disposal activities. However, because future offshore wind activities would take place within the RI/MA WEA and there is no marine mineral extraction or dredged material disposal areas that overlap, this impact is expected to be **negligible** adverse.	**Offshore and Onshore:** Construction and operational vessel traffic from the Proposed Action is expected to occur. This could create conflicts with vessels undergoing marine mineral extraction and dredged disposal activities. However, because the Proposed Action would take place within the RI-MA WEA and there is no marine mineral extraction or dredged material disposal areas that overlap, this impact is expected to be **negligible** adverse. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint and duration of construction activities, but effects would also be **negligible** adverse.
Climate change	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters and sea level rise.	No future activities were identified within the geographic analysis area other than ongoing activities.	Future offshore wind activities without the Proposed Action could result in construction activities that increase GHG emissions. Increased GHG emissions could	**Offshore and Onshore:** The Proposed Action could result in offshore and onshore construction, O&M, and decommissioning activities that increase GHG emissions.

Associated IPFs: Sub-IPFs	**Ongoing Activities**	**Future Non–Offshore Wind Activities Intensity/Extent**	**Future Offshore Wind Activities Intensity/Extent**	**Action Alternatives B through F**
			contribute to climate change impacts. However, the construction of future offshore wind facilities would ultimately help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources. While negative impacts of climate change could affect marine mineral resources due to ocean acidification and other negative effects of climate change, future offshore wind activities without the Proposed Action are expected to help slow the negative impacts of climate change overall. Therefore, the effects of climate change under the No Action Alternative would be **negligible** adverse.	Increased GHG emissions could contribute to climate change impacts. However, O&M would help slow the negative effects of climate change by redistributing some of the East Coast's energy generation to renewable sources and reducing net GHG emissions in the area. While negative impacts of climate change could affect marine mineral resources due to ocean acidification and other negative effects of climate change, the Proposed Action is expected to help slow the negative impacts of climate change overall. Therefore, the effects of climate change under the Proposed Action by itself combined with other reasonably foreseeable projects would be **negligible** adverse. Alternatives C through F would require fewer construction vessel trips and WTGs and would reduce the overall footprint and duration of construction activities, but effects would also be **negligible** adverse.

Literature Cited

Auster, P.J., and R. Langton. 1999. The effects of fishing on fish habitat. *American Fisheries Science* Symposium 22:150–187.

Bartol, S.M. 1994. Auditory evoked potentials of the loggerhead sea turtle (*Caretta caretta*). Master's thesis, College of William and Mary, Virginia Institute of Marine Science, Williamsburg.

Baulch, S., and C. Perry. 2014. Evaluating the impacts of marine debris on cetaceans. *Marine Pollution Bulletin* 80:210–221.

Bembenek-Bailey, S.A., J.N. Niemuth, P.D. McClellan-Green, M.H. Godfrey, C.A. Harms, H. Gracz, and M.K. Stoskopf. 2019. NMR metabolomics analysis of skeletal muscle, heart, and liver of hatchling loggerhead sea turtles (*Caretta caretta*) experimentally exposed to crude oil and/or Corexit. *Metabolites* 2019(9):21. doi:10.3390/metabo9020021.

Berreiros, J.P., and V.S. Raykov. 2014. Lethal lesions and amputation caused by plastic debris and fishing gear on the loggerhead turtle *Caretta caretta* (Linnaeus, 1758). Three case reports from Terceira Island, Azores (NE Atlantic). *Marine Pollution Bulletin* 86:518–522.

Block Island Times. 2020. $5.2 million secured for improvements project at Port of Galilee. October 2020. Available at: https://www.blockislandtimes.com/article/52-million-secured-improvements-project-port-galilee/58130. Accessed August 19, 2021.

Briggs, K.T., M.E. Gershwin, and D.W. Anderson. 1997. Consequences of petrochemical ingestion and stress on the immune system of seabirds. *ICES Journal of Marine Science* 54:718–725.

Brown, C.L., A.R. Hardy, J.R. Barber, K.M. Fristrup, K.R. Crooks, and L.M. Angelloni. 2012. The effect of human activities and their associated noise on ungulate behavior. *PLoSONE* 7(7):e40505. doi: 10.1371/journal.pone.0040505.

Browne, M.A., A.J. Underwood, M.G. Chapman, R. Williams, R.C. Thompson, and J.A. van Franeker. 2015. Linking effects of anthropogenic debris to ecological impacts. *Proceedings of the Royal Society B* 282:20142929. Available at: http://dx.doi.org/10.1098/rspb.2014.2929.

Bugoni, L., L Krause, and M.V. Petry. 2001. Marine debris and human impacts on sea turtles in southern Brazil. *Marine Pollution Bulletin* 42(12):1330–1334.

Bureau of Ocean Energy Management (BOEM). 2007. *Final Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf.*

———. 2015. *Oil Spill Risk Analysis*. OCS Study BOEM 2015- 0721. Section 512. U.S. Department of the Interior, Bureau of Ocean Energy Management. July.

———. 2016. *The Identification of Port Modifications and the Environmental and Socioeconomic Consequences.* OCS Study BOEM 2016-034. Available at: https://espis.boem.gov/final%20reports/5508.pdf. Accessed August 2021.

———. 2018. Marine Minerals Program. Requests and Active Leases. Available at: https://www.boem.gov/Requests-and-Active-Leases/. Accessed January 17, 2019.

———. 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 at: 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.

