Coastal Virginia Offshore Wind Commercial Project Biological Assessment

For U.S. Fish and Wildlife Service
December 2022

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

BOEM
Bureau of Ocean Energy Management

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Abbreviations and Acronyms

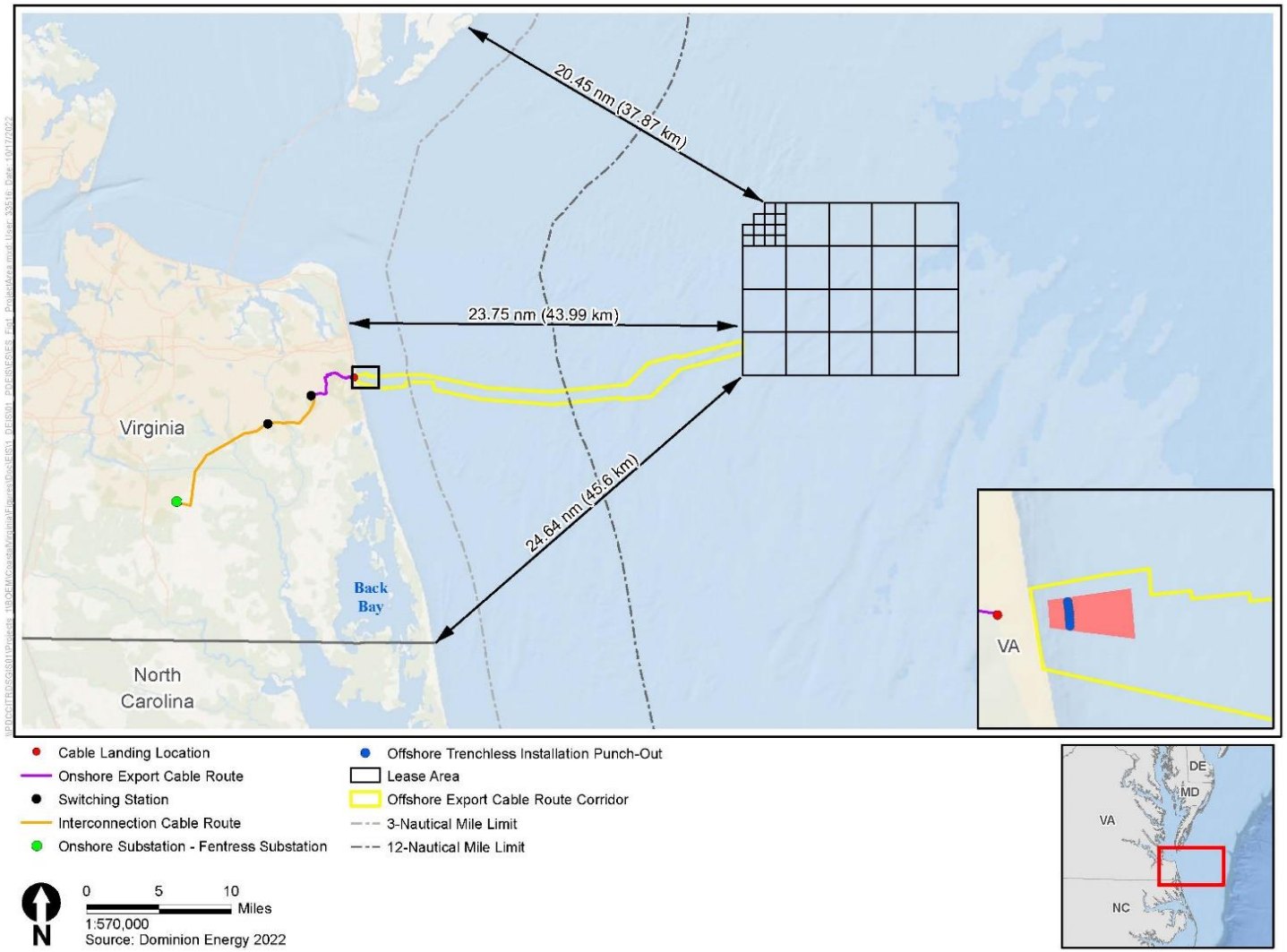
°F	Degrees Fahrenheit
ADLS	Aircraft Detection Lighting System
BA	Biological Assessment
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
COP	Construction and Operations Plan
CVOW-C	Coastal Virginia Offshore Wind Commercial
DEIS	Draft Environmental Impact Statement
Dominion Energy	Virginia Electric and Power Company, doing business as Dominion Energy Virginia
DPS	distinct population segment
DSPT	direct steerable pipe thrusting
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMF	electromagnetic field
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FR	Federal Register
GPS	Global Positioning System
HDD	horizontal directional drilling
IPaC	Information for Planning and Consultation
IPF	impact producing factor
IUCN	International Union for Conservation of Nature
kV	kilovolt
kW	kilowatt
Lease Area	Lease Area OCS-A 0483
mG	milligauss
MHz	megahertz
MSL	mean sea level
MW	megawatt
NAS	Naval Air Station
NMFS	National Marine Fisheries Service
O&M	operations and maintenance
OCS	Outer Continental Shelf
OSS	Offshore Substation
PDE	Project Design Envelope
POI	Point of Interconnection
Project	Coastal Virginia Offshore Wind Commercial Project, also Proposed Action
Proposed Action	Coastal Virginia Offshore Wind Commercial Project, also Project
ROW	right-of-way

rpm	revolutions per minute
RSZ	rotor-swept zone
SAP	Site Assessment Plan
SCRAM	Stochastic Collision Risk Assessment for Movement
SMR	State Military Reservation
TEWG	Turtle Expert Working Group
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
VaFWIS	Virginia Fish and Wildlife Information Service
VDEQ	Virginia Department of Environmental Quality
VDWR	Virginia Department of Wildlife Resources
VNHDE	Virginia Natural Heritage Data Explorer
WEA	Wind Energy Area
WERMS	Wildlife Review Map Service
WNS	white-nose syndrome
WTG	wind turbine generator

1. Introduction

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, the Bureau of Ocean Energy Management (BOEM) requests informal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding species that may be affected by the approval of a Construction and Operations Plan (COP) for the Coastal Virginia Offshore Wind Commercial (CVOW-C) Project (Project, or Proposed Action). As detailed in the COP (Dominion Energy 2022), the proposed Project would include the construction, operations and maintenance (O&M), and eventual decommissioning of an up-to 3,000 megawatt (MW) offshore wind energy facility, and associated submarine and upland cable interconnecting the wind facility to one cable landing location in Virginia Beach, Virginia (Figure 1-1).The Proposed Action (Alternative A) would include up to 205 wind turbine generators (WTGs) within BOEM Renewable Energy Lease Area OCS-A 0483 (Lease Area), within the Virginia Wind Energy Area (WEA), located on the Outer Continental Shelf (OCS) approximately 27 miles (24 nautical miles, 44 kilometers) east off the Virginia Beach, Virginia coastline.

This Biological Assessment (BA) evaluates the potential effects of the proposed Project on federally listed species under the jurisdiction of the USFWS that would potentially occur within the Project area if BOEM were to approve the COP. Federally listed species under the jurisdiction of the National Marine Fisheries Service (NMFS) are being evaluated in a separate BA. This BA describes the proposed Project (Section 2), defines the Action Area (Section 3), describes the federally listed species covered in this BA (Section 4), and provides an analysis and determination of how the proposed Project may affect listed species or their habitats (Section 5). The ESA Section 7 determinations are provided in Section 6 and the applicant-proposed avoidance, minimization, and mitigation measures are detailed in Section 7.



Source: Dominion Energy 2022

Figure 1-1 Coastal Virginia Offshore Wind Commercial Project Location

1.1. Background

BOEM began evaluation for offshore wind development areas on the Atlantic outer continental shelf (OCS) in 2009, which was authorized by the Energy Policy Act of 2005. The act, implemented by BOEM, provides a framework for issuing leases, easements, and rights-of-way (ROW) for OCS activities. BOEM's renewable energy program occurs in four distinct phases: (1) planning and analysis, (2) lease issuance, (3) site assessment, and (4) construction and operations. BOEM proceeded with this initiative on a state-by-state basis. The history of BOEM's planning and leasing activities offshore of Virginia includes the following:

- On February 3, 2012, BOEM published a "Call for Information and Nominations" ("Call") in the *Federal Register* (77 *FR* 5545) to initiate the first step in the renewable energy leasing process for offshore Virginia. The purpose of the Call was to help BOEM determine whether competitive interest exists in the Call Area and also requested information from the public on issues relevant to BOEM's review of nominations for potential leasing in the area. The comment period closed on March 19, 2012. BOEM received eight public comment submissions and eight nominations of interest from companies expressing interest in obtaining a commercial lease for a wind energy project.
- On February 3, 2012, BOEM also published in the *Federal Register* (77 *FR* 5560) a Notice of Availability of an Environmental Assessment (EA) and a Finding of No Significant Impact (FONSI) for commercial wind lease issuance and site assessment activities on the Atlantic OCS offshore New Jersey, Delaware, Maryland, and Virginia. Consultations ran concurrently with preparation of the EA and included consultations under the ESA, Magnuson-Stevens Fishery Conservation and Management Act, Section 106 of the National historic Preservation Act, and the Coastal Zone Management Act.
- On December 3, 2012, BOEM published in the *Federal Register* (77 *FR* 71621) the Virginia Proposed Sale Notice, which provided the proposed lease terms and conditions as well as details on the lease sale. A 60-day public comment period accompanied the notice. A public information seminar was held on January 17, 2013, and the comment period closed on February 1, 2013. In response, 16 comments were received as well as two additional qualification packages from companies wanting to participate in the lease sale.
- On July 23, 2013, BOEM announced in the *Federal Register* (78 *FR* 44150) that it published a Final Sale Notice announcing the date of the commercial lease sale.
- On September 4, 2013, BOEM held the commercial lease sale (i.e., auction) for the WEA offshore Virginia. This auction was the second competitive lease sale for renewable energy on the OCS. The Virginia WEA was auctioned as one lease, with Virginia Electric and Power Company (doing business as Dominion Virginia Power, referred to as Dominion Energy, or Applicant) as the winner of commercial wind lease OCS-A 0483.
- On November 1, 2013, the commercial wind energy lease with Dominion Energy went into effect.
- On March 2, 2016, Dominion Energy submitted a Site Assessment Plan (SAP) for lease OCS-A 0483. The plan details methods and procedures to collect and analyze meteorological data and information on the conditions of the marine environment within the Lease Area. BOEM approved the SAP on October 12, 2017. Conditional to the terms of the Lease, Dominion Energy submitted semi-annual progress reports to BOEM through the duration of the site assessment term in May and October 2014, May and October 2015, April and November 2016, and May 2017. The SAP, Appendices, and semi-annual progress reports can be accessed on BOEM's website at https://www.boem.gov/CVOW-C

- On February 14, 2020, Dominion Energy submitted a SAP and COP Survey Plan to BOEM, with modifications submitted on March 26, April 10, May 20, and September 8, 2020 and February 1, and March 29, 2021) to conduct high-resolution geophysical, geotechnical, benthic, and other survey activities on the Lease Area, offshore export cable corridor, and Onshore Project area. BOEM acknowledged that all comments had been addressed on June 12 and September 12, 2020 and April 13, 2021. Survey work commenced in Spring 2020 and continued through August 2021.
- On December 17, 2020, Dominion Energy submitted a COP to BOEM for the construction, O&M, and eventual decommissioning of the Project within the Lease Area. An updated COP was submitted on June 17, 2021. The CVOW-C Project COP and Appendices can be accessed on BOEM's website at: https://www.boem.gov/CVOW-C.
- On July 1, 2021, BOEM published in the *Federal Register* (86 *FR* 35329) a Notice of Intent to Prepare an Environmental Impact Statement (EIS) for CVOW-C. A 30-day public comment period ended on August 2, 2021, during which three public, virtual scoping meetings were held.

1.2. Consultation History

This informal consultation for Dominion Energy builds upon BOEM's experience with similar offshore wind assessment and development projects in the Atlantic.

- On March 24, 2011, BOEM requested informal ESA Section 7 consultation with the USFWS for lease issuance and site assessment activities off New Jersey, Delaware, Maryland, and Virginia. On June 20, 2011, the USFWS concurred with BOEM's determinations that the risk to the endangered roseate tern (*Sterna dougallii dougallii*), threatened piping plover (*Charadrius melodus*), endangered Bermuda petrel (*Pterodroma cahow*), and candidate rufa red knot (*Calidris canutus rufa*) regarding lease issuance, associated site characterization (survey work), and site assessment activities (construction, O&M, and decommissioning of buoys and meteorological towers) was "small and insignificant" and therefore not likely to adversely affect the three federally listed species and one candidate species.
- On October 19, 2012, BOEM requested informal ESA Section 7 consultation with USFWS for lease issuance and site assessment activities off Rhode Island and Massachusetts. On November 1, 2012, the USFWS concurred with BOEM's determination that the proposed action is not likely to adversely affect the endangered roseate tern, threatened piping plover, and candidate rufa red knot. To evaluate collision risk, the USFWS recommended the placement of visibility sensors on the meteorological towers to collect data on the occurrence, frequency, and duration of poor visibility conditions.
- On February 12, 2014, BOEM requested informal ESA Section 7 consultation with the USFWS for lease issuance and site assessment activities offshore North Carolina, South Carolina, and Georgia. On March 17, 2014, the USFWS concurred with BOEM's determination that commercial wind lease issuance and site assessment activities would not likely adversely affect the endangered Bermuda petrel, endangered roseate tern, threatened piping plover, candidate rufa red knot, and Kirtland's warbler (*Setophaga kirtlandii*; recovered and removed from the Federal List of Endangered and Threatened Wildlife, effective November 8, 2019 [84 *FR* 54436]).

- BOEM was also involved in consultation with the USFWS regarding the construction, O&M, and decommissioning of offshore wind turbines for the Cape Wind Energy Project in federal waters of Nantucket Sound, Massachusetts. The proposed Cape Wind Energy Project included up to 130, 3.6 MW WTGs with a maximum blade height of 440 feet (134 meters) located within federal waters in Nantucket Sound. The USFWS biological opinion (dated November 21, 2008) concluded that the proposed Cape Wind Energy Project was not likely to jeopardize the continued existence of the piping plover and roseate tern and that, in all cases except collisions, the effects were insignificant or discountable and would not result in take (mortality) of roseate terns and piping plovers (USFWS 2008).
- BOEM was a cooperating agency with the U.S. Army Corps of Engineers (USACE), which informally consulted with the USFWS on the Deepwater Wind Block Island Wind Facility and Block Island Transmission System. The Block Island Wind Facility is composed of five 6-MW wind turbines within 3 miles (2.6 nautical miles, 4.8 kilometers) of Block Island, Rhode Island. On July,31, 2013, the USFWS concurred that the proposed Block Island Wind Facility and Block Island Transmission System were not likely to adversely affect the American burying beetle (*Nicrophorus americanus*), roseate tern, piping plover, or rufa red knot "due to insignificant (should never reach the scale where take occurs) and discountable (extremely unlikely to occur) effects."
- BOEM was the lead agency and informally consulted with the USFWS on the Virginia Offshore Wind Technology Advancement Project. The project is composed of two 6-MW wind turbines 27.6 miles (24 nautical miles, 44.4 kilometers) offshore with a subsea export cable making landfall on Camp Pendleton Beach. On January 29, 2015, the USFWS concurred with the determinations of "no effect" on hawksbill and leatherback sea turtles and "not likely to adversely affect" the green sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, piping plover, rufa red knot, roseate tern, Bermuda petrel, and black-capped petrel (*Pterodroma hasitata*). On March 27, 2019, the USFWS completed its review of the revised plan and found that no effects on federally listed species or designated critical habitat would occur.

On September 1, 2022, in preparation for the Draft EIS (DEIS) and this BA, BOEM used the USFWS's Information for Planning and Consultation (IPaC) system to determine the federally listed threatened and endangered species, proposed and candidate species, as well as any proposed or designated critical habitats that may potentially occur within the Onshore and Offshore Project areas (summarized here and described in Section 3). Three separate shapefiles, together encompassing the entire Onshore and Offshore Project areas, were uploaded into IPaC: 1) the Lease Area, 2) the offshore export cable route, and 3) the landfall site and all onshore components. The IPaC system indicated that a total of eight[1] federally recognized threatened, endangered, or candidate species under USFWS jurisdiction that may occur in the Project area and/or may be affected by the Proposed Action (see Appendix A). Three additional species were identified as having ranges that potentially include the Project area and are also discussed within this BA.

[1] The IPaC database additionally identified the hawskbill (*Eretmochelys imbricata*) and leatherback (*Dermochelys coriacea*) sea turtles, which are not known to nest in Virginia and therefore are under the jurisdiction of NMFS; they are being evaluated in a separate BA.

2. Description of Proposed Action

As detailed in Section 2.1 of the DEIS, the Proposed Action would allow Dominion Energy to construct, operate, maintain, and eventually decommission a wind energy facility up to 3,000 MW in scale on the OCS offshore Virginia within the range of design parameters outlined in Section 1 of the COP (Dominion Energy 2022). The Offshore Project Infrastructure, including the offshore substations (OSSs), inter-array cables, and WTGs, will be located in federal waters in the Lease Area, while the offshore export cable corridor will traverse both federal and state territorial waters of Virginia (Figure 2-1). The onshore components of the Project, including the onshore substation, interconnection cables, switching station, onshore export cables, and the cable landing location will be located in Virginia Beach, Virginia. The construction stage of the Project will include a temporary construction laydown area(s) and construction port(s). The O&M stage of the Project will include an onshore O&M facility with an associated Base Port. The onshore substation is an existing substation currently owned by Dominion Energy called the Fentress Substation. Onshore export cables are anticipated to be constructed as underground transmission lines from the cable landing location to a common location, while the interconnection cables are expected to be constructed as overhead transmission lines from the common location to the onshore substation. The key components of the Project are summarized in Table 2-1. A schematic of the Project components is depicted in Figure 2-2. Further description of the Action Area is provided below in Section 3.

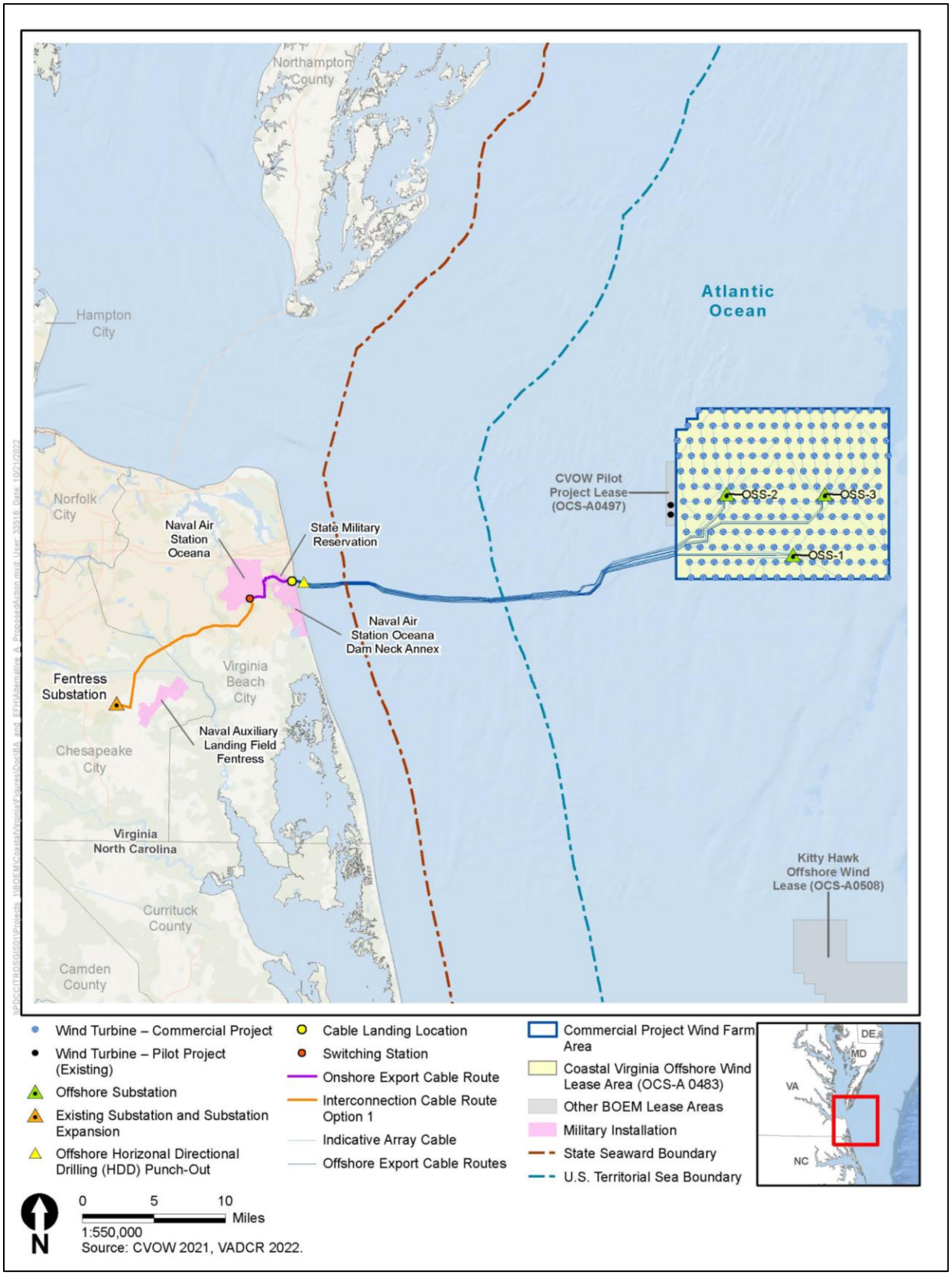
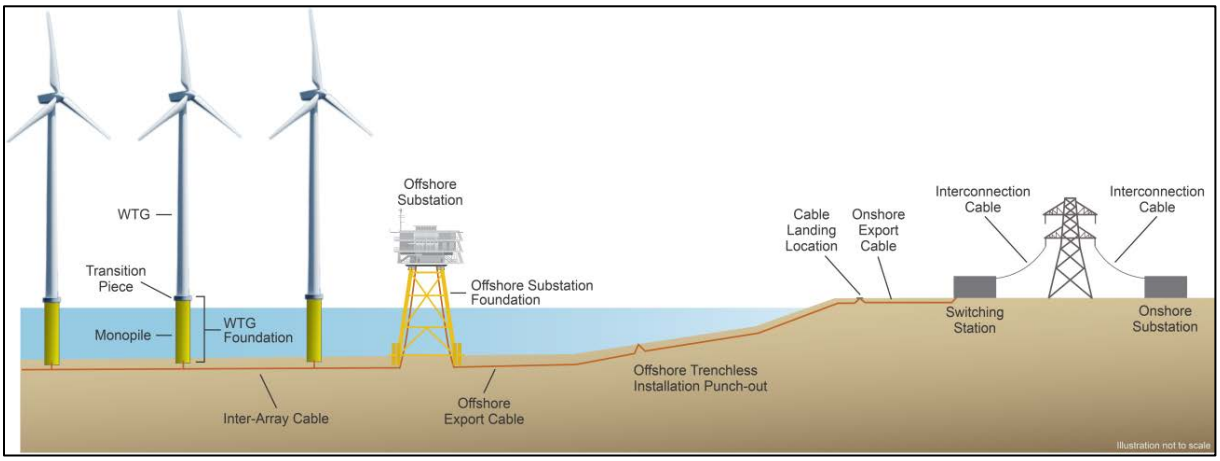