———. 2021. *Guidelines for Lighting and Marking of Structures Supporting Renewable Energy Development*. April 28. Available at: https://www.boem.gov/sites/default/ https://www.boem.gov/vineyard-wind files/documents/renewable-energy/2021-Lighting-and-Marking-Guidelines.pdf. Accessed September 17, 2021.

Burge, C.A., C.M. Eakin, C.S. Friedman, B. Froelich, P.K. Hershberger, E.E. Hofmann, L.E. Petes, K.C. Prager, E. Weil, B.L. Willis, S.E. Ford, and C.D. Harvell. 2014. Climate change influences on marine infectious diseases: Implications for management and society. *Annual Review of Marine Science* 6:249–277.

Camacho, M., O.P. Luzardo, L.D. Boada, L.F.L. Jurado, M. Medina, M. Zumbado, and J. Orós. 2013. Potential adverse health effects of persistent organic pollutants on sea turtles: Evidence from a cross-sectional study on Cape Verde loggerhead sea turtles. *Science of the Total Environment* 458–460:283–289.

Causon, Paul D., and Andrew B. Gill. 2018. Linking ecosystem services with epibenthic biodiversity change following installation of offshore wind farms. *Environmental Science and Policy* 89:340–347.

CH2M HILL Engineers Inc. (CH2M HILL). 2018. *Commercial and Recreational Fisheries Technical Report*. Appendix Y in Construction and Operations Plan South Fork Wind Farm. Sterling, Virginia: U.S. Department of the Interior, Bureau of Ocean Energy Management.

Cho, Renee. 2020. Why Climate Change is an Environmental justice Issue. State of the Plante: News from the Columbia Climate School. Available at: https://news.climate.columbia.edu/2020/09/22/climate-change-environmental-justice/. Accessed August 17, 2021.

Claisse, J.T., D.J. Pondella II, M. Love, L.A. Zahn, C.M. Williams, J.P. Williams, and A.S. Bull. 2014. Oil platforms off California are among the most productive marine fish habitats globally. *Proceedings of the National Academy of Sciences of the United States of America* 111(43):15462–15467. doi.org/10.1073/pnas.1411477111.

Collie, J.S., J. Hermsen, P.C. Valentine, and F. Almeida. 2005. Effects of fishing on gravel habitats: Assessment and recovery of megafauna on Georges Bank. *American Fisheries Society Symposium* 41:325–343.

Communications Security, Reliability and Interoperability Council (CSRIC). 2014. *Final Report – Protection of Submarine Cables Through Spatial Separation*. CSRIC Working Group 8: Submarine Cable Routing and Landing. Federal Communications Commission. December.

Cook, A.S.C.P., and N.H.K. Burton. 2010. *A Review of Potential Impacts of Marine Aggregate Extraction on Seabirds*. Marine Environment Protection Fund Project 09/P130. Available at: https://www.bto.org/sites/default/files/shared_documents/publications/research-reports/2010/rr563.pdf. Accessed February 25, 2020.

CSA Ocean Sciences Inc. 2021. *Assessment of Impacts to Marine Mammals, Sea Turtles, and ESA-Listed Fish Species Revolution Wind Offshore Wind Farm*. Appendix Z in *Construction and Operations Plan Revolution Wind Farm*. Stuart, Florida: CSA Ocean Sciences Inc.

CSA Ocean Sciences, Inc. and Exponent. 2019. *Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England*. OCS Study BOEM 2019-049. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs.

Degraer, S., R. Brabant, B. Rumes, and L. Vigin, eds. 2019. *Environmental Impacts of Offshore Wind Farms in the Belgian Part of the North Sea: Marking a Decade of Monitoring, Research and Innovation*. Brussels: Royal Belgian Institute of Natural Sciences, OD Natural Environment, Marine Ecology and Management.

Dernie, K.M., M.J. Kaiser, E.A. Richardson, and R.M. Warwick. 2003. Recovery of soft sediment communities and habitats following physical disturbance. *Journal of Experimental Marine Biology and Ecology* 285–286:415–434.

Dolbeer, R.A., M.J. Begier, P.R. Miller, J.R. Weller, and A.L. Anderson. 2019. *Wildlife Strikes to Civil Aircraft in the United States, 1990–2019*. Federal Aviation Administration National Wildlife Strike Database Serial Report Number 25. Available at: https://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications/Airport-Safety-Detail/ArtMID/3682/ArticleID/2853/Wildlife-Strikes-to-Civil-Aircraft-in-the-United-States-1990-2019. Accessed November 3, 2021.

Efroymson, R.A., W. Hodge Rose, S. Nemth, and G.W. Suter II. 2000. *Ecological Risk Assessment Framework for Low Altitude Overflights by Fixed-Wing and Rotary-Wing Military Aircraft*. Research sponsored by Strategic Environmental Research and Development Program of the U.S. Department of Defense under Interagency Agreement 2107-N218-S1. Publication No. 5010. Oak Ridge, Tennessee: Environmental Sciences Division, Oak Ridge National Laboratory.

Elliot, J., K. Smith, D.R. Gallien, and A. Khan. 2017. *Observing Cable Laying and Particle Settlement During the Construction of the Block Island Wind Farm*. OCS Study BOEM 2017-027. Final report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. March.

Exponent. 2018. *Deepwater Wind South Fork Wind Farm Onshore Electric and Magnetic Field Assessment*. Appendix K2 in *Construction and Operations Plan South Fork Wind Farm*. New York, New York: Exponent Engineering, P.C.

———. *Onshore Magnetic-Field Assessment*. Appendix Q2 in *Construction and Operations Plan Revolution Wind Farm.* March. Bowie: Maryland: Exponent.

———. *Revolution Wind Farm Offshore Electric- and Magnetic-Field Assessment*. Appendix Q1 in *Construction and Operations Plan Revolution Wind Farm*. Bowie, Maryland: Exponent.

Fabrizio, M.C., J.P. Manderson, and J.P. Pessutti. 2014. Home range and seasonal movements of black sea bass (*Centropristis striat*a) during their inshore residency at a reef in the Mid-Atlantic Bight. *Fishery Bulletin* 112:82–97. doi: 10.7755/FB.112.1.5.

Finkbeiner, E.M., B.P. Wallace, J.E. Moore, R.L. Lewison, L.B. Crowder, and A.J. Read. 2011. Cumulative estimates of sea turtle bycatch and mortality in USA fisheries between 1990 and 2007. *Biological Conservation* 144(11)2719–2727. doi: 10.1016/j.biocon.2011.07.033.

Gall, S.C., and R.C. Thompson. 2015. The impact of marine debris on marine life. *Marine Pollution Bulletin* 92:170–179.

Gill, A.B., I. Gloyne-Phillips, K.J. Neal, and J.A. Kimber. 2005. *The Potential Effects of Electromagnetic Fields Generated by Sub-Sea Power Cables Associated with Offshore Wind Farm Developments on Electrically and Magnetically Sensitive Marine Organisms – A Review.* Report No. COWRIE-EM FIELD 2-06-2004. Final report. Prepared for Collaborative Offshore Wind Research Into the Environment. Cranfield University and the Centre for Marine and Coastal Studies Ltd.

Greene, J.K., M.G. Anderson, J. Odell, and N. Steinberg (editors). 2010. *The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One*. Boston, Massachusetts: The Nature Conservancy, Eastern U.S. Division.

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

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

Haney, J.C., P.G.R. Jodice, W.A. Montevecchi, and D.C. Evers. 2017. Challenges to oil spill assessments for seabirds in the deep ocean. *Archives of Environmental Contamination and Toxicology* 73:33–39.

Hann, Z.A., M.J. Hosler, and P.R. Mooseman, Jr. 2017. Roosting habits of two Lasiurus borealis (eastern red bat) in the Blue Ridge Mountains of Virginia. *Northeastern Naturalist* 24 (2):N15–N18.

Hare, J.A., W.E. Morrison, M.W. Nelson, M.M. Stachura, E.J. Teeters, and R.B. Griffis. 2016. A vulnerability assessment of fish and invertebrates to climate change on the Northeast U.S. Continental Shelf. *PLOS ONE* 11(2):e0146756.

Hawkins, A., and A. Popper. 2017. A sound approach to assessing the impact of underwater noise on marine fishes and invertebrates. *ICES Journal of Marine Science* 74(3):635–651. doi:10.1093/icesjms/fsw205.

Hazel, J., I.R. Lawler, H. Marsh, and S. Robson. 2007. Vessel speed increases collision risk for the green turtle *Chelonia mydas*. *Endangered Species Research* 3:105–113.

Hoarau, L., L. Ainley, C. Jean, S. Ciccione. 2014. Ingestion and defecation of marine debris by loggerhead sea turtles, from by-catches in the south-west Indian Ocean. *Marine Pollution Bulletin* 84:90–96.

Hüppop, O., J. Dierschke, K. Exo, E. Frerich, and R. Hill. 2006. Bird migration and potential collision risk with offshore wind turbines. *Ibis* 148:90–109.

Hutchison, Z.L., P. Sigray, H. He, A.B. Gill, J. King, and C. Gibson, 2018. *Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables.* OCS Study BOEM 2018-003. Sterling, Virginia: U.S. Department of the Interior, Bureau of Ocean Energy Management.

Inspire Environmental. 2019. *Sediment Profile and Plan View Imaging Benthic Assessment Survey in Support of the South Fork Wind Farm Site Assessment*. Appendix N in *Construction and Operations Plan South Fork Wind Farm*. Newport, Rhode Island: Inspire Environmental.

Intergovernmental Panel on Climate Change (IPCC). 2021. Summary for Policymakers. In *Climate Change 2021: The Physical Science Basis*. Available at: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf. Accessed November 3, 2021. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Edited by V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou. Cambridge University Press. In press.

International Tanker Owners Pollution Federation Limited. 2021. Oil Tanker Spill Statistics 2021. Available at: https://www.itopf.org/knowledge-resources/data-statistics/statistics/. Accessed March 2022.

Jensen, J.H., L. Bejder, M. Wahlberg, N. Aguilar Solo, M. Johnson, and P.T. Madsen. 2009. Vessel noise Effects on Delphinid Communication. *Marine Ecology Progress Series* 395:161–175.

Karp, M.A., J.O. Peterson, P.D. Lynch, R.B. Griffis, C.F. Adams, W.S. Arnold, L.A. Barnett, Y. deReynier, J. DiCosimo and K.H. Fenske. 2019. Accounting for shifting distributions and changing productivity in the development of scientific advice for fishery management. *ICES Journal of Marine Science* 76 (5):1305–1315.

Kellar, N.M., T.R. Speakman, C.R. Smith, S.M. Lane, B.C. Balmer, M.L. Trego, K.N. Catelani, M.N. Robbins, C.D. Allen, R.S. Wells, E.S. Zolman, T.K. Rowles, and L.H. Schwacke. 2017. Low reproductive success rates of common bottlenose dolphins *Tursiops truncatus* in the northern Gulf of Mexico following the Deepwater Horizon disaster (2010-2015). *Endangered Species Research* 33:143–158.