Figure 2-1 Proposed Action Project Layout

Table 2-1 Summary of Project Components and Proposed Action

Project Component	Proposed Action
Wind Turbine Generator (WTG)	Up to 16 MW (SG-14-222 DD) 14.7 MW (SG-14-222 DD) with power boost technology has been selected by Dominion Energy
WTG Layout	Up to 205 WTGs with monopile foundation Spacing = 0.75 to 0.93 nautical miles Fish haven area may include WTGs; Dominion Energy's preferred layout would avoid the fish haven area
Foundations	Monopiles
Inter-Array Cables	66-kV inter-array cables
Offshore Substations (OSSs)	Three OSSs Actual capacity may vary depending on final capacity of the Project.
Offshore Export Cables	Up to nine buried submarine high-voltage alternating current (HVAC) cables located within the offshore export cable route corridor Cable landing location at the proposed parking lot, west of the firing range at the State Military Reservation (SMR)
Onshore Export Cable Route (Cable Landing Location to Common Location North of Harpers Road)	Cable landing location at the proposed parking lot, west of the firing range at SMR to the common location north of Harpers Road
Switching Station	One switching station: "Harpers Switching Station" associated with Interconnection Cable Route Option 1
Interconnection Cable Route (Common Location north of Harpers Road to Onshore Substation/ Point of Interconnection [POI])	Switching station to the onshore substation/POI; one overhead interconnection cable route option with one switching station
Onshore Substation	Fentress Substation

Source: Dominion Energy 2022
kV = kilovolt; MW = Megawatt; SMR = State Military Reservation; WTG = wind turbine generator



Source: Dominion Energy 2022.
Note: The interconnection cable will begin before the switching station, at a common location north of Harpers Road.

Figure 2-2 Overall Project Operational Concept

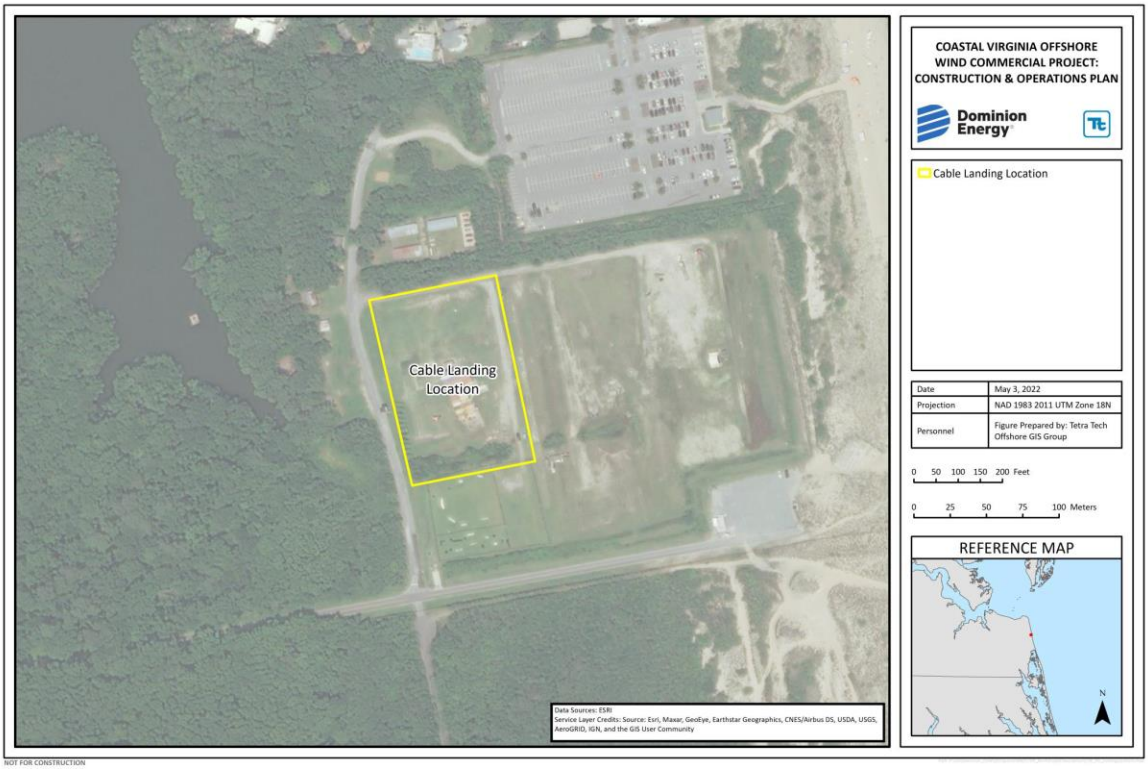
2.1. Construction and Installation

The proposed Project would include the construction and installation of both onshore and offshore facilities. Construction and installation would begin in 2023 and be completed in 2027. Dominion Energy anticipates beginning with land-based construction (onshore export and interconnection cable installation, switching station construction, and existing onshore substation upgrade construction) in the third quarter of 2023 and finishing in 2025. Construction of the offshore components would begin in the fourth quarter of 2023 with scour protection pre-installation (ending in 2025), offshore export cable installation (ending in 2026), and monopile and transition piece transport and onshore staging (ending in 2026). WTG and OSS installation would occur from May 2024 through October 2025. Transition piece installation and scour protection post-installation would occur in 2024 through 2026. Inter-array cable installation and WTG pre-assembly and installation are planned to start in 2025 and end in 2026 and 2027, respectively. Commissioning is planned for 2024 through 2027. As per Dominion Energy's commitment to seasonal restrictions from November through April, no WTG or OSS foundation installation activities are planned for winter. Monopile and OSS pin pile installation is planned for part of spring (May), summer (June, July, August), and fall (September through October) annually. Inter-array and offshore export cable emplacement associated with construction of the WTGs and OSSs would occur during two separate construction seasons, which would provide a recovery period for sand ridge habitats between the installation of the inter-array and offshore export cables. Additionally, there would be an approximate 1- to 2.5-month period between installation of each offshore export cable, with the potential for a longer period dependent on weather conditions and operational needs for cable resupply. There would be several months of seafloor rest following the completion of offshore export cable installation at one OSS prior to commencement of inter-array cable emplacement associated with the next OSS. An indicative Project schedule is included in COP Section 1, Table 1.1-3 (Dominion Energy 2022).

2.1.1 Onshore Activities and Facilities

Proposed onshore Project elements include the cable landing location, the onshore export cable route, the switching station, the onshore interconnection cable routes, and expansions/upgrades to the onshore substation that connects to the existing grid (Figure 2-1). These elements collectively compose the Onshore Project area. COP Section 3, *Description of Proposed Activity,* provides additional details on construction and installation methods (Dominion Energy 2022).

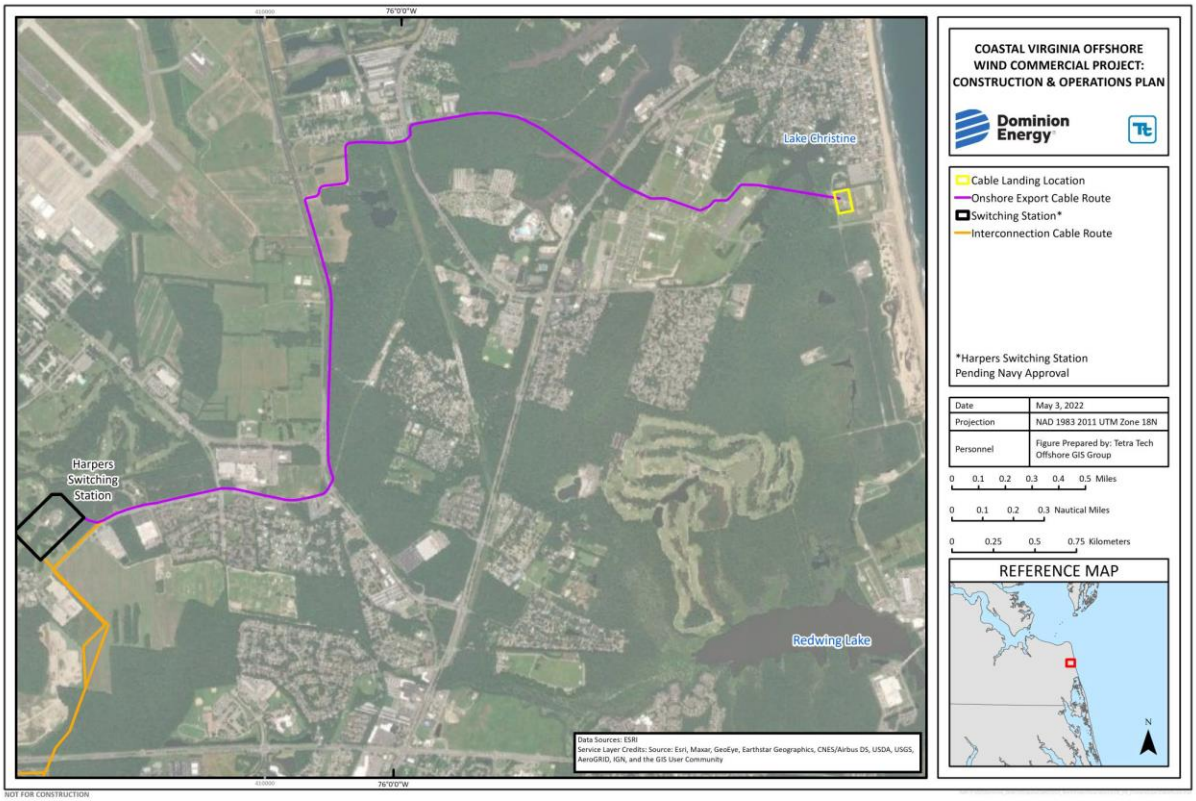
The proposed Project would include a cable landing location in Virginia Beach, Virginia as shown in Figure 2-3. The cable landing location would be located at the proposed parking lot west of the firing range at the State Military Reservation (SMR). Dominion Energy plans to use trenchless installation—direct steerable pipe thrusting (DSPT; preferred) or horizontal directional drilling (HDD)—to install the offshore export cables under the beach and dune and bring them to shore through a series of conduits. HDD and DSPT are both trenchless methods of installing cables. HDD would create a pilot bore along the cable corridor, expand the bore to a diameter necessary for the cables, then pull the cables into the prepared borehole. DSPT is similar, though the bore is created and expanded simultaneously. Upon exiting the conduits, the nine 230-kilovolt (kV) offshore export cables would be spliced in a series of nine separate single circuit vaults laid in a single ROW and transition to the onshore export cables at the cable landing location. Although HDD is viable, Dominion Energy is currently pursuing a DSPT installation solution, which has been determined to be the most appropriate installation technology that would avoid impacting a forested area on SMR. The onshore export cables will be installed via open trench microtunneling and HDD. The operational footprint for cable landing location is anticipated to be approximately 2.8 acres (1.1 hectare).



Source: Dominion Energy 2022.

Figure 2-3 Onshore Project Components–Cable Landing Location

Onshore export cables would transfer the electricity from the cable landing location to a common location north of Harpers Road and would comprise 27 single-phase 230-kV onshore export cables installed underground within the onshore export cable route corridor. The proposed Project currently includes a single onshore export cable route that plans to use HDD below Lake Christine. The onshore export cable route (Figure 2-4) would be 4.41 miles (7.10 kilometers) long, and the operational corridor would be approximately 51 acres (20.5 hectares), with maximum temporary disturbance estimated to be approximately 26.6 acres (10.8 hectares).



Source: Dominion Energy 2022.

Figure 2-4 Onshore Project Components–Onshore Export Cable Route

The switching station would be constructed north of Harpers Road (Harpers Switching Station) (Figure 2-1 and Figure 2-4). The switching station would collect power and convert an underground cable configuration to an overhead configuration. The power would then be transmitted to the existing onshore substation for distribution to the grid. The switching station would be an aboveground, fenced facility and would generally have the appearance of a typical larger Dominion Energy substation. The footprint of Harpers Switching Station would be approximately 45.4 acres (18.4 hectares). The switching station would serve as a transition point where the power transmitted through twenty-seven 230-kV onshore export cables would be collected to three 230-kV interconnection cables.

A triple-circuit 230-kV transmission line would be constructed from Harpers Road along an interconnection cable route corridor to the expanded/upgraded onshore substation at Fentress. The interconnection cable (Interconnection Cable Route Option 1) would be installed as all overhead transmission facilities. A maximum construction and operational corridor width of 250 feet (76.2 meters) would be needed for overhead cables. Existing ROWs would be used to the extent practical. For overhead interconnection cables, the height would vary from 75 feet (22.9 meters) to 170 feet (51.8 meters), depending on the terrain within the route.

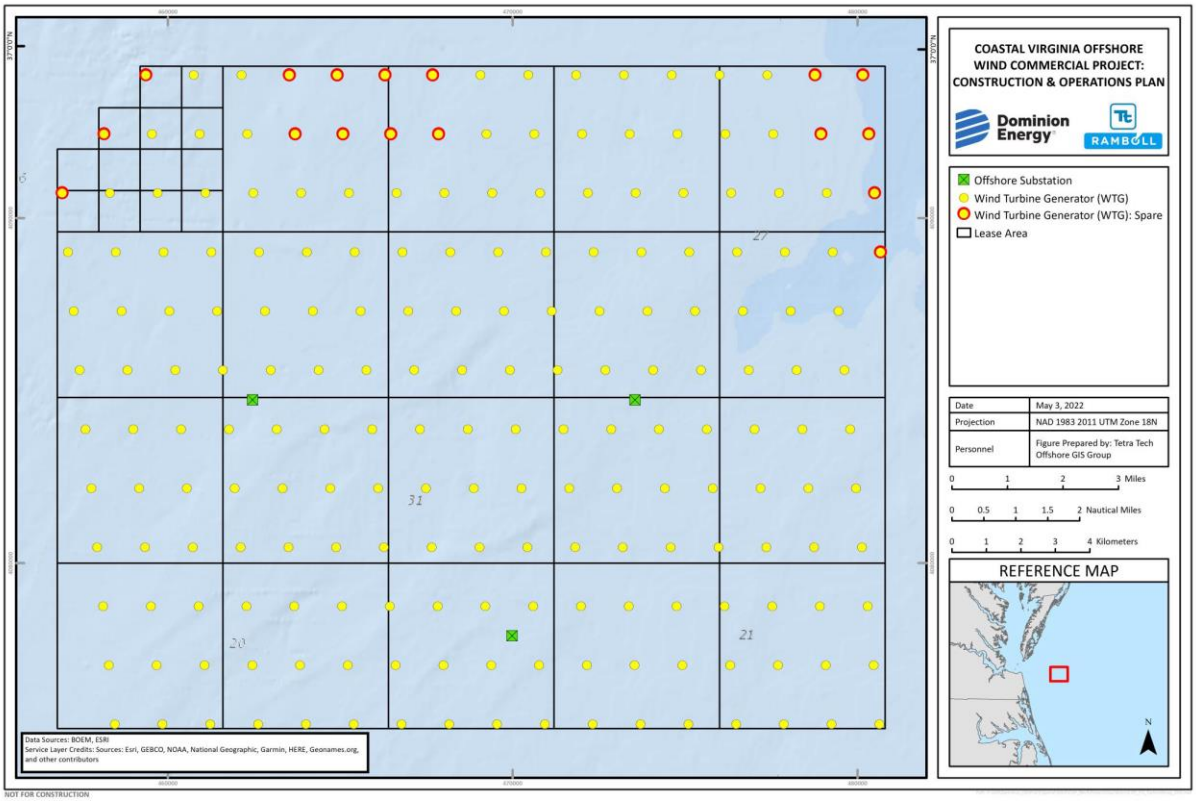
The existing onshore substation (Fentress Substation) that would be expanded/upgraded to accommodate the electricity from the Project is located in Chesapeake, Virginia. The Fentress Substation would serve as the final point of interconnection (POI) for power distribution to the Pennsylvania–New Jersey–Maryland interconnection grid. The total footprint for the Fentress Substation would be 26.9 acres (10.9 hectares). The onshore substation expansions/upgrades would serve as the POI for the three 230/500-kV auto-transformers for connection into the grid. The existing equipment at the onshore substation affected by

this Project would include one 500-kV transmission line, two 230/500-kV transformer banks, and a security fence. The onshore substation expansion/upgrades would include the addition of three 230/500-kV transformer banks, a 500-kV gas-insulated switchgear building, static poles, and other ancillary equipment. The facility is planned to be surrounded by a security fence approximately 20 feet (6.1 meters) high.

2.1.2 Offshore Activities and Facilities

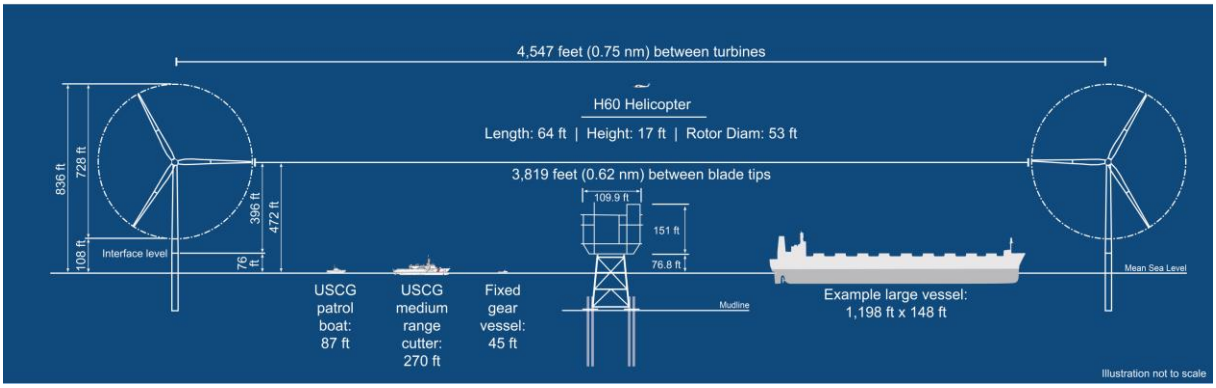
Proposed offshore Project components include WTGs and their foundations, OSSs and their foundations, scour protection for foundations, inter-array cables, and offshore export cables (these elements collectively compose the Offshore Project area). The proposed offshore Project elements would be on the OCS, with the exception of a portion of the offshore export cables, which would be within state waters; WTGs and OSSs would be, at minimum, 27 miles (24 nautical miles, 44 kilometers) offshore (see Figure 2-1). COP Section 3, *Description of Proposed Activity,* provides additional details on construction and installation methods (Dominion Energy 2022). Potential detonation of UXOs is not included under the Proposed Action and is not anticipated. Preliminary survey data and analysis of available information indicates potential UXO can be avoided through micrositing and other non-detonation measures (Tetra Tech 2022).

Dominion Energy proposes the installation of 205 14 to 16 MW WTGs (Figure 2-5). The proposed WTG layout would include 29 alternative or spare WTG positions. The spare WTG locations include 17 locations along the northwestern and northeastern boundaries of the Lease Area and in the fish haven area along the northern border of the Lease Area. The proposed WTG layout would be arranged in a grid pattern oriented at 35° to minimize wake losses within the wind farm (Figure 2-5). WTGs would be spaced approximately 0.75 nautical miles (1.39 kilometers) in an east–west direction and 0.93 nautical miles (1.72 kilometers) in a north–south direction. However, the distances between some turbines in the final WTG layout may be slightly larger or smaller, subject to micrositing; some WTG foundation installation locations may shift up to 500 feet (152 meters) to avoid obstructions, sensitive cultural and natural resources, and due to local site condition variations. Turbine tip height as measured from mean seal level would be between 804 feet (245 meters) and 869 feet (265 meters). The distance from the bottom of the turbine tip to the highest astronomical tide would be between 82 feet (25 meters) and 115 feet (35 meters). Refer to Figure 2-6 for a simplified elevation drawing of the proposed WTG. Dominion Energy would mount the WTGs on monopile foundations consisting of two parts: a lower foundation pile (monopile) driven into the seabed and an upper transition piece mounted on top of the monopile (together referred to as the WTG foundation). Monopiles would be installed to the target penetration depth via pile-driving. Dominion Energy proposes using near-field noise mitigation systems such as the Hydro Sound Damper, the Noise Mitigation Sleeve, the AdBm Noise Mitigation System, or double big bubble curtains, to reflect and dampen underwater sound waves. The WTG foundations would have scour protection installed around the base of the monopile.



Source: Dominion Energy 2022.

Figure 2-5 CVOW-C WTG and Offshore Substation Maximum Layout



Source: Tetra Tech 2022.

Figure 2-6 Scaled Representation of Proposed Offshore Project Components and Common Vessel Types Relative to Wind Turbine Generator Rotor Diameter and 0.75 Nautical Mile (nm) Turbine Spacing

Dominion Energy proposes to construct three offshore substations, each with a rated capacity of up-to 900 MW. The proposed locations of the offshore substations would either be placed in offset positions between the gridded WTG layout or within the rows of the gridded WTG layout, taking the place of three WTG positions, depending on the final design scenario. The offshore substation would comprise two main components: a foundation attached to the seafloor and a topside to contain the decks holding the main electrical and support equipment. Dominion Energy is also considering adding a helideck to support monitoring and maintenance to each of the OSSs for normal and emergency access by helicopters. Dominion Energy is proposing to use pre-installed, piled, jacket foundations to support the OSS. The OSS foundations are foreseen to have scour protection installed around the base of the piled jackets. The need, type, and method for installing scour protection for the WTG foundations and the OSS foundations would be determined in consultation and coordination with relevant jurisdictional agencies prior to construction and installation. Dominion Energy believes that it is possible to design and install the size and type of piled jacket foundations included in the Project Design Envelope (PDE) to the desired target penetration depth of 229 feet (70 meters) to 269 feet (82 meters). The distance of the OSS topside substructure base above the highest astronomical tide would be between 56 feet (17 meters) and 151 feet (46 meters).

The inter-array cable system would be composed of a series of cable "strings" that interconnect a small grouping of WTGs to the offshore substations. The inter-array cables would consist of strings of three-core copper and/or aluminum conductor, with a rated voltage of 72.5 kV and an operating voltage of 66 kV, connecting up to six WTGs per string. The WTG strings would be connected to each other via link/switch, and each offshore substation would be tied to a WTG string. Dominion Energy anticipates approximately 12 WTG strings would be connected to each offshore substation, for a total of 36 WTG strings. However, the number of WTGs per string and/or the number of WTG strings connecting to each offshore substation may be modified given the final layout of WTGs.

The offshore export cables would transfer the electricity from the offshore substation to the cable landing location in Virginia Beach, Virginia. Electricity would be transferred from each of the three offshore substations to the cable landing location via three 3-core copper and/or aluminum-conductor 230-kV subsea cables, for a total of nine offshore export cables. The offshore export cable route corridor width associated with the three cables originating from each OSS would be 1,280 feet (390 meters). Upon exiting the Lease Area, the three offshore export cable route corridors originating at the offshore substation would merge to become one overall offshore export cable route corridor containing all nine offshore export cables. The offshore export cable route corridor between the western edge of the Lease Area and the cable landing location would range in width from 1,970 feet (600 meters) to 9,400 feet (2,865 meters). Variability in the offshore export cable route corridor width would be driven by several external constraints, including existing telecommunications cable and transmission cable crossings; the U.S. Department of Defense exclusion area to the south; the vessel traffic lane and proposed Atlantic Coast Port Access Study safety fairway to the north; the Dam Neck Ocean Disposal Site; obstructions, exclusion areas, and seabed conditions identified from existing data and ongoing surveys; potential risks due to the use of the area by third parties; and the approach to the HDD at the cable landing location. Within the offshore export cable route corridor, the nine offshore export cables would generally be spaced approximately 164 to 2,716 feet (50 to 828 meters) apart and constrained at times to be spaced 164 to 328 feet (50 to 100 meters) apart.

Dominion has proposed several cable installation methods for the inter-array and offshore export cables. The cable burial methods being considered as part of the PDE include jet plow, jet trenching, chain cutting, trench former, hydroplow (simultaneous lay and burial), mechanical plowing (simultaneous lay and burial), pre-trenching (both simultaneous and separate lay and burial), mechanical trenching (simultaneous lay and burial), and/or other technologies available at the time of installation. Final installation methods would be determined by the final engineering design process that is informed by

detailed geotechnical data, risk assessments, and coordination with regulatory agencies and stakeholders. For all the proposed installation methods, a narrow temporary trench is created into which the cable is laid while the equipment is towed along the seabed. Inter-array cables would be buried to a depth of between 3.9 feet (1.2 meters) and 9.8 feet (2.9 meters); however, the exact depth would be dependent on the substrate encountered along the route. The offshore export cables would be buried to a target depth of between 3.3 feet (1.0 meter) and 16.4 feet (4.9 meters).

Prior to cable installation, survey campaigns would be completed including boulder, and sand wave clearance, and pre-grapnel runs. A pre-grapnel run may be completed to remove seabed debris, such as abandoned fishing gear, wires, etc., from the siting corridor. Based on recent input from Dominion Energy, sandwave removal methods are not currently anticipated to occur prior to cable installation[2].

Dominion Energy has identified three in-service telecommunications cables within the offshore export cable route corridor that would be crossed by the offshore export cables. At cable crossings, both the existing infrastructure and the offshore export cables must be protected. The protection and crossing method would be determined on a case-by-case basis. At a minimum, it is expected that each asset crossing would include two layers of cable protection installed prior and post offshore export cable installation and a potential third layer of protection if stabilization and scour protection is deemed necessary.

The construction and installation phase of the proposed Project would make use of both construction and support vessels to complete tasks in the Offshore Project area. COP Section 3 Table 3.4-5, *Preliminary Summary of Offshore Vessels for Construction* (Dominion Energy 2022) provides details and specifications on vessels expected to be used during construction. Vessel trips would average 46 trips per day through the duration of construction activities (January 2023 through August 2027). Daily estimated vessel trips would be dependent on the construction period and activity range from a minimum of 3 trips per day to a maximum of 95 trips per day. Construction vessels would travel between the Offshore Project area and the third-party port facility where equipment and materials would be staged. Dominion Energy and the Port of Virginia have executed a lease agreement for a portion of the existing Portsmouth Marine Terminal facility in the city of Portsmouth, Virginia to serve as a construction port. The port would be used to store monopile and transition pieces and to store and pre-assemble wind turbine generation components.

2.2. Operations and Maintenance

The proposed Project is anticipated to have an operating period of 33 years.[3] Dominion Energy intends to lease an existing O&M facility with the preferred location at Lambert's Point, located on a brownfield site in Norfolk, Virginia. Dominion Energy is also evaluating leasing options in Virginia Port Authority's Portsmouth Marine Terminal and Newport News Marine Terminal near Hampton Roads, Virginia. The O&M facility would monitor operations and would include office space, a control room, warehouse, shop, and pier space.

[2] Email from Mitchell Jabs, Dominion Energy to BOEM Re: Dominion CVOW EIS Coordination – ICF & BOEM. Dated September 12, 2022.

[3] Dominion Energy's lease with BOEM (Lease OCS-A 0483) has an operations term of 25 years that commences on the date of COP approval. See https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/Renewable_Energy_Program/State_Activities/Commercial%20Lease%20OCS-A%200483.pdf; see also 30 CFR § 585.235(a)(3). Dominion Energy would need to request an extension of its operations term from BOEM to operate the proposed Project for 33 years. For the purposes of maximum-case scenario and to ensure NEPA coverage if BOEM grants such an extension, the DEIS analyzes a 33-year operations term.

The proposed Project would include a comprehensive maintenance program and planned and unplanned inspections, including preventive maintenance based on statutory requirements, original equipment manufacturers' guidelines, and industry best practices. Dominion Energy would maintain an Oil Spill Response Plan and Safety Management System that would be developed and implemented prior to construction and installation activities in coordination with BOEM and the Bureau of Safety and Environmental Enforcement (COP, Appendices A and Q; Dominion Energy 2022).

2.2.1 Onshore Activities and Facilities

The switching station and onshore substation would be equipped with monitoring equipment and would be regularly inspected during the operational lifespan. Onshore maintenance activities could include routine maintenance, including the replacement or upgrade of electrical components and equipment. The onshore export cables and interconnection cables would require periodic testing; however, maintenance should not be required outside of occasional repair activities as a result of damage due to unanticipated events. Overhead lines would be inspected prior to being energized and routinely inspected by vegetation management crews every 3 years for woody vegetation and hazard trees, with additional inspections following localized storm events.

2.2.2 Offshore Activities and Facilities

Routine inspection and maintenance are expected for WTGs, foundations, and the offshore substations. Offshore O&M activities would include inspections of offshore Project components for signs of corrosion and wear on WTG components, inspection of electrical components associated with the WTGs and offshore substations, surveys of cables to confirm they have not become exposed or that any cable protection measures have not worn away, replacement of consumable items such as filters and hydraulic oils, repairs or replacement of worn or defective components, and disposal of waste materials and parts. Crew transfer vessels and service operation vessels would be used to support O&M activities offshore. Helicopters are also being considered to support the Project's O&M activities. Dominion anticipates 365 operating days for the service operations vessel, with 26 annual round trips to port and 365 operating days for each crew transfer vessel, with 26 annual round trips to port per vessel.

The WTGs would be monitored through a supervisory control and data acquisition system and offshore export cables and inter-array cables would be monitored through distributed temperature sensing equipment to provide real-time detection of possible faults. In the event of a fault or failure of an offshore Project component, Dominion Energy would repair and replace it in a timely manner.

Appropriate safety systems would be included on all WTGs, including fire detection and an audible and visible warning system, painting and marking, lightning protection, aids to navigation in accordance with U.S. Coast Guard requirements, and appropriate lighting for the aviation and maritime industries.

2.3. Decommissioning

In accordance with 30 Code of Federal Regulations (CFR) 585 and other BOEM requirements, Dominion Energy would be required to remove or decommission all Project infrastructure and clear the seabed of all obstructions following the end of the Project's operational activities and the lease. All foundations would need to be removed to 15 feet (4 meters) below the mudline (30 CFR 585.910(a)). Offshore export cables and inter-array cables would be retired in place or removed in accordance with the decommissioning plan. Unless otherwise authorized by BOEM, Dominion Energy would have to achieve complete decommissioning within 2 years of termination of the lease and either reuse, recycle, or responsibly dispose of all materials removed. See COP Section 3, Table 3.6-1 (Dominion Energy 2022) for additional details on removal methods and assumptions that would likely be applicable based on

present-day understanding of available decommissioning approaches. Although the proposed Project has a designated lifespan of 33 years, some installations and components may remain fit for continued service after this time. Dominion Energy would have to apply for an extension to operate the proposed Project for more than the operations term.

BOEM would require Dominion Energy to submit a decommissioning application upon the earliest of the following dates: 2 years before the expiration of the lease, 90 days after completion of the commercial activities on the commercial lease, or 90 days after cancellation, relinquishment, or other termination of the lease (see 30 CFR 585.905). Upon completion of the technical and environmental reviews, BOEM may approve, approve with conditions, or disapprove the lessee's decommissioning application. This process would include an opportunity for public comment and consultation with municipal, state, and federal management agencies. Dominion Energy would need to obtain separate and subsequent approval from BOEM to retire in place any portion of the proposed Project. Approval of such activities would require compliance under NEPA and other federal statutes and implementing regulations.

If the COP is approved or approved with modifications, Dominion Energy would have to submit a bond that would be held by the U.S. government to cover the cost of decommissioning the entire facility if Dominion Energy would not otherwise be able to decommission the facility.

2.3.1 Onshore Activities and Facilities

At the time of decommissioning, some components of the onshore electrical infrastructure may still have substantial life expectancies. Dominion Energy anticipates removing the onshore substation buildings and equipment unless it is suitable for future use. Materials would be recycled as appropriate. Removal of the onshore export cable and interconnection cable is assumed by Dominion Energy to be limited to disconnecting and cutting at the fence line below ground level at both sides. The termination points would be removed, the cable would be cut 3 feet (1 meter) below ground level, and remaining cable would be capped off and earthed.

2.3.2 Offshore Activities and Facilities

The decommissioning process for the WTGs and offshore substations is anticipated to the be the reverse of construction and installation, with turbine components or the offshore substation topside structure removed prior to foundation removal. Decommissioning of the topside structures for WTGs and offshore substations is assumed by Dominion Energy to include removal of all WTG components including removal of the rotor, nacelle, blades and tower and removal of the offshore substation topside structure. Materials would be brought onshore for recycling and disposal. WTG monopile foundations and the offshore substations piled jacket foundations would be removed by cutting below the mud line and lifting the foundation off by a heavy lift vessel to a barge. The steel used in the foundations and towers would be recycled. The scour protection placed around the base of each foundation, if used, would be removed unless leaving in place is deemed appropriate through consultation with appropriate authorities. The offshore export cables and inter-array cables would be lifted out and cut into pieces or reeled in, and the cable would be recycled as appropriate.

2.4. Relevant Alternatives to the Proposed Action

2.4.1 Alternative B—Revised Layout to Accommodate the Fish Haven and Navigation

Alternative B was developed through the scoping process for the Draft EIS in response to comments that the original proposed siting of the three OSSs would disrupt the common grid pattern of the project layout

and produce potential impacts on a known fish haven area. Under Alternative B the construction, O&M, and eventual decommissioning of a 2,587-megwatt wind energy facility consisting of 176 WTGs and 3 OSSs in the Lease Area and associated export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Similar to Alternative A, Dominion would use 14-MW WTGs each capable of generating up to 14.7 MW using power boost capability in a 0.93-by-0.75-nautical-mile (1.72-by-1.39-kilometer) offset grid in an east–west-by-northwest-by-southeast gridded layout. However, under Alternative B, the fish haven area located along the northern boundary of the Lease Area would be an exclusion zone where WTGs, inter-array cables, or other Project infrastructure would not be sited (Figure 2-7). The three OSSs would be placed within the rows of the gridded WTG layout to minimize disruptions to surface and aerial navigation through the wind farm. This configuration would still allow micrositing of infrastructure (WTGs, inter-array cables, and OSSs), up to 500 feet (152 meters), to avoid sensitive cultural resources and marine habitats. Onshore components would be the same as described under Alternative A. Alternative B would result in a reduction of 29 WTGs from the 205 WTGs for the Proposed Action. There would be a concomitant reduction in the length of inter-array cable networks connecting the removed WTGs. The avoidance of the fish haven area from development under Alternative B would reduce softbottom habitat impacts of the Proposed Action by 28.1 acres (0.11 square kilometers). The number of cables within the offshore export corridor would not change, but the length of the offshore export cables would be reduced by 70.2 miles (112.1 kilometers) and the length of inter-array cables would decrease by 80.1 miles (127.2 kilometers). With the removal of inter array cables between WTGs and rerouting of the export cables there will be a reduction of 150.3 acres (483.7 hectares) in temporary disturbance to the benthic habitat related to cable installation for Alternative B. Onshore components are the same as under the Proposed Action.

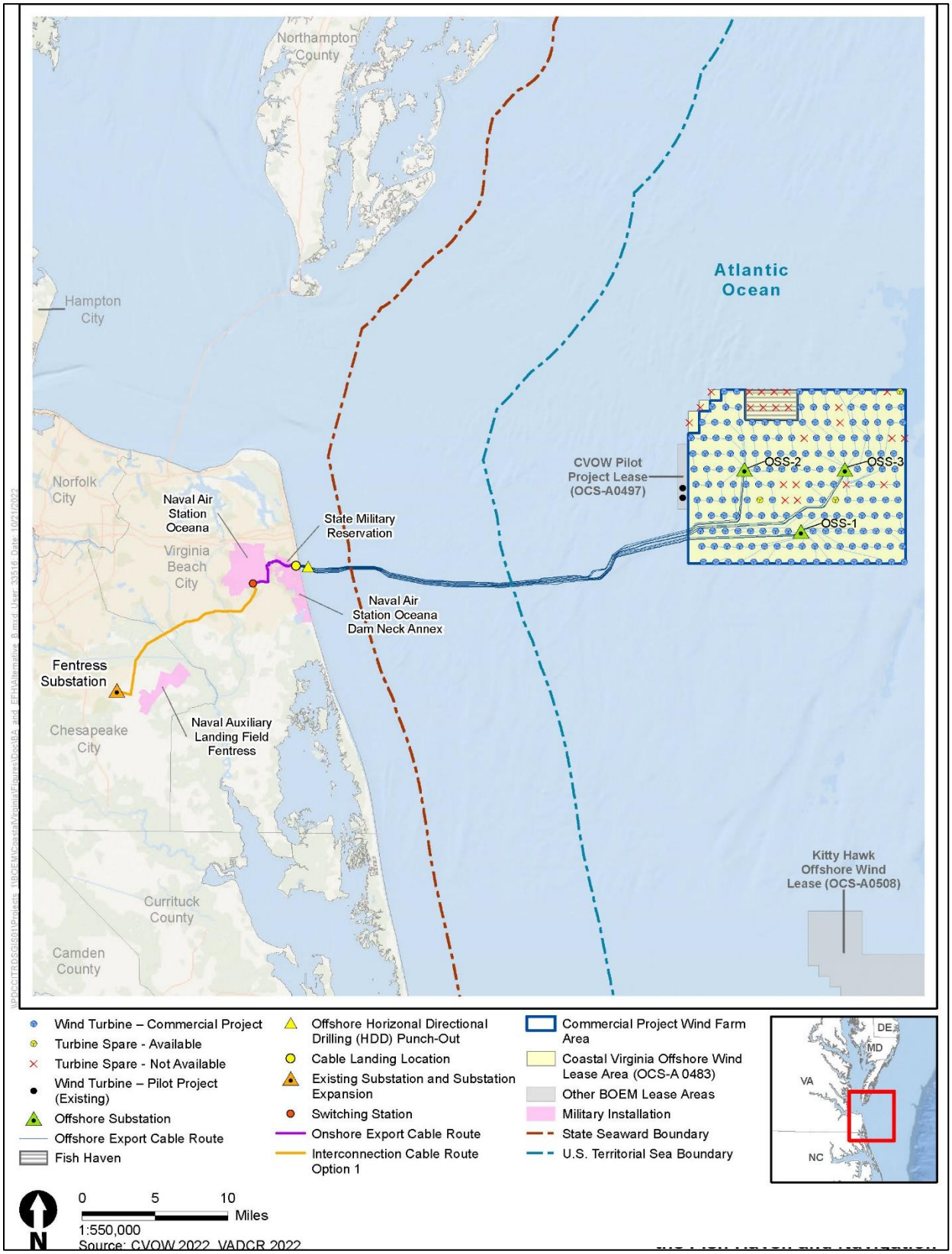


Figure 2-7 Alternative B: Revised Layout to Accommodate the Fish Haven and Navigation

2.4.2 Alternative C—Sand Ridge Impact Minimization Alternative

Alternative C was developed through the scoping process for the Draft EIS in response to scoping comments received requesting an alternative to minimize impacts on offshore benthic habitats. Under Alternative C, the construction, operation, maintenance, and eventual decommissioning of a wind energy facility would include the same offshore layout of project components as described under Alternative B; however, Alternative C would avoid sand ridge habitat and shipwrecks through a combination of: micrositing of WTGs, inter-array cables and/or OSSs (up to 500 feet [152 meters]); and the relocation or removal of WTGs and associated inter-array cables within sand ridge habitat areas (Figure 2-8). Specifically, under Alternative C, the removal of four WTGs and relocation of one WTG allows for the reconfiguration of inter-array cabling that would otherwise be developed within priority sand ridge habitats, thus reducing potential seafloor disturbance, including the cross-cutting and trenching of sand ridges. As a result, an up-to 2,528 MW wind energy facility consisting of up to 172 WTGs (inclusive of two spare WTG positions) and three OSSs with associated export cables would be developed under Alternative C.

This alternative would result in a reduction of benthic and pelagic resource impacts within the Lease Area in comparison to the Proposed Action. Approximately 169.7 acres (0.7 square kilometers) of benthic resources would be permanently impacted due to the installation of the 172 WTGs and the scour protection pad installed around each WTG foundation. Under the Proposed Action it is estimated that 201.7 acres (0.8 square kilometers) of benthic habitat would be permanently impacted. If Alternate C were selected as the project design and there is a reduction of four WTGs from Alternate B (176 WTGs) this would reduce the permanent impact to benthic resources by 32 acres (0.1 square kilometers). There would be an additional reduction in the impacts related to cable installation with the removal of the inter array cables connecting the four removed WTGs in Alternate C. Alternate C would result in a reduction of 16 percent of soft bottom converted to hard bottom habitat within the Lease Area. Onshore components are the same as under the Proposed Action.