Kilfoyle, A.K., R.F. Jermain, M.R. Dhanak, J.P. Huston, and R.E. Speiler. 2018. Effects of EMF emissions from undersea electric cables on coral reef fish. *Bioelectromagnetics* 39:35–52.

Kirschvink, J.L. 1990. Geomagnetic Sensitivity in Cetaceans an Update with Live Strandings Recorded in the US. In *Sensory Abilities of Cetaceans*, edited by J. Thomas and R. Kastelein. New York, New York: Plenum Press.

Kite-Powell, H.L., A. Knowlton, and M. Brown. 2007. *Modeling the Effect of Vessel Speed on Right Whale Ship Strike Risk*. Unpublished report for NOAA/NMFS Project NA04NMF47202394.

Kraus, S.D., M.W. Brown, H. Caswell, C.W. Clark, M. Fujiwara, P.H. Hamilton, R.D. Kenney, A.R. Knowlton, S. Landry, C.A. Mayo, W.A. McLellan, M.J. Moore, D.P. Nowacek, D.A. Pabst, A.J. Read, and R.M. Rolland. 2005. North Atlantic right whales in crisis. *Science* 309:561–562.

Kraus, S.D., S. Leiter, K. Stone, B. Wikgren, C. Mayo, P. Hughes, R.D. Kenney, C. W. Clark, A. N. Rice, B. Estabrook, and J. Tielens. 2016. *Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles.* OCS Study BOEM 2016-054. Final report. Sterling, Virginia: U.S. Department of the Interior, Bureau of Ocean Energy Management.

La Sorte, Frank, K. Horton, C. Nilsson, and A. Dokter. 2018. Projected changes in wind assistance under climate change for nocturnally migrating bird populations. Available at: https://par.nsf.gov/servlets/purl/10092560. Accessed February 10, 2021.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. Collisions between ships and whales. *Marine Mammal Science* 17(1):35–75.

Law, K.L., S. Morét-Ferguson, N.A. Maximenko, G. Proskurowski, E.E. Peacock, J. Hafner, and C.M. Reddy. 2010. Plastic accumulation in the North Atlantic Subtropical Gyre. *Science* 329:1185–1188.

Lewison, R.L., L.B. Crowder, B.P. Wallace, J.E. Moore, T.Cox, R. Zydelis, S. McDonald, A. DiMatteo, D.C. Dunn, C.Y. Kot, R. Bjorkland, S. Kelez, C. Soykan, K.R. Stewart, M. Sims, A. Boustany, A.J. Read, P. Halpin, W.J. Nichols, and C. Safina. 2014. Global patterns of marine megafauna bycatch reveal taxa-specific and cumulative megafauna hotspots. *Proceedings of the National Academy of Sciences* 111 (14) 5271–5276.

Lukens, R.R., and C. Selberg. 2004. *Guidelines for Marine Artificial Reef Materials*. 2nd ed. Atlantic and Gulf States Marine Fisheries Commission. Joint Publication No. 121. January. Available at: https://www.gsmfc.org/pubs/SFRP/Guidelines_for_Marine_Artificial_Reef_Materials_January_2004.pdf. Accessed November 3, 2021.

Luschi, P., S. Benhamou, C. Girard, S. Ciccione, D. Roos, J. Sudre, and S. Benvenuti. 2007. Marine turtles use geomagnetic cues during open sea homing. *Current Biology* 17:126–133.

MacLeod, C.D. 2009. Global climate change, range changes, and potential implications for the conservation of marine cetaceans: A review and synthesis. *Endangered Species Research* 7:125–136.

Maggini, I., L.V. Kennedy, A. Macmillan, K.H. Elliot, K. Dean, and C.G. Guglielmo. 2017. Light oiling of feathers increases flight energy expenditure in a migratory shorebird. *Journal of Experimental Biology* 220:2372–2379.

Mazet, J.A.K., I.A. Gardner, D.A. Jessup, and L.J. Lowenstine. 2001. Effects of petroleum on mink applied as a model for reproductive success in sea otters. *Journal of Wildlife Diseases* 37(4):686–692.

McConnell, B.J., M.A. Fedak, P. Lovell, and P.S. Hammond. 1999. Movements and foraging areas of grey seals in the North Sea. *Journal of Applied Ecology* 36:573–590.

McCreary, S., and B. Brooks. 2019. *Atlantic Large Whale Take Reduction Team Meeting: Key Outcomes Memorandum*. April 23–26. https://media.fisheries.noaa.gov/dam-migration/final--atlantic_large_whale_take_reduction_team_meeting_april23-26_kom_(508).pdf. Accessed March 17, 2020.

Michel, J., A.C. Bejarano, C.H. Peterson, and C. Voss. 2013. *Review of Biological and Biophysical Impacts from Dredging and Handling of Offshore Sand*. OCS Study BOEM 2013-0119. Herndon, Virginia: U.S. Department of the Interior, Bureau of Ocean Energy Management.

Miller, J.H., and G.R. Potty. 2017. Overview of underwater acoustic and seismic measurements of the construction and operation of the Block Island Wind Farm. *Journal of the Acoustical Society of America* 141(5):3993–3993. doi:10.1121/1.4989144.

Minerals Management Service (MMS). 2007. *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement, October 2007*. OCS EIS/EA MMS 2007-046. Available at: https://www.boem.gov/renewable-energy/guide-ocs-alternative-energy-final-programmatic-environmental-impact-statement-eis. Accessed August 2021.