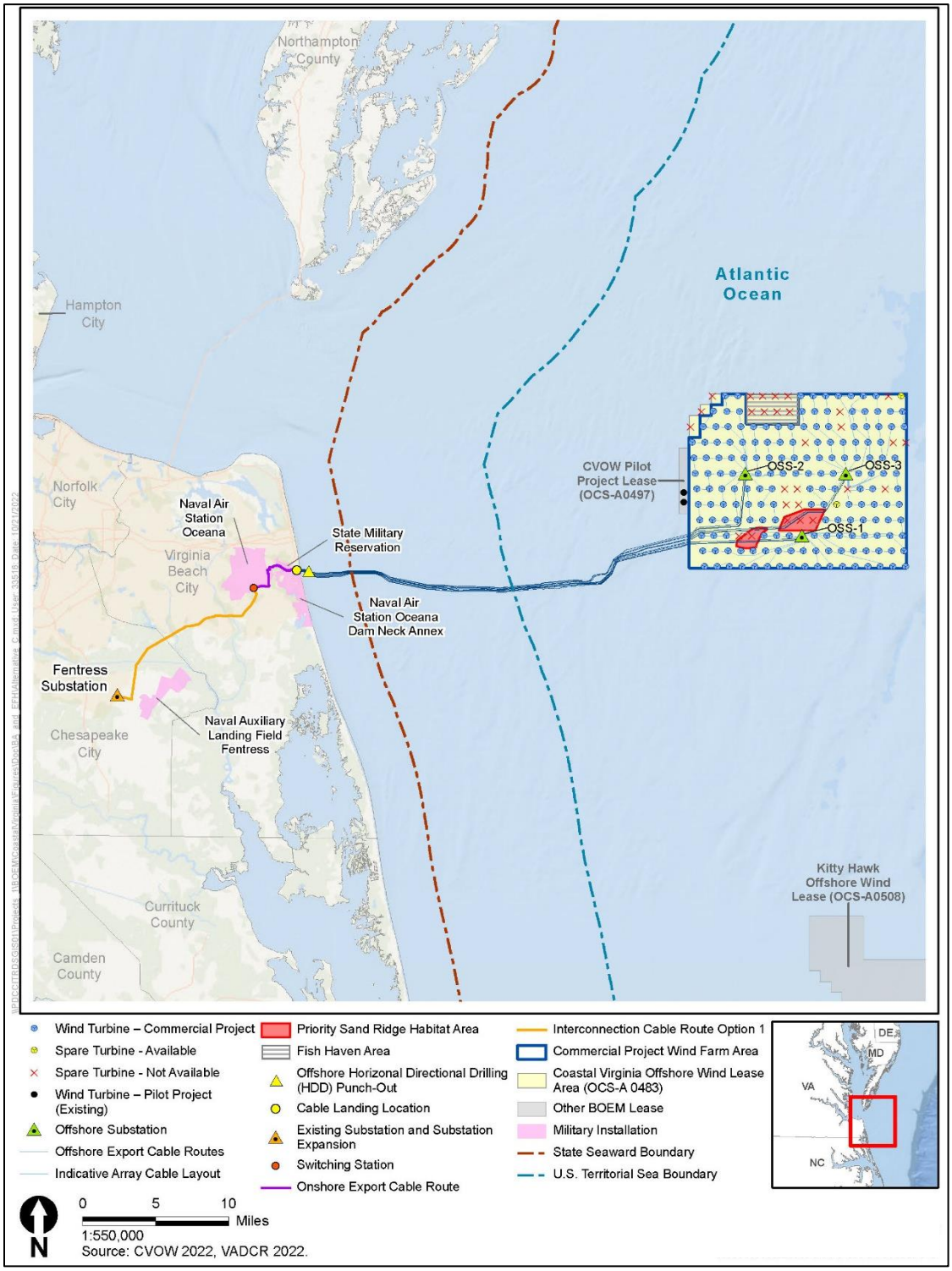


Figure 2-8 Alternative C: Sand Ridge Impact Minimization Alternative

2.4.3 Alternative D—Onshore Habitat Impact Minimization Alternative

Alternative D was developed through the scoping process for the Draft EIS in response to public comments regarding the potential impacts on sensitive onshore habitats, including wetlands. Under

Alternative D the construction, O&M, and eventual decommissioning of a wind energy facility would include the same offshore layout and range of design parameters as Alternative A: an up-to 3,000 MW wind energy facility consisting of up to 205 WTGs ranging from 14 MW to 16 MW each and 3 OSSs in the Lease Area, with associated export cables. Unlike the Proposed Action, the construction of onshore interconnection cables under Alternative D would follow either Interconnection Cable Route Option 1 or Interconnection Cable Route Option 6 (Hybrid Route) (Figure 2-9). Therefore, under Alternative D, BOEM would consider and potentially approve Interconnection Cable Route Option 1 or Interconnection Cable Route Option 6, whereas only Interconnection Cable Route Option 1 is considered under Alternative A. Each of the following sub-alternatives may be individually selected or combined with any or all other alternatives or sub-alternatives, subject to the combination meeting the purpose and need.

- **Alternative D-1** (Figure 2-10)**:** Interconnection Cable Route Option 1 would be the same as described under the Proposed Action and would be approximately 14.2 miles (22.8 kilometers) long and installed entirely overhead. From the common location north of Harpers Road, Interconnection Cable Route Option 1 would continue to the onshore substation, and the new Harpers Switching Station would be located at Naval Air Station (NAS) Oceana Parcel, pending Navy approval. The total footprint of the Harpers Switching Station would be 45.4 acres (18.4 hectares).
- **Alternative D-2** (Figure 2-11)**:** Interconnection Cable Route Option 6 (Hybrid Route) would be approximately 14.2 miles (22.8 kilometers) long and mostly follow the same route as Interconnection Cable Route Option 1, with the exception of the switching station. Interconnection Cable Route Option 6 would be installed via a combination of underground and overhead construction methods. Following Interconnection Cable Route Option 1 as an underground transmission line for approximately 4.5 miles (7.2 kilometers) to a point north of Princess Anne Road, Interconnection Cable Route Option 6 would transition to an overhead transmission line configuration. The Chicory Switching Station would be built north of Princess Anne Road; therefore, no aboveground switching station would be built at Harpers Road. From the Chicory Switching Station, Interconnection Cable Route Option 6 would align with Interconnection Cable Route Option 1 for the remaining 9.7 miles (15.6 kilometers) to the onshore substation. The maximum construction and operational corridor for the underground portion of Interconnection Cable Route Option 6 would be 86.5 feet (26 meters); the overhead portion would be 250 feet (76.2 meters), which is equivalent to the corridor width for Interconnection Cable Route Option 1. The total footprint of the Chicory Switching Station would be 35.5 acres (14.4 acres).

Interconnection Cable Route Option 1 would be an entirely overhead route, while Interconnection Cable Route Option 6 (Hybrid Route) would involve installation of the interconnection cable using a hybrid of overhead and underground construction methods. Both interconnection cable route options are intended to avoid and minimize impacts on onshore sensitive habitats, including wetlands, surface waters, and ecological cores.

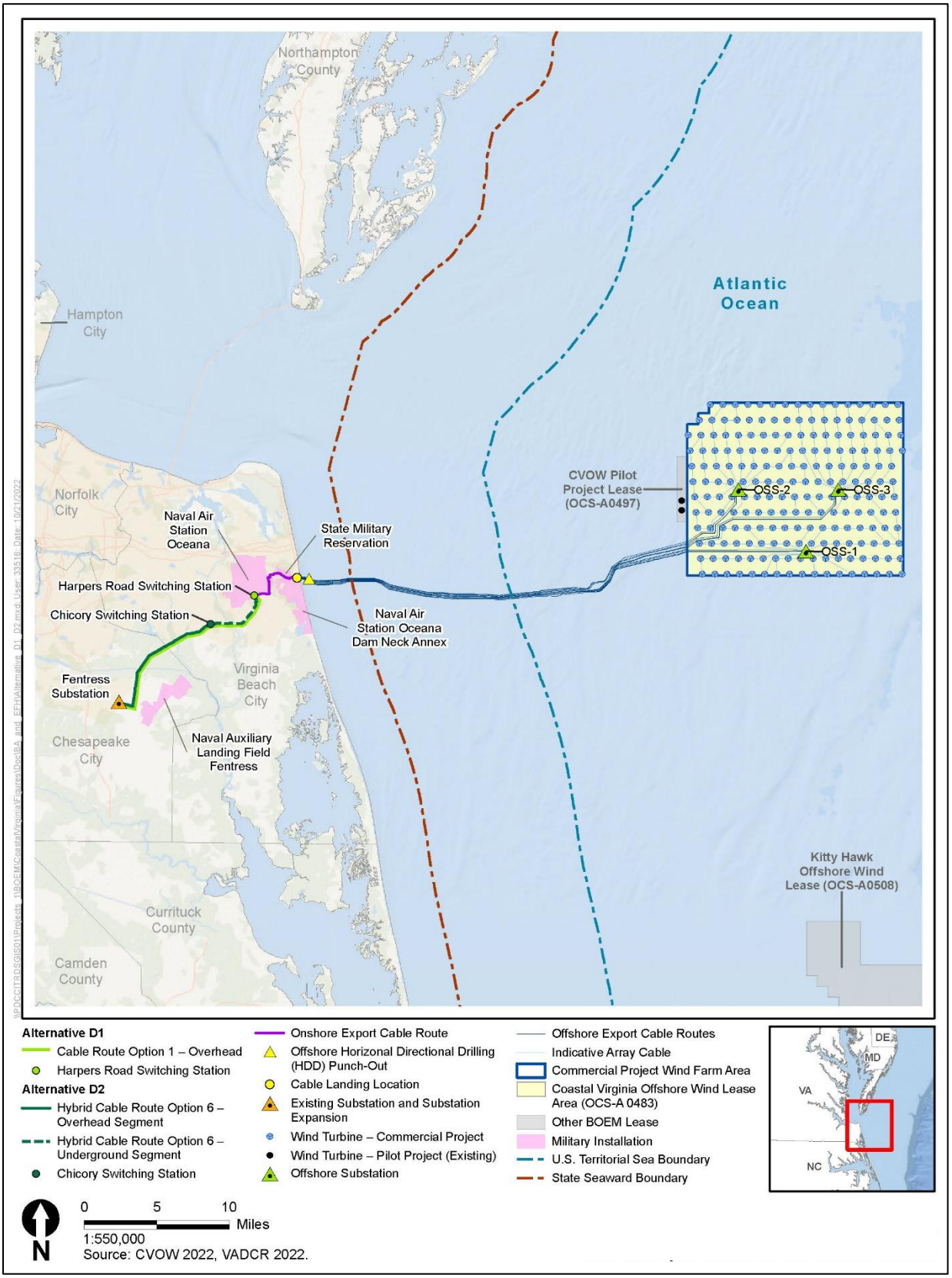


Figure 2-9 Alternative D: Onshore Habitat Impact Minimization Alternative

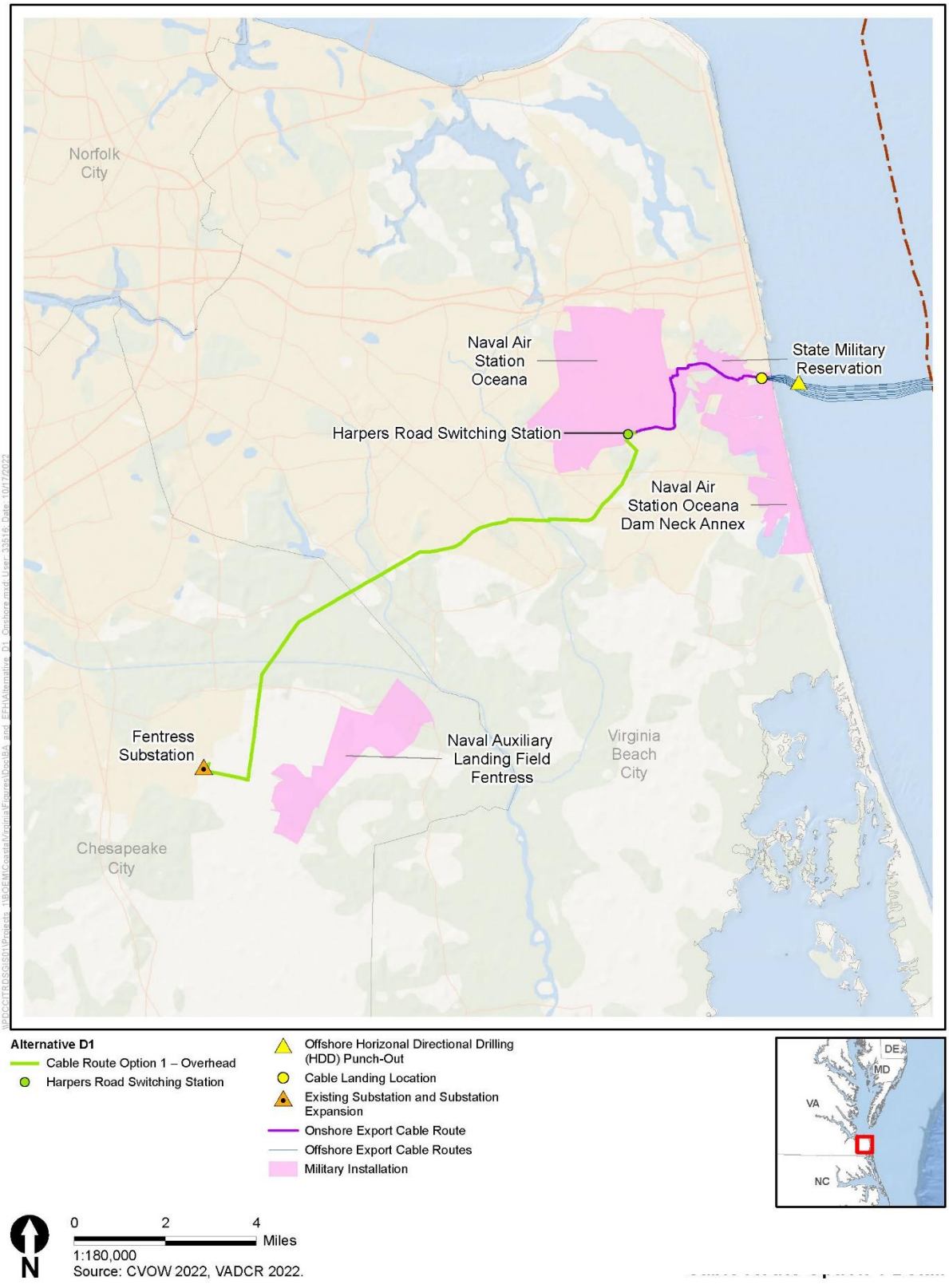


Figure 2-10 Alternative D-1: Interconnection Cable Route Option 1 Detail

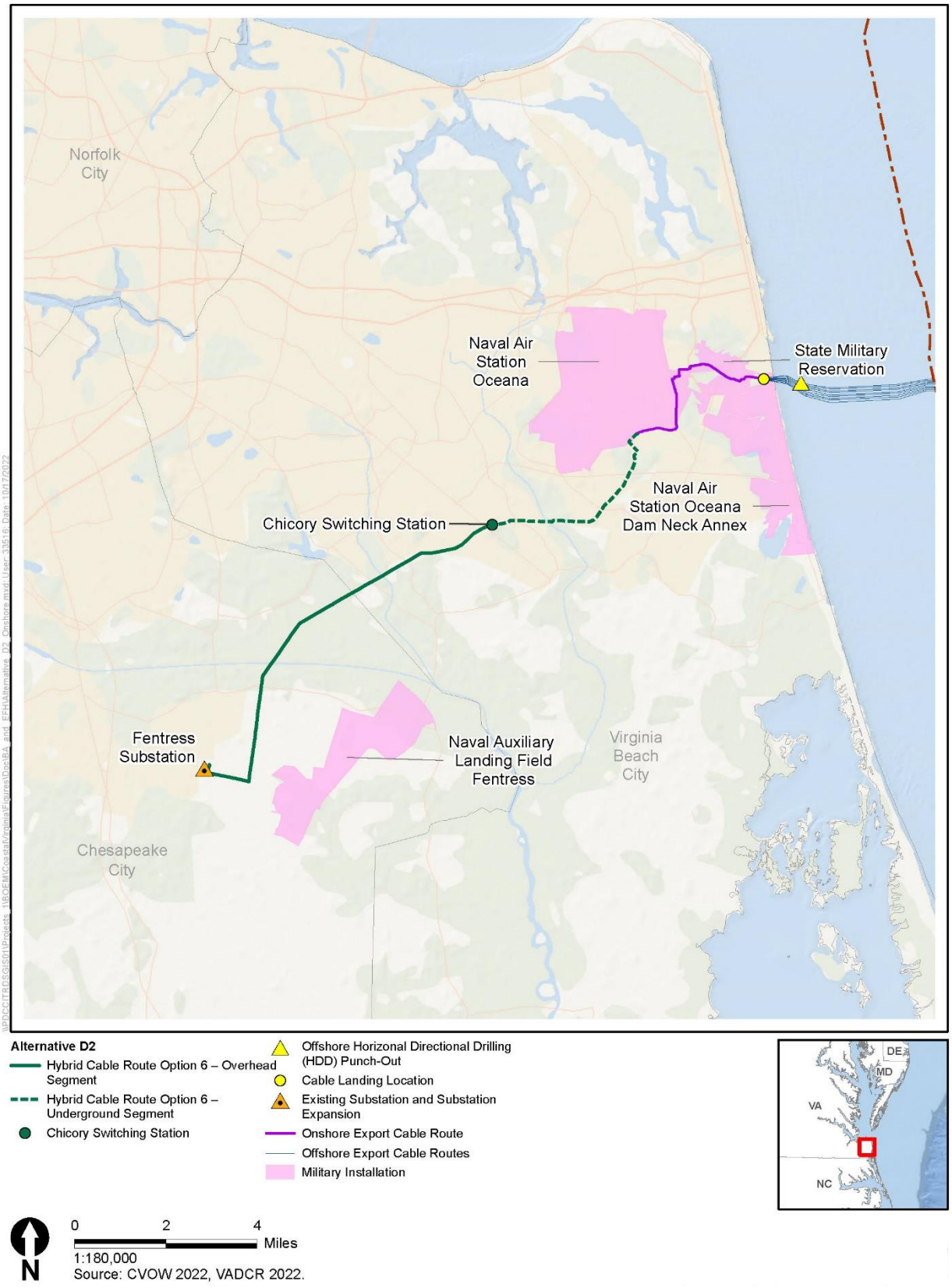


Figure 2-11 Alternative D-2: Interconnection Cable Route Option 6 (Hybrid Route) Detail

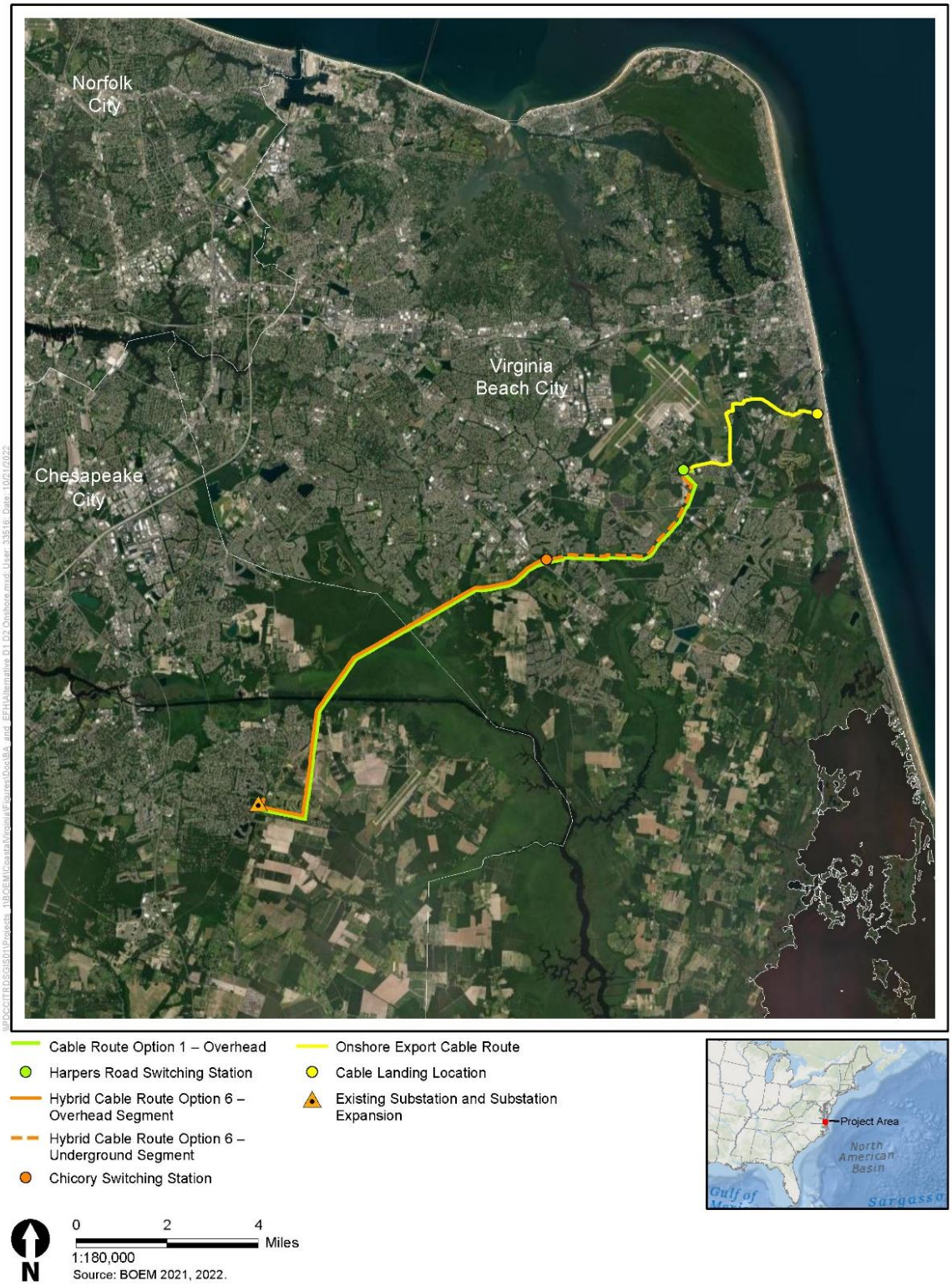
2.4.4 Alternative E—No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and conceptual decommissioning would not occur; and no additional permits or authorizations for the Project would be required. Any potential environmental and socioeconomic impacts, including benefits, associated with the Project as described under the Proposed Action would not occur. However, all other existing or other reasonably foreseeable future impact-producing activities would continue. The impact of the No Action Alternative serves as the baseline against which all action alternatives are evaluated.