Mitchelmore, C.L., C.A. Bishop, and T.K. Collier. 2017. Toxicological estimation of mortality of oceanic sea turtles oiled during the Deepwater Horizon oil spill. *Endangered Species Research* 33:39–50.

Mohr, F.C., B. Lasely, and S. Bursian. 2008. Chronic oral exposure to bunker C fuel oil causes adrenal insufficiency in ranch mink. *Archive of Environmental Contamination and Toxicology* 54:337–347.

Moore, M.J., and J.M. van der Hoop. 2012. The painful side of trap and fixed net fisheries: Chronic entanglement of large whales. *Journal of Marine Biology* 2012:Article ID 230653.

Moser, J., and G.R. Shepherd. 2009. Seasonal distribution and movement of black sea bass (*Centropristis striata*) in the northwest Atlantic as determined from a mark-recapture experiment. *Journal of Northwest Atlantic Fishery Science* 40:17–28. doi:10.2960/J.v40.m638.

National Institutes of Health (NIH). 2002. *EMF – Electric and Magnetic Fields Associated with the Use of Electric Power: Questions and Answers*. Prepared by the National Institute of Environmental Health Sciences, National Institutes of Health. Available at: https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf. Accessed November 8, 2021.

National Marine Fisheries Service (NMFS). 2015. *Endangered Species Act (ESA) Section 7 Consultation Biological Opinion, Deepwater Wind: Block Island Wind Farm and Transmission System*. June 5.

———. 2016. *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing*. NOAA Technical Memorandum NMFS-OPR-55. Silver Spring, Maryland: National Marine Fisheries Service, Office of Protected Resources. July.

———. 2018a. Fisheries Bycatch Data for Areas 537, 538, 539, and 611. Data received August 7, 2018.

———. 2018b. *Taking and Importing Marine Mammals: Incidental to Geophysical Surveys Related to Oil and Gas Activities in the Gulf of Mexico*. June 21. Available at: https://www.regulations.gov/document/NOAA-NMFS-2018-0043-0011. Accessed February 2022.

National Marine Fisheries Service and U.S. Fish and Wildlife Service (NMFS and USFWS). 2007. *Loggerhead Sea Turtle (*Caretta caretta*) 5-Year Review: Summary and Evaluation*. Silver Spring, Maryland: Office of Protected Resources, National Marine Fisheries Service; Jacksonville, Florida: U.S. Fish and Wildlife Service, Jacksonville Ecological Services Field Office.

National Oceanic and Atmospheric Administration (NOAA). 2018. *Biological Opinion on the Bureau of Ocean Energy Management's Issuance of Five Oil and Gas Permits for Geological and Geophysical Seismic Surveys off the Atlantic Coast of the United States, and the National Marine Fisheries Services' Issuance of Associated Incidental Harassment Authorizations*. U.S. Department of Commerce, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Office of Protected Resources.

———. 2020a. National Data Buoy Center. Available at: https://www.ndbc.noaa.gov/. Accessed February 18, 2020.

———. 2020b. *Section 7 Effect Analysis: Turbidity in the Greater Atlantic Region*. Available at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-effect-analysis-turbidity-greater-atlantic-region. Accessed March 18, 2022.

National Oceanic and Atmospheric Administration Marine Debris Program (NOAA-MDP). 2014a. 2014 *Report on the Entanglement of Marine Species in Marine Debris with an Emphasis on Species in the United States*. April. Available at: https://marinedebris.noaa.gov/sites/default/files/mdp_entanglement.pdf. Accessed November 4, 2021.

———. 2014b. *Occurrence and Health Effects of Anthropogenic Debris Ingested by Marine Organisms*. Silver Spring, Maryland: NOAA Marine Debris Program. April.

National Science Foundation (NSF) and U.S. Geological Survey (USGS). 2011. *Final Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research*. Arlington, Virginia: National Science Foundation; Weston, Virginia: U.S. Geological Survey. June.

Nelms, S.E., E.M. Duncan, A.C. Broderick, T.S. Galloway, M.H. Godfrey, M. Hamann, P.K. Lindeque, and B.J. Godley. 2016. Plastic and marine turtles: A review and call for research. *ICES Journal of Marine Science* 73(2):165–181.

New England Marine Energy Development System. 2017. *New England Marine Energy Development System NEMEDS*. Available at: https://www.mreconewengland.org/marine_renewable_energy/wp-content/uploads/2017/08/MRECo_Testing_Facilities_v2017.pdf. Accessed November 17, 2021.

New York State Energy Research Development Authority (NYSERDA). 2017. *New York State Offshore Wind Master Plan*. Available at: https://www.nyserda.ny.gov/All%20Programs/Programs/Offshore%20Wind/About%20Offshore%20Wind/Master%20Plan. Accessed September 17, 2021.

Newby, T.C., F.M. Hart, and R.A. Arnold. 1970.Weight and blindness of harbor seals. *Journal of Mammalogy* 51(1):152.

Nightingale, B., T. Longcore, and C.A. Simenstad. 2006. Artificial night lighting and fishes. In *Ecological Consequences of Artificial Night Lighting*, edited by C. Rich and T. Longcore, pp. 257–276. Washington, D.C.: Island Press.

Normandeau Associates, Inc., Exponent, Inc., T. Tricas, and A. Gill. 2011. *Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species*. OCS Study BOEMRE 2011-09. Camarillo, California: U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Pacific OCS Region.