3. Action Area

The Action Area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The Action Area for constructing, operating, and decommissioning the proposed Project includes onshore areas where Project activities and facilities would occur, as described above in Section 2.1.1; and the offshore areas where WTGs, OSS, inter-array cables, and offshore export cables would be located, as described above in Section 2.1.2.

While the Action Area is the same for all covered species, 8 of the 11 species covered in the BA can fly and therefore potentially could occur within both onshore and offshore project areas. Two of the species are not reasonably expected to occur on land. For all remaining species, the onshore portion of the Action Area encompasses the areas affected by the onshore cables and substations in the vicinity of the cable landing location, the onshore export cable, the switching station, the interconnection cable route, and the onshore substation (Figure 3-1). These onshore areas, inclusive of all Onshore Project components from the cable landing location to the POI, include all areas that would be affected by the Proposed Action and are hereafter referred to as the Onshore Project area. The offshore area, inclusive of all Offshore Project Components within the Lease Area and Offshore export cable route corridor to the Offshore trenchless installation punch-out location, is hereafter referred to as the Offshore Project area.



Source: Dominion Energy 2022.

Figure 3-1 CVOW-C Onshore Project Area Overview

3.1. Onshore Project Area

The Onshore Project Components, including the onshore export cables, switching station, interconnection cables, and an onshore substation, would be located within the municipalities of Virginia Beach and Chesapeake, Virginia. The offshore export cable would transition to shore using trenchless installation and terminate at the cable landing location at the proposed parking lot, west of the firing range at SMR. Beach habitat, dunes and dune grass, scrub-shrub, and wetlands are adjacent to the cable landing location. The beach is not expected to be disturbed because trenchless installation will be used.

The onshore export cable, which is proposed to be installed underground, originates from the cable landing location and predominately follows developed corridors and previously disturbed land to a common location north of Harpers Road. The onshore export cable route would pass through several habitat types, including open water, developed, forested, shrub/scrub, agricultural, and wetland.

The Harpers Switching Station would be constructed on a parcel north of Harpers Road (Interconnection Cable Route Option 1). The Harpers Switching Station operational footprint is anticipated to be approximately 46.4 acres (18.8 hectares), including any associated stormwater facilities, parking areas, relocation of golf course facilities, etc., and is expected to be constructed on a combination of existing developed areas, as well as undeveloped areas, composed of a mix of forest and woody wetlands. Some vegetation clearing would be required.

The interconnection cable route would extend from the common location north of Harpers Road to the onshore substation and would utilize overhead transmission lines (Figure 2-5). The interconnection cable route would pass through several habitat types, including open water, developed, forested, shrub/scrub, agricultural field, and wetland.

There are three broad portions of the interconnection cable route. The first portion would run from Harpers Road up to the forested and wetland habitat adjacent to the North Landing River, which primarily passes through a mix of urban developed areas and agricultural land. The second portion would pass through a relatively undisturbed area of mixed forest, wetlands, and riverine habitat associated with the North Landing River (i.e., Gum Swamp) and was identified in the Coastal Virginia Ecological Value Assessment (Virginia Coastal Zone Management Program n.d.) as having “very high” ecological value. The third portion would pass through a mix of agricultural land and wetlands adjacent to a canal. Site-specific surveys may be needed in portions of the interconnection cable route that pass through undisturbed areas. The onshore substation is largely characterized by an existing substation with a small amount of forested area.

COP Sections 4.2.1 *Wetlands and Waterbodies* and 4.2.2 *Terrestrial Vegetation and Wildlife* discuss existing onshore habitats and natural resources in greater detail (Dominion Energy 2022).

3.2. Offshore Project Area

The Offshore Project Components, including the WTGs, inter-array cables, and OSS, would be located in federal waters within the Lease Area, while the offshore export cable route would traverse both federal and state territorial waters. The boundary of the Lease Area is located 20.45 nautical miles (37.87 kilometers) from the northwest corner to the Eastern Shore Peninsula and 23.75 nautical miles (43.99 kilometers) from Virginia Beach, Virginia. The Lease Area itself is 13.0 nautical miles (24.08 kilometers) from the westernmost to easternmost edge, 10.4 nautical miles (19.26 kilometers) from the northernmost to southernmost edge, and 112,799 total acres in size.

The Offshore Project area is located on the OCS at the southern end of the Mid-Atlantic Bight, which is an oceanic region that spans coastal and offshore waters from Cape Cod, Massachusetts, to Cape Hatteras, North Carolina, and is characterized by a broad expanse of gently sloping, sandy-bottomed continental shelf. In this area, the shelf extends up to 93 miles (150 kilometers) offshore, where the waters reach to about 656 feet (200 meters) deep. Cool, northern waters interact with warm Gulf Stream waters in the continental shelf break region offshore from Cape Hatteras, North Carolina. A seasonal cycle in water temperatures is evident in the Mid-Atlantic region, with sea surface temperatures ranging 37 to 86 degrees Fahrenheit (°F) (3 to 30 degrees Celsius [°C]).

Water depths range from 62 to 134 feet (19 to 41 meters) in the Lease Area. The general trend of currents within the region offshore of the Mid-Atlantic Bight, including the Lease Area and offshore export cable route corridor, is a southward movement of shelf waters; the Gulf Stream does not directly interact with water masses within the Offshore Project area. Data analysis identified that while winds in the Lease Area occur from all directions, the strongest winds are from the north, and the highest frequency of winds are from the southwest. Air temperatures range from -0.4 to 95°F (-18 to 35°C). WTGs and OSSs would be, at minimum, 27 miles (24 nautical miles, 44 kilometers) offshore (see Figure 1-1). Turbines would be spaced 4,547 feet (0.75 nautical miles, 1.4 kilometers) apart and the maximum turbine tip height would be 869 feet (265 meters) above mean sea level (MSL).

Additional habitat information relevant to the Offshore Project area is located in the COP, Section 4.1.1 *Physical and Oceanographic Conditions* (Dominion Energy 2022).

4. Covered Species

This section describes the 11 Threatened, Endangered, or candidate species under the USFWS' jurisdiction that may occur in the Action Area or may be affected by the Proposed Action (Table 4-1). There is no designated critical habitat for these species in the Action Area (see IPaC reports in Appendix A). Data sources used for the analysis are discussed in Section 4.1. A description of each species and the potential occurrence in the Action Area is provided in Sections 4.2 through 4.13.

Table 4-1 Threatened, Endangered, or Candidate Species with the Potential to Occur in the Action Area

Species	Status	Primary Occurrence	Habitat(s)
Mammals			
Indiana bat[1] (*Myotis sodalis*)	E	Onshore	Hibernates in caves and mines during the winter; roosts and forms maternity colonies in trees with loose bark or cavities in the summer; forages in open forests, edges, open fields, and around bodies of water
Northern long-eared bat (*Myotis septentrionalis*)	E[2]	Onshore	Hibernates in caves, mines, and dams during the winter; roosts and forms maternity colonies in trees with loose bark or cavities near wetlands/open water during the summer; forages in open forests, edges, and around wetlands or water
Tricolored bat (*Perimyotis subflavus*)[3]	P	Onshore	Winter: caves and mines; Spring, Summer, Fall: primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees. May also roost in structures (e.g., barns, bridges). Forages around water and forest edges.
Birds			
Bermuda petre[4] (*Pterodroma cahow*)	E	Offshore	Highly pelagic; forages far offshore in productive waters associated with oceanographic features (esp. Gulf Stream frontal boundaries); nests on rocky islands in Bermuda
Black-capped petrel[4] (*Pterodroma hasitata*)	PT	Offshore	Highly pelagic; forages offshore in productive waters associated with oceanographic features (esp. Gulf Stream frontal boundaries); nests on high elevation cliffs in the West Indies
Piping plover (*Charadrius melodus*)	T	Coastal	Oceanfront beaches and barrier islands; forages on intertidal beaches, exposed mudflats and sandflats, wrack lines and shorelines; nests in coastal sandy beaches and dunes
Rufa red knot (*Calidris canutus rufa*)	T	Coastal	Oceanfront beaches and barrier islands during migration; nests in Canada and migrates to South America
Roseate tern (*Sterna dougallii dougallii*)	E	Coastal	Coastal beaches; protected bays and estuaries; offshore ocean; nests in coastal sandy beaches and dunes
Insects			
Monarch butterfly (*Danaus plexippus*)	C	Onshore & Coastal	Anywhere with milkweed and an abundance of native nectar plants
Reptiles			
Loggerhead sea turtle (*Caretta caretta*)	T	Coastal & Offshore	Nests on sandy beaches above the high-tide line, most commonly on the ocean-facing side of barrier islands

Species	Status	Primary Occurrence	Habitat(s)
Green sea turtle (*Chelonia mydas*)	T	Coastal & Offshore	Nests on sandy, ocean-facing beaches
Kemp's ridley sea turtle (*Lepidochelys kempii*)	E	Coastal & Offshore	Nests on sandy, ocean-facing beaches

Status Codes: C = Candidate for Federal listing; E = Federally listed Endangered; PT = Proposed Threatened; T = Federally listed Threatened

[1] The federally listed Endangered Indiana bat was not identified via IPaC but may be present within the Project area due to recent presence discoveries in the Virginia Coastal Plain, including a maternity roost in Caroline County, approximately 110 mi [177 km] from the Project area (St. Germain et al. 2017, COP Appendix O, Dominion Energy 2022).

[2] On November 29, 2022, the USFWS announced a final rule to reclassify the northern long-eared bat as endangered under the ESA. The rule becomes effective on January 30, 2023. BOEM will update this BA to include new guidance for the northern long eared bat as it becomes available.

[3] Tricolored bat does not show up on IPaC, but the species range includes New York and suitable habitat is generally similar to northern long-eared bat.

[4]The federally Endangered Bermuda petrel and Proposed Threatened black-capped petrel were not identified by IPaC, but potentially occurs on the Virginia Outer Continental Shelf as vagrants.

A review of the Virginia Natural Heritage Data Explorer (VNHDE) identified one federal "Species of Concern," the long beach seedbox (*Ludwigia brevipes*; Virginia Department of Conservation and Recreation 2022). This designation is an informal term used by the USFWS that refers to those species which may require some conservation actions, but which are not necessarily threatened with extinction. Species of concern are not provided legal protection under the ESA, and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a Threatened or Endangered species. The USFWS evaluates Species of Concern to determine the extent of their conservation needs and to determine whether additional legal protection should be sought for them. A copy of the VNHDE species/community search results is provided in the COP, Appendix R, *Threatened and Endangered Species Review,* Attachment R-3 (Dominion Energy 2022). This species is not addressed further in this document.

The bald eagle (*Haliaeetus leucocephalus*) is not a federally listed species under the ESA but is protected under both the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. A review of the Center for Conservation Biology Virginia Bald Eagle Nest Locator was completed on April 21, 2022 and indicates that no known bald eagle nests occurs within 660 feet (201 meters) of the interconnection cable route. An aerial survey conducted by Tetra Tech on March 11, 2022 located one previously undocumented active bald eagle nest within 660 feet (201 meters) of the Project area, approximately 340 feet (104 meters) east of the Battlefield Boulevard Golf Club (36.688225°, -76.170469°). Coordination with the Virginia Department of Wildlife Resources (VDWR) and USFWS may be required if impacts are anticipated within the regulated 660-foot (201-meter) buffer (USFWS 2020a). The Center for Conservation Biology Bald Eagle Nest Maps are provided in the COP, Appendix R, *Threatened and Endangered Species Review,* Attachment R-4 (Dominion Energy 2022). This species is not addressed further in this document.

The Florida manatee (*Trichechus manatus latirostris*), subspecies of the West Indian manatee (*T. manatus*), may occasionally be encountered in waters off Virginia. However, given the species' rare occurrence, it is unlikely to be encountered during Project activities. As a result, the species is not addressed further in this document.

The leatherback sea turtle (*Dermochelys coriacea*) and hawksbill sea turtle (*Eretmochelys imbricata*) occur in coastal and offshore Virginia waters. However, there are no documented nesting sites for either species within Virginia. Due to absence of documented nesting sites for leatherback and hawksbill sea turtles within the Action Area, the Proposed Action would have ***no effect*** on either species. Therefore, this BA does not discuss leatherback and hawksbill sea turtles any further.

4.1. Data Sources for Analysis

BOEM used information in the COP and DEIS for the Proposed Action as a starting point for the development of this BA. The COP and DEIS are incorporated into this analysis by reference. Various literature sources were used to supplement the information BOEM has compiled about potential effects to federally listed species from other offshore wind projects on the OCS, including peer-reviewed literature, USFWS 5-year reviews, USFWS species status assessments, *Federal Register* publications (i.e., listing rules), recovery plans, recent USFWS biological opinions, recent USFWS biological assessments, Natural Heritage Program reports, VDWR Virginia Fish and Wildlife Information Service (VaFWIS) and Wildlife Review Map Service (WERMS), and various websites. In addition, previous environmental studies and monitoring efforts by Federal and state agencies were reviewed to gain an understanding of the presence, distribution, and history of Threatened or Endangered species in the vicinity of the Action Area.

4.2. Indiana Bat

4.2.1 Species Description

The Indiana bat (*Mystis sodalis*) can be found in interior portions of the eastern and central United States. The Indiana bat was originally listed in 1967 as in danger of extinction under the Endangered Species Preservation Act of 1966 and is currently listed as Endangered under the ESA (32 *FR* 4001), with the most substantial threat at the time of listing being human disturbance at hibernacula. Since its listing in 1967, the range-wide population has continued to decline, though threats to the population have shifted over time, with human-related factors having lower influence on the current observed decline than when the species was first listed (USFWS 2019a). The current range-wide population estimate for the Indiana bat is approximately 537,297 bats (USFWS 2019a). The species is also listed as Endangered by the VDWR (2022a) and Near Threatened under the IUCN Red List (IUCN 2022). Critical habitat exists for the Indiana bat in a number of hibernacula (42 *FR* 47840); no critical habitat occurs in the vicinity of the Project area.

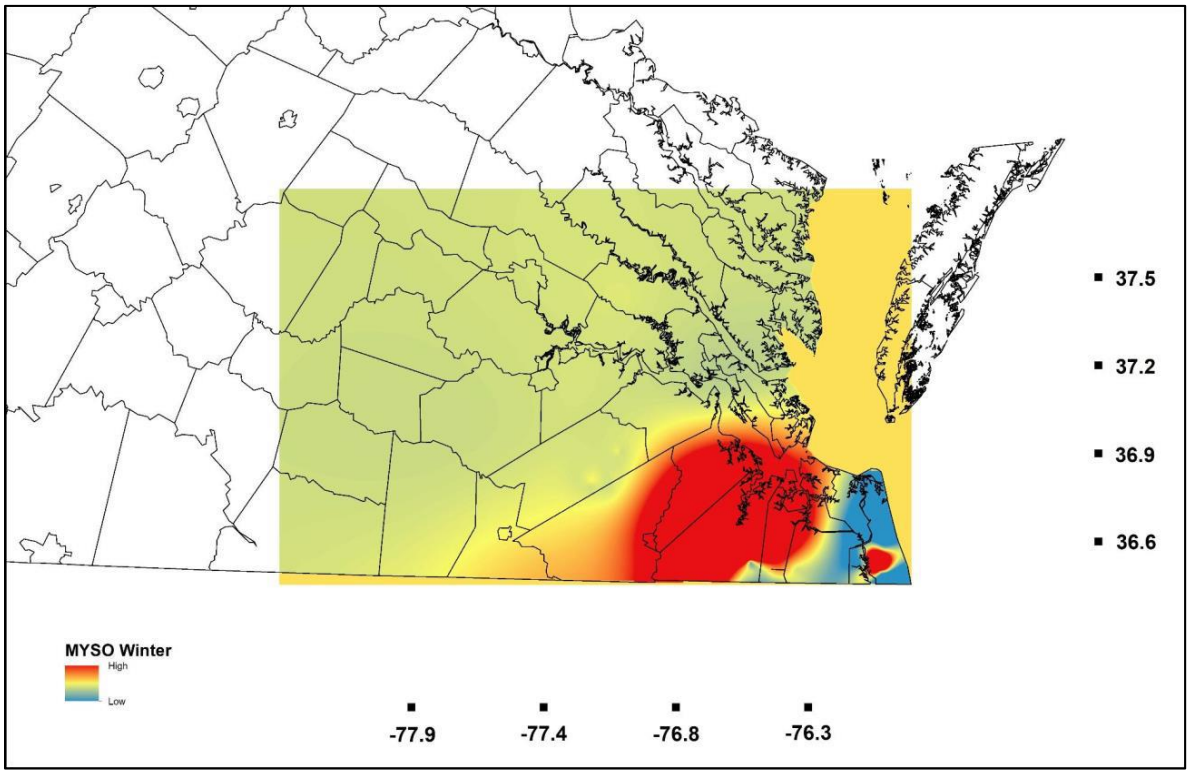
The Indiana bat is a medium-sized cave-hibernating bat that closely resembles the little brown bat except in coloration. Acoustically, it is nearly indistinguishable from the northern long-eared bat. The annual life cycle of the Indiana bat is similar to other *Myotis* species and includes winter hibernation, spring staging, spring migration, summer birth of young, fall migration, and fall swarming and mating. In spring, reproductive females leave their hibernacula and migrate to wooded areas where they will form maternity colonies, give birth, and raise their young. This migration may be up to 357 miles (575 kilometers) (Winhold and Kurta 2006). Roost trees are most commonly within canopy in a forest or along a boundary, such as in a fence line or along a wooded edge whereas maternity roosts may be found in riparian zones (habitat at the interface between land and a body of water such as a river, stream, or lake), bottomland and floodplains, wooded wetlands, and upland communities (USFWS 2007). Summer habitat home ranges have been recorded ranging from 287-398-acres (116-161 hectares) (Menzel et al. 2005), though they exhibit relative plasticity in foraging range size based on resource availability. Males and females then return to hibernacula in late summer or early fall when they mate and enter hibernation. Most hibernacula are caves in the east-central US, but they also utilize other sites such as mines (USFWS 2007). Approximately 95 percent of the entire Indiana bat population reside in just 15 hibernacula (VDWR 2020b). There are approximately 269 documented maternity colonies in 16 states, though it is likely most maternity colonies are not located given their wide dispersal (USFWS 2007).

Indiana bats are nocturnal insectivorous and typically forage in semi-open to closed forested habitat, forest edges, and riparian areas (USFWS 2007). Other foraging habitat include upland forests, wetlands, and in the vicinity of ponds and streams (Menzel et al. 2005; USFWS 2007). A large portion of the

Indiana bat diet consists of aquatic insects; other prey types include moths, beetles, and flies (USFWS 2007).

The range-wide population of Indiana bats has been in decline since the time of its listing as Endangered (USFWS 2019A). The Virginia population of Indiana bat has been declining since initial surveys in the 1970s (VDWR 2020b). Indiana bats are present in low numbers in 12 different caves in western Virginia (VDWR 2020b). Their summer range is likely minimal outside the western portion of the state (Timpone et al. 2011), but more recent studies have documented its presence, including a maternity colony, in the coastal plain of the state (St. Germain et al. 2017; Silvis et al. 2017; De La Cruz 2020). The Indiana bat is typically active throughout early spring to late fall, though suspected non-hibernating populations appear to maintain some level of activity throughout the winter in southeastern Virginia and northeastern North Carolina (Figure 4-1; De La Cruz and Ford 2018 as cited in COP, Appendix O-1; Dominion Energy 2022). Additional threats to the Indian bat include degradation, destruction, and modification of hibernation, migration, and summer habitats, human disturbance, environmental contaminants, natural factors, and climate change.

Additional information about the Indiana bat can be found within the species' profile page on the USFWS' ECOS website (USFWS 2022a).



Source: Figure 15 in De La Cruz et al. 2018 as cited in COP, Appendix O-1; Dominion Energy 2022.

Figure 4-1 Relative Activity of Indiana Bats (*Myotis sodalis*) During Winter in Southeastern Virginia, 2017–2018

4.2.2 Indiana Bat in the Action Area

Indiana bat hibernacula are caves and mines in the western portion of Virginia, and there are no known hibernation in the vicinity of the Project area. The nearest documented maternity colony is in Caroline County, Virginia, approximately 110 miles (177 kilometers) northwest of the Project area (St. Germain

et al. 2017). The species has not been detected offshore on the OCS and is not expected to occur in or near the Offshore Project area. The species was also not detected during offshore acoustic surveys in the CVOW-C lease (COP, Appendix O-2; Dominion Energy 2022). Further, no Indiana bats were detected during acoustic bird and bat post-construction monitoring (August 2021 to November 2021) of turbines for the CVOW-Pilot Project (Dominion Energy 2022).

The cable landing location would be located in a proposed parking lot, which is highly unlikely to provide foraging or roosting habitat for any bat species. Although acoustic analyses using KPro software identified as Indiana bat from 16 passes, the identities could not be confirmed by manual vetting (calls of Indiana bats and little brown bats are nearly indistinguishable), and no Indiana bats were captured during mist netting efforts in the area (Tetra Tech 2019 as cited in COP Section 4.2.3; Dominion Energy 2022). While bats may be present in habitat adjacent to the Onshore Project area, exposure is expected to be limited (see COP, Appendix O-1; Dominion Energy 2022) because the cable route is underground and primarily collocated with existing roads. While individual trees may need to be removed in limited quantities within the onshore cable route, species-specific time of year cutting restrictions will be followed if necessary pending the results of additional pre-construction surveys and coordination/consultation with BOEM, USFWS, and VDWR (see measure 4 in Table 7-2).