Nunny, L., and M.P. Simmonds. 2019. *Climate Change and Cetaceans: An Update*. Paper presented at the Annual Meeting of the International Whaling Commission Scientific Committee, Nairobi, Kenya.

Orr, T.L., S.M. Herz, and D.L. Oakley. 2013. *Evaluation of Lighting Schemes for Offshore Wind Facilities and Impacts to Local Environments*. OCS Study BOEM 2013-0116. Available at: https://espis.boem.gov/final%20reports/5298.pdf. Accessed September 1, 2020.

Pace, R.M., and G.K. Silber. 2005. Simple analysis of ship and large whale collisions: Does speed kill? Presentation at the Sixteenth Biennial Conference on the Biology of Marine Mammals, San Diego, California.

Paruk, J.D., E.M. Adams, H. Uher-Koch, K.A. Kovach, D. Long, IV, C. Perkins, N. Schoch, and D.C. Evers. 2016. Polycylic aromatic hydrocarbons in blood related to lower body mass in common loons. *Science of the Total Environment* 565:360–368.

Patenaude, N.J., W.J. Richardson, M.A. Smultea, W.R. Koski, and G.W. Miller. 2002. Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea. *Marine Mammal Science* 18(2):309–335.

Popper, A.N., A.D. Hawkins, R.R. Fay, D. Mann, S. Bartol, T. Carlson, S. Coombs, W.T. Ellison, R. Gentry, M.B. Halvorsen, and S. Løkkeborg. 2014. *Sound Exposure Guidelines for Fishes and Sea Turtles.* ASA S3/SC1. 4 TR-2014. Technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI.

Record, N.R., J.A. Runge, D.E. Pendleton, W.M. Balch, K.T.A. Davies, A.J. Pershing, C.L. Johnson, K. Stamieszkin, Z. Feng, S.D. Kraus, R.D. Kenney, C.A. Hudak, C.A. Mayo, C. Chen, J.E. Salisbury, and C.R.S. Thompson. 2019. Rapid climate-driven circulation changes threaten conservation of endangered North Atlantic right whales. *Oceanography* 32(2):162–196.

Revolution Wind and Inspire Environmental. 2021. *Revolution Wind Fisheries Research and Monitoring Plan*. Appendix Y in *Construction and Operations Plan Revolution Wind Farm.* Newport, Rhode Island: Inspire Environmental. October.

Rich, C., and T. Longcore (eds.). 2006. *Ecological Consequences of Artificial Night Lighting*. Washington, D.C.: Island Press.

Robichaud, R., G. Mosey, and D. Olis. 2012. *Renewable Energy Optimization*. *Report for Naval Station Newport: A Study Prepared in Partnership with the Environmental Protection Agency for the RE-Powering American's Land Initiative: Siting Renewable Energy on Potentially Contaminated Land and Mine Sites.* Technical Report NREL/TP-6A20-48852. Golden, Colorado: National Renewable Energy Laboratory. February.

Roman, L., B.D. Hardesty, M.A. Hindell, and C. Wilcox. 2019. A quantitative analysis linking seabird mortality and marine debris ingestion. *Scientific Reports* 9(1):1–7.

RPS. 2021. *Hydrodynamic and Sediment Transport Modeling Report Revolution Wind Offshore Wind Farm.* Appendix J in *Construction and Operations Plan Revolution Wind Farm.* South Kingstown, Rhode Island. RPS. March.

Samuel, Y., S.J. Morreale, C.W. Clark, C.H. Greene, and M.E. Richmond. 2005. Underwater, low-frequency noise in a coastal sea turtle habitat. *Journal of the Acoustical Society of America* 117(3):1465–1472.

Schaub, A., J. Ostwald, B.M. Siemers. 2008. Foraging bats avoid noise. *Journal of Experimental Biology* 211:3147–3180.

Schuyler, Q.A., C. Wilcox, K. Townsend, B.D. Hardesty, and N.J. Marshall. 2014. Mistaken identity? Visual similarities of marine debris to natural prey items of sea turtles. *BMC Ecology* 14(14). doi:10.1186/1472-6785-14-14.

Schwemmer P., B. Mendel, N. Sonntag, V. Dierschke, and S. Garthe. 2011. Effects of ship traffic on seabirds in offshore waters: Implications for marine conservation and spatial planning. *Ecological Applications* 21(5):1851–1860.

Secor, D.H., F. Zhang, M.H.P. O'Brien, and M. Li. 2018. Ocean destratification and fish evacuation caused by a mid-Atlantic tropical storm. *ICES Journal of Marine Science* 76(2):573–584. doi.org/10.1093/icesjms/fsx241.

Sharples, M. 2011. *Offshore Electrical Cable Burial for Wind Farms: State of the Art, Standards and Guidance & Acceptable Burial Depths, Separation Distances and Sand Wave Effect*. Prepared for the U.S. Department of Interior, Bureau of Ocean Energy Management, Regulation & Enforcement. BOEM-RE Technology Assessment & Research Program Project No. 671, Contract M10PS00204. Houston, Texas: Risk and Technology Consulting Inc. November.

Shigenaka, G., S. Milton, P. Lutz, R. Hoff, R. Yender, and A. Mearns. 2010. *Oil and Sea Turtles: Biology, Planning, and Response.* Originally published 2003. National Oceanic and Atmospheric Administration Office of Restoration and Response Publication.