The occurrence of the Indiana bats offshore or within the Lease Area is highly unlikely because they are closely associated with forests and rarely travel more than 1,000 feet (305 meters) from forested habitats (USFWS 2011). If they were to migrate over water, movements would likely be in close proximity to the mainland. The species was not detected in the Project's acoustic surveys (COP, Appendix O-2; Dominion Energy 2022) and, like other cave-hibernating bats, they do not regularly use the offshore environment for foraging or migrating (Dowling et al. 2017; Sjollema et al. 2014; Solick and Newman 2021; Stantec 2016). Given the above information, it is extremely unlikely that Indiana bats use the offshore environment near the offshore portion of the proposed project.

4.3. Northern Long-eared Bat

4.3.1 Species Description

The northern long-eared bat (*Myotis septentrionalis*) is widely distributed throughout much of eastern and central North America. Following substantial population decline as a result of white-nose syndrome (WNS), a fungal disease of hibernating bats that results in high mortality rates, the northern long-eared bat was federally listed as Threatened in 2015 (80 *FR* 17974)[4]. In January 2016, the USFWS issued an ESA §4(d) Rule (81 *FR* 1900) that specifically defines *take* prohibitions and exempts most incidental take for a variety of commercial and industrial projects within the species range, subject to known roost trees and hibernacula within areas affected by WNS. The species is also listed as Threatened by the VDWR (2022a) and Near Threatened by the International Union for Conservation of Nature (IUCN) Red List (IUCN 2022). Critical habitat was assessed for the species but was determined not prudent in April 2016 (81 *FR* 24707); thus, no critical habitat exists for the northern long-eared bat. On November 29, 2022, the USFWS announced a final rule to reclassify the northern long-eared bat as endangered under the ESA. The rule becomes effective on January 30, 2023. BOEM will update this BA to include new guidance for the northern long eared bat as it becomes available.

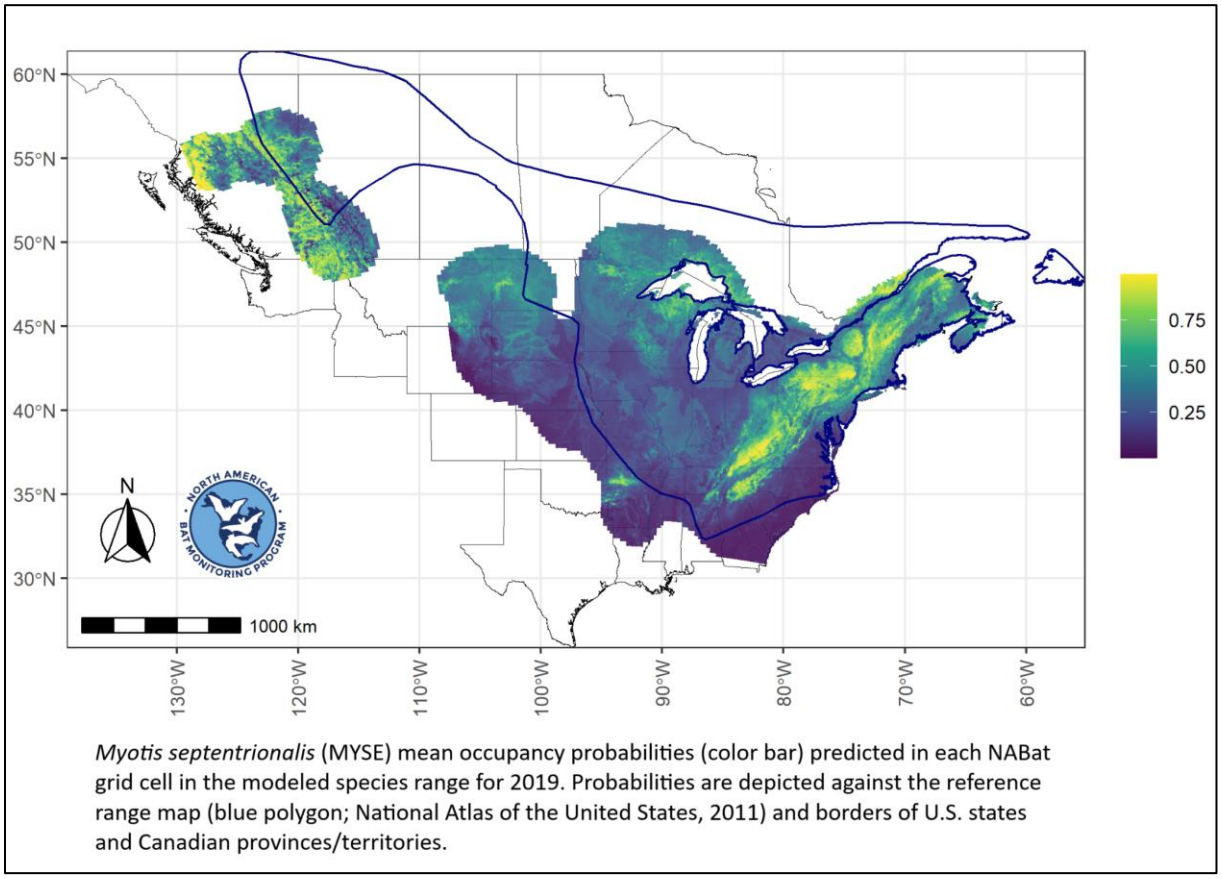
[4] On November 29, 2022, USFWS announced a final rule to reclassify the northern long-eared bat as endangered under the ESA. The rule becomes effective on January 30, 2023. . Dominion Energy will update protocols as necessary to comply with any changed requirements associated with the status change and BOEM will update this BA as new information becomes available.

The once common northern long-eared bat is a medium-sized cave-hibernating bat that is distinguished from other *Myotis* species by its long ears. Its annual life cycle includes winter hibernation (caves and mines), spring staging, spring migration, summer birth of young, fall migration, and fall swarming and mating. In spring, the bats leave their hibernacula to roost in trees and forage near the hibernaculum in preparation for migration. Trees used are typically greater than or equal to 3 inches (7.6 centimeters) diameter at breast height, within 1,000 feet (305 meters) of forest. They also roost in cracks, crevices, cavities, and exfoliating bark of trees. Compared to migratory tree-roosting bat species, northern long-eared bats are short-distance migrants. From approximately mid-May through mid-August, they occupy summer habitat, where they roost under bark and in cavities or crevices of both live and dead trees (Foster and Kurta 1999; Owen et al. 2002; Perry and Thill 2007). Females roost in small maternity colonies and males roost alone (Amelon and Burhans 2006). Northern long-eared bats also switch roosts frequently, typically every 2 to 3 days (Carter and Feldhamer 2005; Foster and Kurta 1999; Owen et al. 2002). During breeding and in the summer, northern long-eared bats have small home ranges (less than 25 acres [10 hectares]; Silvis et al. 2016) and migratory movements can be up to 170 miles (275 kilometers; Griffin 1945).

Most foraging is within a few meters above the ground in between the understory and forest canopy (Brack and Whitaker 2001) and within a few kilometers of their roost sites (Timpone et al. 2010). Northern long-eared bats are insectivorous, typically foraging on moths, flies, leafhoppers, caddisflies, and beetles (Brack and Whitaker 2001). They will also forage in open forests, edges, and around ponds, streams, and wetlands. Individuals congregate in the vicinity of their hibernacula in August or September and enter hibernacula in October and November. An individual will use the same hibernaculum for multiple years.

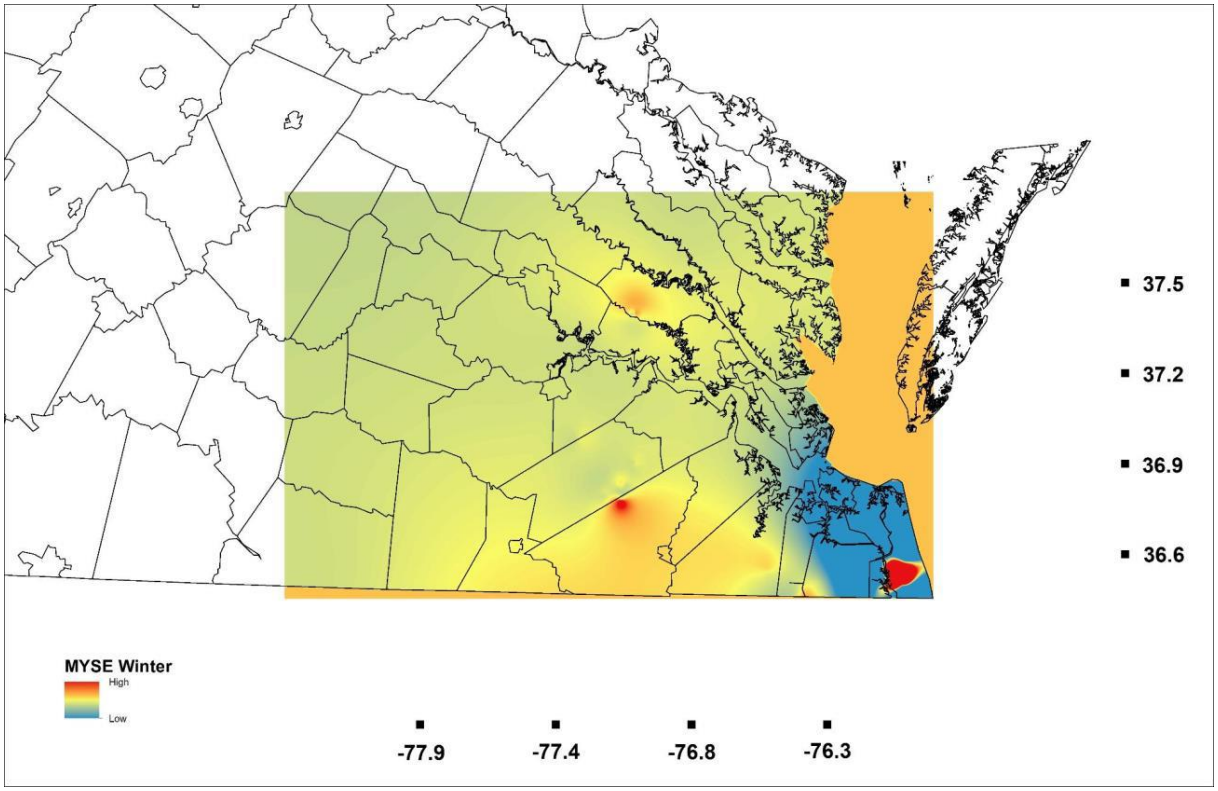
The northern long-eared bat is found throughout the state of Virginia during the summer and in the western regions of the state during the winter (VDWR 2020a). The bat is active throughout early spring to late fall (March-November; Brooks and Ford 2005; Pettit and O'Keefe 2017), though summer occupancy levels are predicted to be low (Figure 4-2; USGS n.d.) and suspected non-hibernating populations appear to maintain some level of activity throughout the winter (Figure 4-3; Grider et al. 2016; De La Cruz and Ford 2018 as cited in COP, Appendix O-1; Dominion Energy 2022) in southeastern Virginia and northeastern North Carolina. The population has declined by 90 to 100 percent in many locations, especially in the Northeast U.S., due to impacts from WNS, which is the predominant threat to this bat. The overall range wide status of the species is declining (81 *FR* 1900). WNS has been detected in Virginia beginning in 2009 in cave hibernating bat populations, including the northern long-eared bat (Turner et al. 2011; White-Nose Syndrome Response Team 2021). It is expected that WNS will continue to spread and will likely have similar impacts to the species as documented in the Northeast (USFWS 2016). Despite severe population declines, northern long-eared bats continue to be found in low numbers in some WNS-affected areas, as well as some coastal areas in eastern North America, where they may not be so severely impacted by WNS (USFWS 2015). Additional threats to the species include degradation, destruction, and modification of hibernation, migration, and summer habitats, human disturbance, environmental contaminants, natural factors, and climate change.

Additional information about the northern long-eared bat can be found within the species' profile page on the USFWS' ECOS website (USFWS 2022a).



Source: USGS n.d.

Figure 4-2 Mean Occupancy Probabilities of Northern Long-Eared Bats (*Myotis septentrionalis*) During Summer for 2019



Source: Figure 12 in De La Cruz et al. 2018 as cited in COP, Appendix O-1; Dominion Energy 2022.

Figure 4-3 Relative Activity of Northern Long-eared Bats (*Myotis septentrionalis*) During Winter in Southeastern Virginia, 2017 through 2018

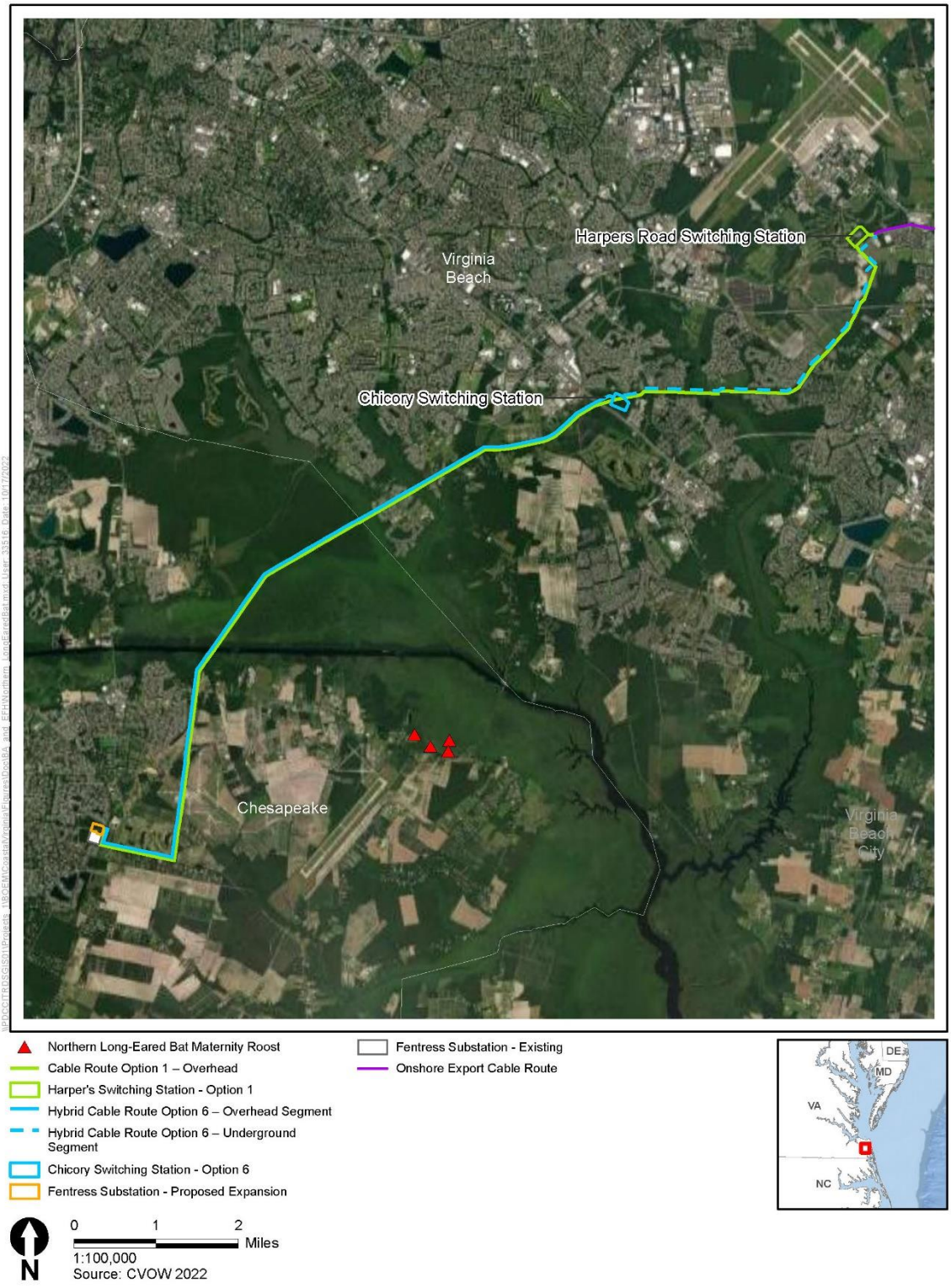
4.3.2 Northern Long-eared Bat in the Action Area

The northern long-eared bat has the potential to occur in or near the Onshore Project area. Cave-hibernating bats in Virginia hibernate regionally in caves, mines, and other structures, and feed primarily on insects in terrestrial and fresh-water habitats. Year-round presence and maternity roosts have been documented in the Virginia Beach region, though no known hibernacula occur in the vicinity. The species was also not detected during offshore acoustic surveys in the CVOW-C lease (COP, Appendix O-2; Dominion Energy 2022). Further, no northern long-eared bats were detected during acoustic bird and bat post-construction monitoring (August 2021 to November 2021) of turbines for the CVOW-Pilot Project (Dominion Energy 2022). Northern long-eared bat habitat use in the Action Area is discussed in greater detail below.

The cable landing location would be located in a proposed parking lot, which is not near high-quality contiguous forests and is highly unlikely to provide roosting or foraging habitat for any bat species. Bat mist-netting efforts in the vicinity of the onshore export cable route, particularly along Birdneck Road and near the SMR beach parking lot, have not reported captures of any federally listed species (Tetra Tech 2019 as cited in COP Section 4.2.3; Dominion Energy 2022). Acoustic analysis in this same area had no confirmed northern long-eared bat calls (Tetra Tech 2019 as cited in COP Section 4.2.3; Dominion Energy 2022). While bats may be present in habitat adjacent to the onshore export cable route, exposure is expected to be limited (see COP, Appendix O-1; Dominion Energy 2022) because the route is underground and primarily collocated with existing roads. Developed areas are unlikely to provide high-quality foraging or roosting habitat. While individual trees may need to be removed in limited quantities within the onshore cable route, species-specific time of year cutting restrictions will be followed if

necessary pending the results of additional pre-construction surveys and coordination/consultation with BOEM, USFWS, and VDWR (see measure 4 in Table 7-2). The switching station Alternatives are located primarily in developed areas associated with an existing golf course or small areas of mixed forest. There is some likelihood that bats could utilize the forested areas for foraging and roosting and open field areas for foraging at the Switching Stations during the bat active period (generally April to October) as well as potentially during the winter if non-hibernating populations persist in this area based on previous bat surveys conducted near the Switching Stations (Tetra Tech 2016a, 2016b, 2019 as cited in COP Section 4.2.3; Dominion Energy 2022).

The existing habitat present along the interconnection cable route has the potential to contain bat habitat as the routes vary in their degree of collocation within existing disturbed areas (e.g., roads, transmission corridors); pass through several areas designated as high or very high ecological value (Virginia Coastal Zone Management Program n.d.); and are in areas with documented northern long-eared bat maternity roosts. The nearest known hibernacula occur far from the Project area in the mountains along the western and northwestern borders of Virginia over 200 miles (320 kilometers) away. Maternity roosts and active detections (mist net captures and acoustic recordings) have been reported for northern long-eared bat in areas around Virginia Beach, with the nearest reported maternity roosts located adjacent to Naval Auxiliary Landing Field Fentress, within 2.57 miles (4.14 kilometers) of the closest portion of Interconnection Cable Route Options 1 and 6 (Figure 4-4) (Tetra Tech 2019 as cited in COP Section 4.2.3; Dominion Energy 2022; VDWR 2022b). In addition, recent acoustic studies have documented year-round use by northern long-eared bats in nearby areas (e.g., Great Dismal Swamp National Wildlife Refuge, Princess Anne Wildlife Management Area), suggesting the presence of non-hibernating, overwintering populations and highlighting the coastal plain as a potentially important refuge for several bat species affected by white-nose syndrome (De La Cruz 2020; De La Cruz and Ford 2018 as cited in COP Section 4.2.3; Dominion Energy 2022). Given the potential year-round presence of federally listed bats, Dominion Energy would consult with state and federal agencies and, if required, would conduct mist-netting surveys along portions of the interconnection cable route that would require tree removal.



Source: Dominion Energy 2022

Figure 4-4 Known Northern Long-Eared Bat Maternity Roosts Are 2.57 Miles (4.14 Kilometers) from the Interconnection Cable Route Options

Cave-hibernating bats generally exhibit lower activity in the offshore environment than migratory tree bats (Sjollema et al. 2014). However, acoustic detectors in the Gulf of Maine and Great Lakes documented higher than expected proportions of *Myotis* calls, suggesting that individuals of this genus are capable of, and may frequently make, long-distance, offshore flights (Stantec 2016). The same study reported very little offshore activity of *Myotis* species in the mid- Atlantic. Solick and Newman (2021) reported over 83 percent of *Myotis* species detections occurring less than 5.2 miles (8.3 kilometers) from shore, though rare detections farther offshore in association with research and fishing vessels do exist. Bat activity overall in the offshore Mid-Atlantic region ranged from May through October, with 79 percent of records indicating solitary bats (Solick and Newman 2021). Based on these data, there is little evidence of northern long-eared bat use of the offshore environment.

During the Project's 2020-2021 offshore acoustic bat survey, 411 detector-nights were sampled within the Offshore Project area from April 14, 2020, to May 15, 2021. None of the total of 592 bat passes recorded in the Offshore Project area were federally listed species (COP, Appendix O-2; Dominion Energy 2022). All bat species confirmed during the acoustic survey were from migratory tree bat species, but some cave-hibernating species may be present in the unidentified high- and low-frequency groups. For these reasons, presence in the Offshore Project area is not expected for the northern long-eared bat.