Sigourney, D.B. C.D. Orphanides, J.M. Hatch. 2019. *Estimates of Seabird Bycatch in Commercial Fisheries off the East Coast of the United States from 2015-2016*. NOAA Technical Memorandum NMFS-NE-252. Woods Hole, Massachusetts.

Simmons, A.M., K.N. Horn, M. Warnecke, and J.A. Simmons. 2016. Broadband noise exposure does not affect hearing sensitivity in big brown bats (*Eptesicus fuscus*). *Journal of Experimental Biology* 219:1031–1040.

Smith, C.R., T.K. Rowles, L.B. Hart, F.I. Townsend, R.S. Wells, E.S. Zolman, B.C. Balmer, B. Quigley, M. Ivnacic, W. McKercher, M.C. Tumlin, K.D. Mullin, J.D. Adams, Q. Wu, W. McFee, T.K. Collier, and L.H. Schwacke. 2017. Slow recovery of Barataria Bay dolphin health following the Deepwater Horizon oil spill (2013-2014) with evidence of persistent lung disease and impaired stress response. *Endangered Species Research* 33:127–142.

Smith, J., M. Lowry, C. Champion, and I. Suthers. 2016. A Designed Artificial Reef is among the Most Productive Marine Fish Habitats: New Metrics to Address 'Production Versus Attraction. *Marine Biology* 163:188.

Snoek, R., R. de Swart, K. Didderen, W. Lengkeek, and M. Teunis. 2016. *Potential Effects of Electromagnetic Fields in the Dutch North Sea.* Final report. Submitted to Rijkswaterstaat Water, Verkeer en Leefmgeving.

Southall, B., A. Bowles, W. Ellison, J. Finneran, R. Gentry, C. Greene Jr., D. Kastak, D. Ketten, J. Miller, P. Nachtigall, W. Richardson, J. Thomas, and P. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals* 33(4):411–509.

Stantec Consulting Services Inc. (Stantec). 2018. *Vessel-Based Acoustic Bat Monitoring. South Fork Wind Farm and South Fork Export Cable*. Prepared for Deepwater Wind Block Island, LLC. March 19.

Sullivan, L., T. Brosnan, T.K. Rowles, L. Schwacke, C. Simeone, and T.K. Collier. 2019. *Guidelines for Assessing Exposure and Impacts of Oil Spills on Marine Mammals*. NOAA Technical Memorandum NMFS-OPR-62. Santa Rosa, California: National Oceanic and Atmospheric Administration, National Ocean Service Office of Response and Restoration, Assessment and Restoration Division.

Takeshita, R., L. Sullivan, C. Smith, T. Collier, A. Hall, T. Brosnan, T. Rowles, and L. Schwacke. 2017. The Deepwater Horizon oil spill marine mammal injury assessment. *Endangered Species Research* 33(1):96–106.

Tamsett, A., K.B. Heinonen, P.J. Auster, and J. Linholm. 2010. *Dynamics of hard substratum communities inside and outside of a fisheries habitat closed area in Stellwagen Bank National Marine Sanctuary (Gulf of Maine, NW Atlantic)*. Marine Sanctuaries Conservation Series ONMS-10-05. Silver Spring, Maryland: U.S. Department of Commerce, National Oceanographic and Atmospheric Administration, Office of National Marine Sanctuaries.

Taormina, B, J. Bald, A. Want, G.D. Thouzeau, M. Lejart, N. Desroy, and A. Carlier. 2018. A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. *Renewable and Sustainable Energy Reviews* 96:380–391.

Tech Environmental. 2021. *Air Emissions Calculations and Methodology Revolution Wind Farm*. Confidential Appendix T in *Construction and Operations Plan Revolution Wind Farm*. April.

Thomás, J., R. Guitart, R. Mateo, and J.A. Raga. 2002. Marine debris ingestion in loggerhead turtles, *Caretta*, from the western Mediterranean. *Marine Pollution Bulletin* 44:211–216.

Thomsen, F. A.B. Gill, M. Kosecka, M. Andersson, M. André, S. Degraer, T. Folegot, J. Gabriel, A. Judd, T. Neumann, A. Norro, D. Risch, P. Sigray, D. Wood, and B. Wilson. 2015. *MaRVEN – Environmental Impacts of Noise, Vibrations and Electromagnetic Emissions from Marine Renewable Energy*. RTD-KI-NA-27-738-EN-N. September. doi:10.2777/272281.

Todd, V.L.G., I.B. Todd, J.C. Gardiner, E.C.N. Morrin, N.A. MacPherson, N.A. DiMarzio, and F. Thomsen. 2015. A review of impacts on marine dredging on marine mammals. *ICES Journal of Marine Science* 72(2):328–340.

Tougaard, J., L. Hermannsen, and P.T. Madsen. 2020. How loud is the underwater noise from operating offshore wind turbines? *Journal of the Acoustical Society of America* 148(5):2885–2893.

Tournadre, J. 2014. Anthropogenic pressure on the open ocean: The growth of ship traffic revealed by altimeter data analysis. *Geophysical Research Letters* 41:7924–7932. doi:10.1002/2014GL061786.

TÜV SÜD PMSS. 2014. *Offshore Wind Submarine Cable Spacing Guidance*. Prepared for the U.S. Department of Interior, Bureau of Safety and Environmental Enforcement. Contract # E14PC00005. New York, NY: TÜV SÜD PMSS.

Tyack, P.L., and E.H. Miller. 2002. Vocal anatomy, acoustic communication and echolocation. In *Marine Mammal Biology: An Evolutionary Approach*, edited by A.R. Hoetzel, pp.142–184. Oxford, United Kingdom: Blackwell Science Ltd.