4.4. Tricolored Bat

4.4.1 Species Description

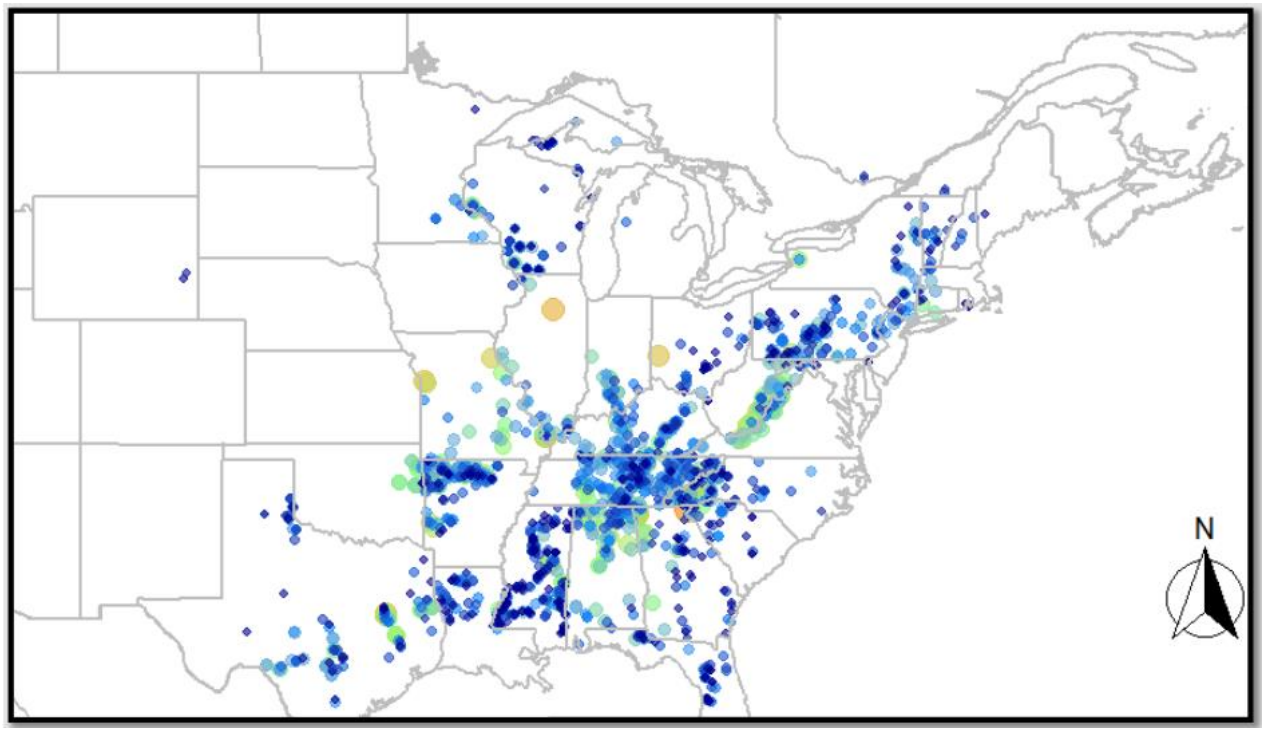
The tricolored bat is the only member of its genus. It is a small bat, measuring about 2 inches in body length (up to 3.5 inches including the tail) and weighing up to approximately 8 grams (USFWS undated). The tricolored bat is distinguished by its unique tricolored fur that appears dark at the base, lighter in the middle, and dark at the tip. They often appear yellowish, varying form pale yellow to nearly orange, but may also appear silvery-gray, chocolate brown, or black (USFWS undated). Newly flying young are much darker and grayer than adults. The tricolored bat's range in the United States includes most of the eastern and midwestern United States. The species was once common and has declined by 90 percent to 100 percent in most locations due to impacts from WNS (USFWS undated). On September 13, 2022, USFWS announced a proposal to list the tricolored bat as endangered under the ESA.

During the spring, summer, and fall—collectively referred to as the non-hibernating seasons—tricolored bats primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees. In the southern and northern portions of the range, tricolored bats will also roost in Spanish moss (*Tillandsia usneoides*) and *Usnea trichodea* lichen, respectively. In addition, tricolored bats have been observed roosting during summer among pine needles; in eastern red cedar (*Juniperus virginiana*); within artificial roosts like barns; beneath porch roofs, bridges, and concrete bunkers; and rarely within caves. Female tricolored bats exhibit high site fidelity, returning year after year to the same summer roosting locations. Females form maternity colonies and switch roost trees regularly. Males roost singly. During the winter, tricolored bats hibernate in caves and mines; although, in the southern United States, where caves are sparse, tricolored bats often hibernate in road-associated culverts, as well as sometimes in tree cavities and abandoned water wells. They exhibit high site fidelity, with many individuals returning year after year to the same hibernaculum. Tricolored bats mate in the fall, hibernate in the winter, and emerge in the spring. They then migrate to summer habitat where females form maternity colonies, where young are born. Bats disperse once young can fly, and then return to winter habitats to swarm, mate, and hibernate. Tricolored bats exhibit site fidelity to both winter and summer roost habitat. They emerge early in the evening and forage at treetop level or above but may forage closer to ground later in the evening. This bat species exhibits slow, erratic, fluttery flight while foraging, and they are known to forage most commonly over waterways and forest edges.

4.4.2 Tricolored Bat in the Action Area

Tricolored bat habitat is very similar to habitats used by the northern long-eared bat (see Section 4.3). There is a record of maternity colonies of northern long-eared bats occurring at Naval Auxiliary Landing Field Fentress, adjacent to the interconnection cable route, and this is likely also suitable habitat for tricolored bats. However, the occurrence of tricolored bats in the vicinity of the Onshore Project area is predicted to be relatively low (Figures 4-5 and 4-6). The USFWS' Species Status Assessment Report for the tricolored bat indicates that there were no known occupied hibernacula near coastal Virginia (Figure 4-5) prior to WNS in the year 2000 (USFWS 2021a).

The onshore export cable route passes through several habitat types, including open water, forested, shrub/scrub, agricultural field, and wetlands and includes areas that have been identified as having general to very high ecological value. Roost trees and nighttime foraging locations of non-listed species like the tricolored bat have been identified in the forested areas bordering Birdneck Road (Tetra Tech 2019). Tricolored bats are state-listed as Endangered in Virginia, thus making these areas of added importance for this species. Bat mist-netting efforts in the vicinity of this route (within 0.5 mile [0.8 kilometer]), particularly along Birdneck Road, have not reported captures of any federally listed species.



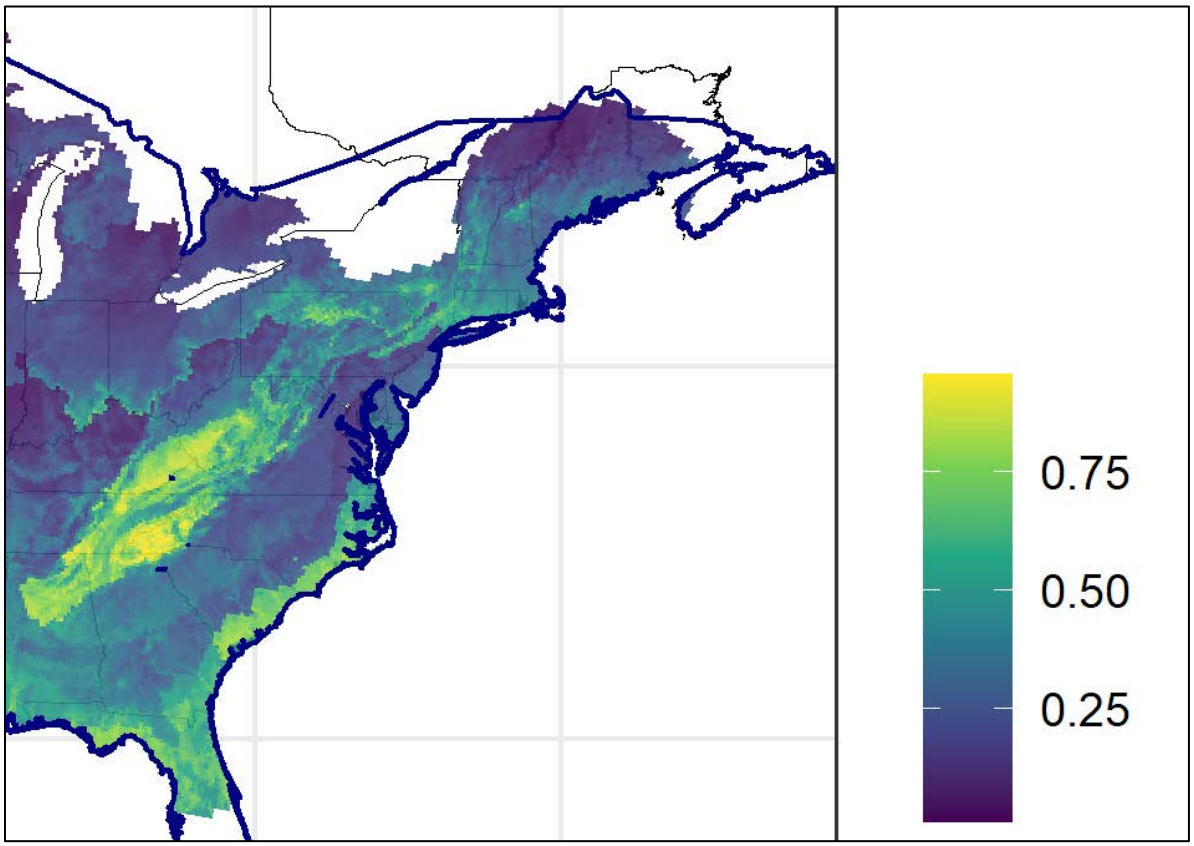
Source: USFWS 2021

Note: Point color and size corresponds to maximum number of Tricolored Bat observed at a hibernaculum.

Figure 4-5 All Known Hibernacula and Winter Abundances for Tricolored Bat in 2000

Recent acoustic studies have documented year-round use by both northern long-eared bats and Indiana bats in nearby areas (e.g., Great Dismal Swamp National Wildlife Refuge, Princess Anne Wildlife Management Area), suggesting the presence of non-hibernating, overwintering populations and highlighting the coastal plain as a potentially important refuge for several bat species, including the tricolored bat, affected by white-nose syndrome (De La Cruz and Ford 2018, 2020).

There is some correlative evidence from inland studies that bat mortality increases with tower height (Barclay et al. 2007; Georgiakakis et al. 2012). However, because the overall occurrence of bats (including listed species) on the OCS is low (COP, Appendix O-2, Dominion Energy 2021; Pelletier et al. 2013; Sjollema et al. 2014; BOEM 2015; Petersen 2016), the presence of tricolored bat in the onshore portion of the Action Area is anticipated to be minimal.



Source: NABat 2019

Figure 4-6 Tricolored Bat Mean Occupancy Probabilities Predicted in Each North American Bat Monitoring Program Grid Cell in the Eastern Portion of the Modeled Species Range for 2019

Because research on the movements of these bats in the marine environment is limited, there remains uncertainty as to whether this species travels offshore. If tricolored bats were to migrate over water, movements would likely be near the mainland. Stantec conducted acoustic surveys between 2009 and 2014 at coastal and offshore locations in the Gulf of Maine and mid-Atlantic and found tricolored bats were detected least frequently and only at approximately half of the survey locations (Stantec 2018). There are records of tricolored bat on Nantucket, Massachusetts (Dowling and O'Dell 2018), indicating that some individuals traveled over open water to the islands, but their occurrence over the ocean is rare. During the offshore construction of the Block Island Wind Farm, bats were monitored with acoustic detectors on boats; no tricolored bats were detected among the 1,546 bat passes (Stantec 2018). Preliminary results of the first year of post-construction monitoring at Block Island Wind Farm indicated low number of tricolored bat calls (33 out of 1,086 calls) (Stantec 2018). In addition, recent data from 3 years of post-construction monitoring around Block Island Wind Farm found relatively low numbers of bats present only during the fall (Stantec 2020); although 80 passes were labeled as tricolored bats, none had characteristics that were diagnostic of the species, and these were more likely to be eastern red bats

(Stantec 2020). Acoustic detectors on WTGs in the CVOW-Pilot Project off Virginia has not detected tricolored bat (Dominion Energy 2022b).

Collectively, this information indicates that tricolored bat could occur in the terrestrial components of the Action Area during non-hibernation periods, although presence would be extremely limited and in very small numbers. Any occurrence of tricolored bat in the offshore component of the Action Area would be very rare and in very small numbers.

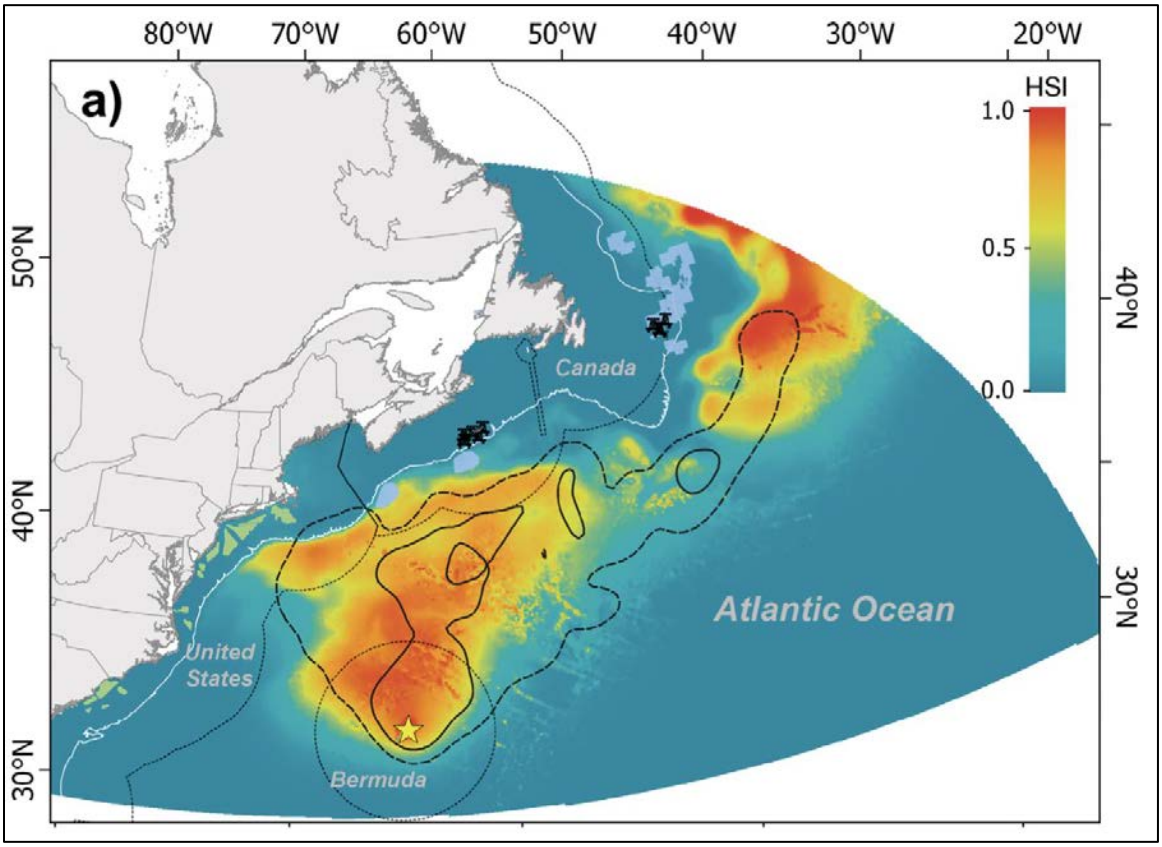
4.5. Bermuda Petrel

4.5.1 Species Description

The Bermuda petrel, also known as the Cahow, is a medium-sized pelagic seabird that is endemic to Bermuda, nesting on only six islands off southeastern Bermuda (Brinkley and Sutherland 2020). The species is believed to range widely throughout the central North Atlantic in waters deeper than 656 feet (200 meters) and only returns to land to breed (Brinkley and Sutherland 2020; Wingate 1973). The species was listed as Endangered under the ESA in 1970 (35 *FR* 8491). At the time of listing, only 24 nesting pairs were reported for the species (Brinkley and Sutherland 2020).

Egg-harvest and nest-predation as a result of human-introduced mammals during English colonization of Bermuda in the early 1600s decimated the Bermuda petrel population (Madeiros 2019). The species was presumed extinct by the 1620s, until a small remnant population of less than 20 breeding pairs was rediscovered in 1951 (Murphy and Mowbray 1951). More recently, reproductive failure as a result of anthropogenic organochlorine pesticides (e.g., DDT, later banned in 1972 in the United States) in the mid-20th century led to further population declines. The number of Bermuda petrel nesting pairs has increased from 18 in 1961, to 85 in 2008, to 131 in 2019 (Madeiros 2019; USFWS 2019a). The species is not listed by the VDWR (2022a) but is listed as Endangered under the IUCN Red List (IUCN 2022). No critical habitat exists for the Bermuda petrel in the Project area.

Their pelagic distribution is associated with the Gulf Stream's western frontal boundary and eddies that create local upwelling and mixing zones, which concentrate prey near the surface (Raine et al. 2021; USFWS 2019b). Bermuda petrel feed primarily on small squid; their diet also includes shrimp and, likely though to a lesser extent, small fish (Wingate 1972). Their breeding and non-breeding foraging range extends from deep, warm waters adjacent to Bermuda to the Gulf Stream North Wall, where warm subtropical waters interact with cold subpolar waters to create a persistent front associated with high productivity and prey convergence; they also occur near the Azores during the nonbreeding season (Raine et al. 2021; Brinkley and Sutherland 2020; Madeiros et al. 2014). Habitat suitability during chick rearing, as predicted by satellite telemetry data, is closely associated with proximity to Bermuda and the Gulf Stream North Wall (Figure 4-7; Raine et al. 2021).



Source: Raine et al. 2021.

Figure 4-7 Spatial Habitat Suitability Index (I) of Foraging Bermuda Petrels During Chick Rearing, Scaled from 0 (unsuitable) to 1 (highly suitable)

Current threats to the species include nest predation by invasive rats, human disturbance, light pollution, insufficient numbers of suitable nesting sites, nest-site competition with tropicbirds, and erosion, sea-level rise, and flooding related to hurricane activity and climate change (Madeiros 2019; USFWS 2019a).

Additional information about the Bermuda petrel can be found within the species' profile page on the USFWS' ECOS website (USFWS 2022a).

4.5.2 Bermuda Petrel in the Action Area

Although the Bermuda petrel's geographic range includes the Offshore Project area, the species is unlikely to be encountered during Project activities due to its preference for deep waters in association with the Gulf Stream seaward of the continental slope. There are confirmed sightings of the species off North Carolina and one record exists approximately 127 miles (204 kilometers) east of the Lease Area (eBird 2022). The Bermuda petrel was not detected during surveys in the vicinity of the Offshore Project area (COP Appendix O-1; Dominion Energy 2022) or during previous surveys (Research Activities Plan 2014; Williams et al. 2015). Telemetry data indicate low habitat suitability in the vicinity of the Project area (Raine et al. 2021). Given that the Bermuda petrel is extremely uncommon in waters landward of the Gulf Stream and continental shelf edge and no known observations of Bermuda petrel exist within the Action Area, the Proposed Action would have ***no effect*** on the species. As such, the Bermuda petrel is not further discussed in this document.

4.6. Black-capped Petrel

4.6.1 Species Description

The black-capped petrel (*Pterodroma hasitata*) is a medium-sized pelagic seabird that breeds in the Caribbean and travels to distant foraging areas in the western Atlantic and southern Caribbean Ocean basins (Jodice et al. 2015; USFWS 2018; Wheeler et al. 2021). The species is considered Proposed Threatened (83 *FR* 50560; USFWS 2022b). The species is not listed by the VDWR (2022a) but is listed as Endangered under the IUCN Red List (IUCN 2022). No critical habitat exists for the black-capped petrel in the Project area.