U.K. Department for Business Enterprise and Regulatory Reform (UKBERR). 2008. *Review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Industry – Technical Report*. January.

U.S. Department of the Navy (Navy). 2017. C*riteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III)*. Technical report developed by the U.S. Navy SPAWAR Systems Center Pacific. June. Available at: https://nwtteis.com/portals/nwtteis/files/technical_reports/Criteria_and_Thresholds_for_U.S._Navy_Acoustic_and_Explosive_Effects_Analysis_June2017.pdf. Accessed March 17, 2022.

———. 2018. *Hawaii-Southern California Training and Testing Final EIS/OEIS*. Available at: https://www.hstteis.com/Documents/2018-Hawaii-Southern-California-Training-and-Testing-Final-EIS-OEIS/Final-EIS-OEIS. Accessed March 17, 2022.

U.S. Energy Information Administration. 2018. Table P5B. Primary Production Estimates, Renewable and Total Energy, in Trillion Btu, Ranked by State, 2017. State Energy Data.

———. 2021. Table P2. Primary Energy Production Estimates in Trillion Btu, 2019. Available at: https://www.eia.gov/state/seds/sep_prod/xls/P2.xlsx. June 25, 2001. Accessed February 2022.

U.S. Environmental Protection Agency (EPA). 2017. Climate Impacts on Society. Available at: https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-society.html. Accessed August 18, 2021.

Vanderlaan, A.S.M., and C.T. Taggart. 2007. Vessel collisions with whales: The probability of lethal injury based on vessel speed. *Marine Mammal Science* 23(1):144–156.

Vargo, S., P. Lutz, D. Odell, E. Van Vleet, and G. Bossart. 1986. *Study of the Effects of Oil on Marine Turtles.* MMS Contract No. 14-12-0001-30063. Final report to Minerals Management Service.

Vegter, A.C., M. Barletta, C. Beck, J. Borrero, H. Burton, M.L. Campbell, M.F. Costa, M. Eriksen, C. Eriksson, A. Estrades, K.V.K. Gilardi, B.D. Hardesty, J.A. Ivar do Sul, J.L. Lavers, B. Lazar, L. Lebreton, W.J. Nichols, C.A. Ribic, P.G. Ryan, Q.A. Schuyler, S.D.A. Smith, H. Takada, K.A. Townsend, C.C.C. Wabnitz, C. Wilcox, L.C. Young, and M. Hamann. 2014. Global research priorities to mitigate plastic pollution impacts on marine wildlife. *Endangered Species Research* 25:225–247.

vhb. 2020. Onshore Acoustic Assessment, Revolution Wind Offshore Wind Farm. Appendix P2 in *Construction and Operations Plan Revolution Wind Farm*. Providence, Rhode Island: vhb.

———. 2021. *Onshore Natural Resources and Biological Assessment*. Appendix K in *Construction and Operations Plan Revolution Wind Farm*. Providence, Rhode Island: vhb.

———. 2022. *Construction and Operations Plan Revolution Wind Farm*. Revision 6: July. Submitted to Bureau of Ocean Energy Management. Available at: https://www.boem.gov/Revolution-Wind.

Village of Port Jefferson. 2019. Master Plan and Upper Port Revitalization Plan. Available at: https://portjeff.com/upperportdec2019/. Accessed August 19, 2021.

Vinhateiro, N., D. Crowley, and D. Mendelsohn. 2018. *Deepwater Wind South Fork Wind Farm: Hydrodynamic and Sediment Transport Modeling Results*. Appendix I in the *South Fork Wind Farm and South Fork Export Cable Construction and Operations Plan*. South Kingstown, Rhode Island: RPS.

Walker, M.M., C.E. Diebel, and J.L. Kirschvink. 2003. Detection and use of the Earth's magnetic field by aquatic vertebrates. In *Sensory Processing in Aquatic Environments*, edited by S.P. Collin and N.J. Marshall, pp. 53–74. New York, New York: Spriner-Verlag.

Wallace, B.P., B.A. Stacey, E. Cuevas, C. Holyake, P.H. Lara, A.C.J. Marcondes, J.D. Miller, H. Nijkamp, N.J. Pilcher, I. Robinson, N. Rutherford, and G. Shigenaka. 2010. Oil spills and sea turtles: Documented effects and considerations for response and assessment efforts. *Endangered Species Research* 41:17–37.

Weilgart, Lindy. 2018. *The Impact of Ocean Noise Pollution on Fish and Invertebrates. Report for OceanCare. Switzerland.* Available at: https://www.oceancare.org/wp-content/uploads/2017/10/OceanNoise_FishInvertebrates_May2018.pdf. Accessed April 21, 2020.

Werner, S., A. Budziak, J. van Franeker, F. Galgani, G. Hanke, T. Maes, M. Matiddi, P. Nilsson, L. Oosterbaan, E. Priestland, R. Thompson, J. Veiga, and T. Vlachogianni. 2016. *Harm Caused by Marine Litter. MSFD GES TG Marine Litter - Thematic Report*. Report No. EUR 28317 EN. doi:10.2788/690366.

Whitaker, J.O., Jr. 1998. Life history and roost switching in six summer colonies of eastern pipistrelles in buildings. *Journal of Mammalogy* 79(2):651–659.

White, J.W., S.G. Morgan, and J.L. Fisher. 2014. Planktonic larval mortality rates are lower than widely expected. *Ecology* 95(12):3344–3353.

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