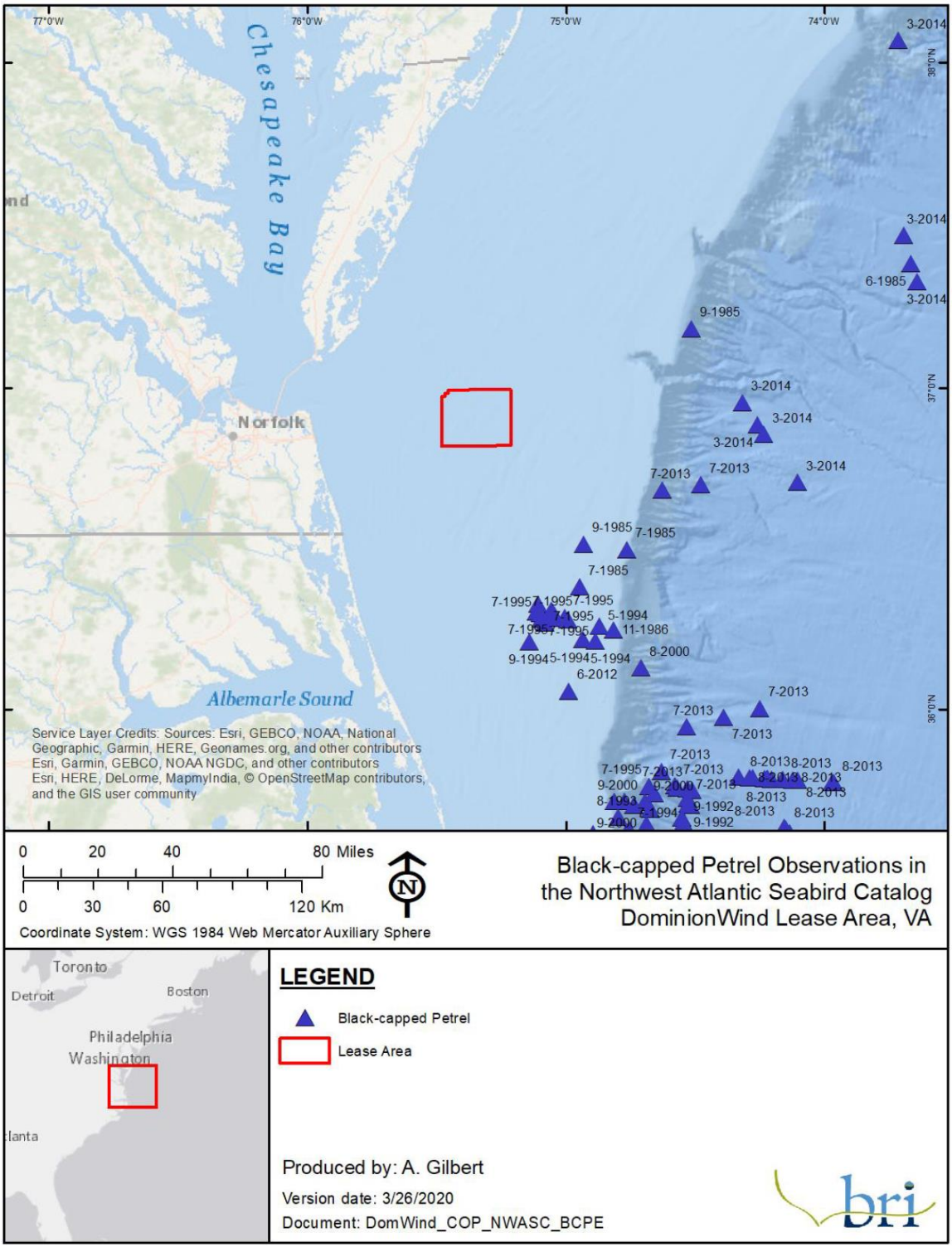
Black-capped petrels spend the majority of their lives over open seas, occurring in terrestrial habitats only to nest. From January to June, the species occupies nesting grounds in habitats characterized by steep mountainous terrain with a sparse and open understory, and decaying vegetation or loose soils to facilitate burrow excavation (Simons et al. 2013; Wingate 1964). All remaining breeding sites are currently located on one island (southwestern Hispaniola). From June through September, the species frequents the western edge of the Gulf Stream (Farnsworth 2020), showing a preference for deep waters (e.g., 0.1 to 1.2-mile [200 to 2,000-meter] depths) where seamounts, submarine ridges, and other landscape features bring prey items such as fish and squid to the surface (Hanley 1987; USFWS 2018; Simons et al. 2013). Strong and persistent upwelling at the shelf break off South Carolina and northern Georgia and off Cape Hatteras, North Carolina are where the greatest number of black-capped petrels are found; they are relatively scarce in shallower waters on the continental shelf (Figures 4-8a and 4-8b; Dominion 2022; Winship et al. 2018). They will track the western edge of the Gulf Stream in the mid-Atlantic, with peak abundances typically in the spring and again in the fall (Haney 1987).

The current size of the black-capped petrel population is estimated between 2,000 and 4,000 birds (Simons et al. 2013) of which perhaps 500 to 1,000 are breeding pairs (USFWS 2018). Recent data continue to indicate ongoing population declines (Wheeler et al. 2021). The most significant threat to the species is considered to be deforestation and agricultural expansion leading to habitat degradation and loss (USFWS 2018; Wheeler et al. 2021). Other threats include human disturbance, light pollution, marine fisheries, naturally-occurring and anthropogenic forest fires, and climate change (USFWS 2018).

Additional information about the black-capped petrel can be found within the species' profile page on the USFWS' ECOS website (USFWS 2022a).

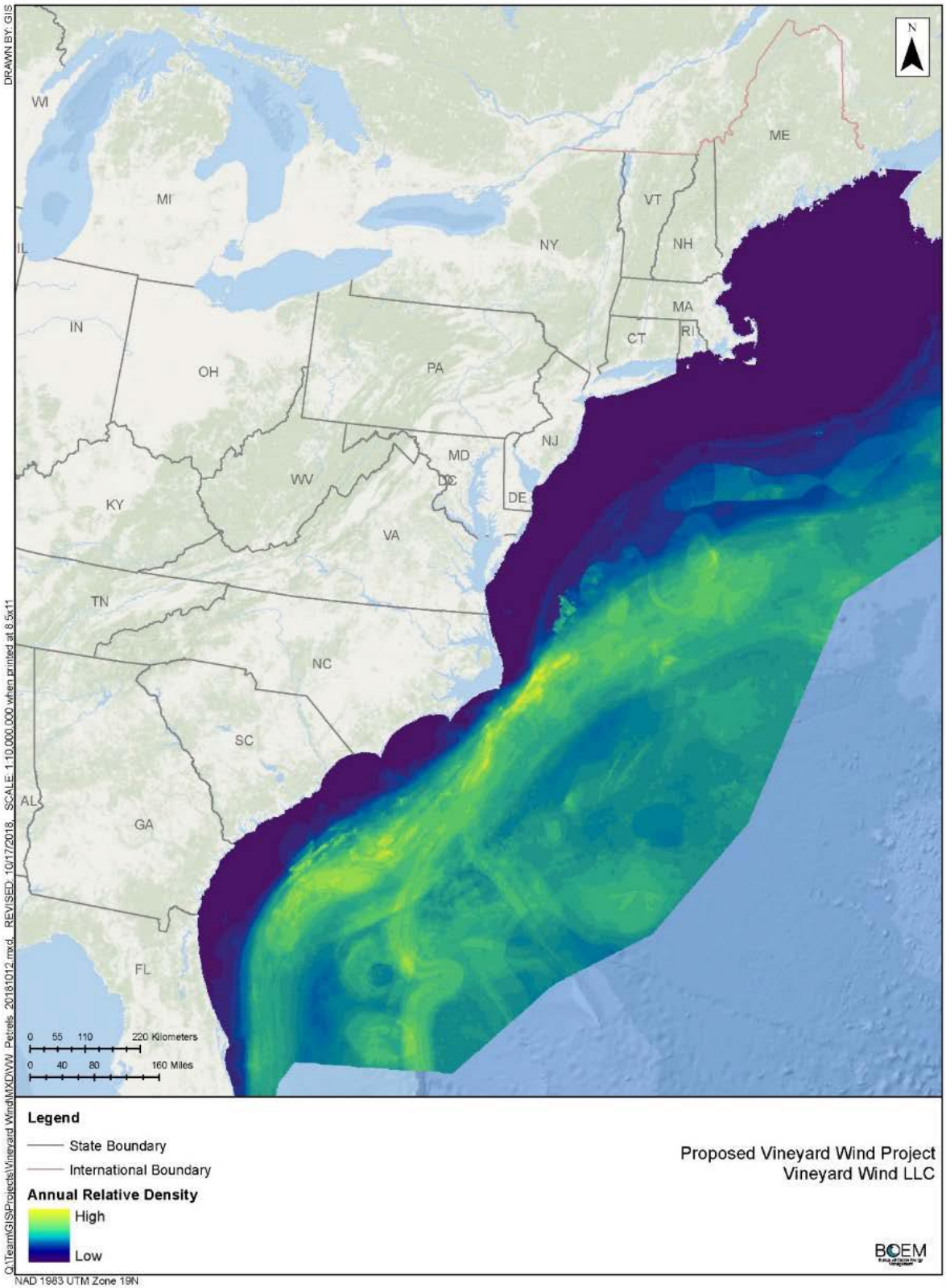
4.6.2 Black-capped Petrel in the Action Area

The black-capped petrel is unlikely to be encountered during Project activities due to its preference for deep waters in association with Gulf Stream frontal boundaries. The nearest confirmed sightings of the species are far to the southeast off North Carolina (Figure 4-8; COP Appendix O-1; Dominion Energy 2022). The black-capped petrel was not detected during surveys in the vicinity of the Offshore Project area (COP Appendix O-1; Dominion Energy 2022). Given that the black-capped petrel is not likely to occur in the Offshore Project area, BOEM anticipates that the Proposed Action ***may affect, but is not likely to adversely affect*** the black-capped petrel. Due to the habitat preferences of this species and absence of known occurrences within the Action Area, this BA does not discuss the black-capped petrel any further.



Source: COP Appendix O-1; Dominion Energy 2022.

Figure 4-8a Black-capped Petrel Observations in the Northwest Atlantic Seabird Catalog in the Vicinity of the Lease Area



Source: Winship et al. 2018; Curtice et al. 2018.

Figure 4-8b Modeled Predicted Relative Density of Black-capped Petrels

4.7. Piping Plover

4.7.1 Species Description

The piping plover is a small migratory shorebird that breeds along the Atlantic coast, the Great Lakes, and the Great Plains regions of the United States and winters in coastal habitats of the southeastern United States, coastal Gulf of Mexico, and the Caribbean (Elliot-Smith and Haig 2004; USFWS 1996, 2009). The USFWS listed the Atlantic coast breeding population as Threatened in 1986 (50 *FR* 50726). Critical habitat for wintering piping plovers has been designated along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (66 *FR* 36038). Only the Atlantic coast population has the potential to occur within the Action Area during the breeding season, as well as spring and fall migration.

The breeding range of the Atlantic coast population includes the Atlantic coast of North America from Canada to North Carolina. The piping plover breeding season extends from April through August, with piping plovers arriving at breeding locations in mid-March and into April. Post-breeding staging in preparation for migration extends from late July through September (USFWS 1996). Piping plover breeding habitat consists of generally undisturbed, sparsely vegetated, flat, sand dune–beach habitats such as coastal beaches, gently sloping foredunes, sandflats, and washover areas to which they are restricted (USFWS 1996, 2009). Nests sites are shallow, scraped depressions in a variety of substrates situated above the high-tide line (USFWS 1996). Piping plovers forage in the intertidal zone. Foraging habitat includes intertidal portions of ocean beaches, washover areas, mudflats, sandflats, as well as shorelines of coastal ponds, lagoons, and saltmarshes where they feed on beetles, crustaceans, fly larvae, marine worms, and mollusks (USFWS 1996).

Post-breeding staging in preparation for migration extends from late July through September, though most migrations southward are initiated before then end of August (USFWS 1996). While a large proportion of the piping plover population likely winter outside the U.S., there are coastal winter populations in Georgia, South Carolina, and North Carolina, but none have been reported Virginia and northward (Nicholls and Baldassarre 1990). Band resight analysis conducted by Gratto-Trevor et al. (2016) concluded that at least 32 percent of the wintering Atlantic coast breeding population winter in the Bahamas.

While the precise migratory pathways and stop over sites along the Atlantic coast and to the Bahamas are not well known, both spring and fall migration routes are believed to follow a narrow strip along the Atlantic coast; piping plover occurrence on the OCS is unlikely (Elliott-Smith and Haig 2020; Normandeau et al. 2011a; USFWS 1996; USFWS 2009; USFWS 2020b). Similar to other shorebirds, piping plovers either make nonstop long-distance migratory flights (Normandeau 2011a), or offshore migratory "hops" between coastal areas (Loring et al. 2021). Due to the difficulty in detecting piping plovers in the offshore environment during migration because of the assumed nocturnal and high-elevation migratory flights, there are no definitive observations of this species in offshore environments greater than 3 miles (4 kilometers) from the Atlantic coast (Normandeau et al. 2011a).

Coastal development, habitat degradation, habitat loss, and recreational disturbance by humans, dogs, and vehicles on sandy beaches and dune habitats are the primary anthropogenic threats to piping plovers (Elliott-Smith and Haig 2020; USFWS 2012; USFWS 2020b). Other threats to the species include contaminants, predation, severe weather, and climate change. Based on a recent review, habitat degradation and recreational disturbances appear to be increasing from 2012 to present, indicating that current conservation methods remain inadequate (USFWS 2020b). The piping plover is among 72 species (out of 177 species on the Atlantic OCS) that ranked moderate in its relative vulnerability to collision with wind turbines (Robinson Willmott et al. 2013). Despite these population pressures, there is little risk

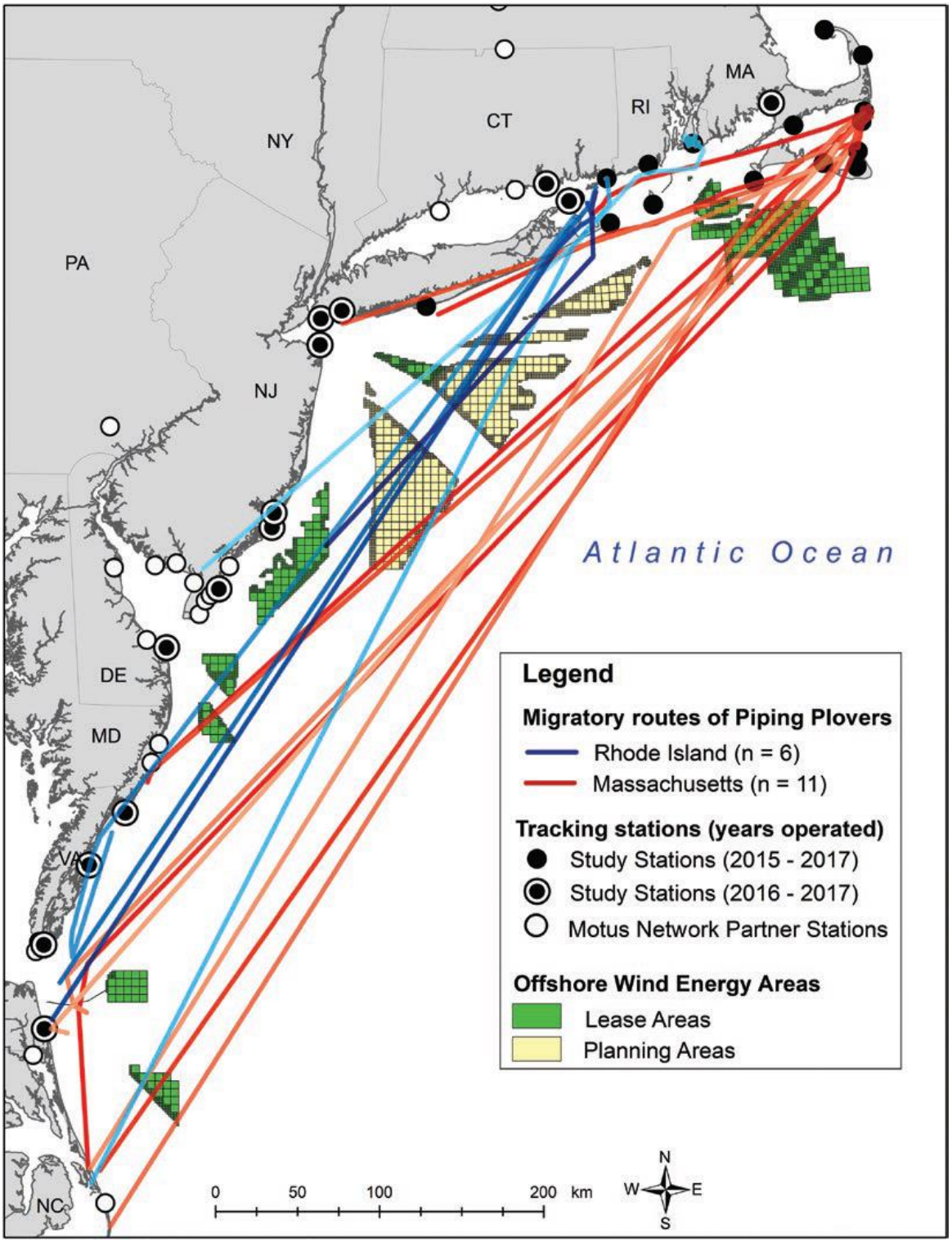
of near-term extinction of the Atlantic Coast population of piping plovers (Plissner and Haig, 2000). Since the time of its ESA listing in 1985, the overall Atlantic Coast piping plover population has increased 240 percent from a low of approximately 790 breeding pairs to an estimated 2,289 breeding pairs in 2021 (USFWS 2020b, 2020c, 2022c). However, only the New England recovery unit has reached and sustained abundance targets, with other recovery units (Eastern Canada, NY-NJ, and Southern) experiencing declines in the percentage of breeding pairs between 2008 and 2018 and remaining below revised recovery plan abundance objectives (USFWS 2020b).

There are an estimated 183 breeding piping plover pairs in Virginia in 2021, up from 89 pairs in 1999 (USFWS 2022c; VDWR 2022c). All piping plover breeding activity in Virginia since the late 1990s has occurred on the Eastern Shore's barrier islands, which offer ideal breeding and foraging habitat (VDWR 2022c). Many of the barrier islands that piping plovers are found on in Virginia are closed to the public during the breeding season or have instituted conservation methods aimed at reducing human disturbances to the breeding population (VDWR 2022c).

4.7.2 Piping Plover in the Action Area

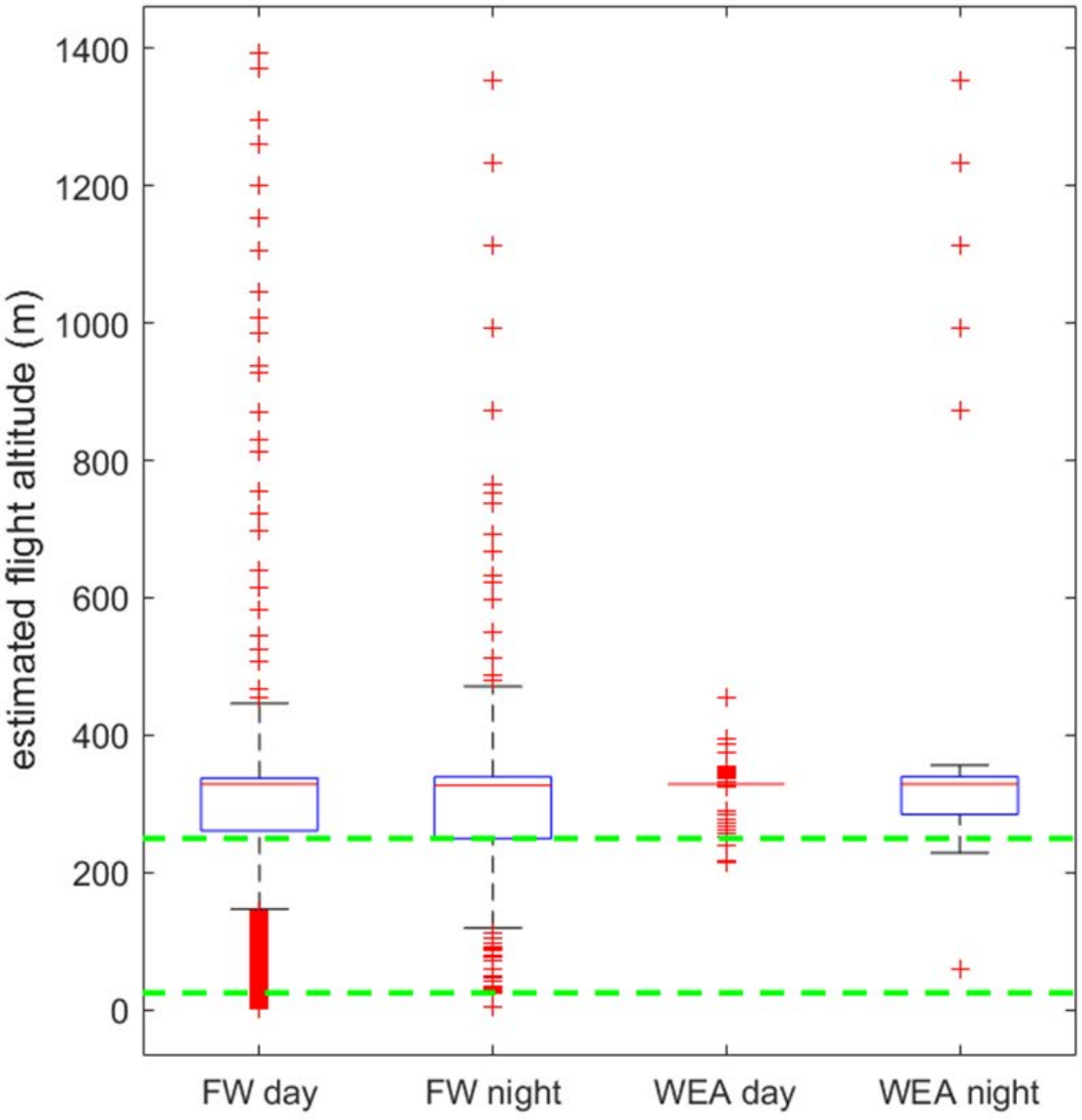
Since the Late 1990s, all of piping plover breeding activity in Virginia has occurred along the eastern shore among the barrier islands, which are a chain of uninhabited islands that extend from the Maryland border south to the Chesapeake Bay Bridge Tunnel (VDWR 2022c). Therefore, no nesting plover are expected near the Project area. There are records indicating that piping plovers use the area south of the Onshore Project area during pre- and post-breeding periods, particularly during spring migration (COP Appendix O-1; Dominion Energy 2022), and there is a total count of 77 piping plovers in the eBird database within 9 miles (15 kilometers) of potential Onshore Project activities (Table 4-7, COP Appendix O-1; Dominion Energy 2022). Importantly, the piping plover was not detected onshore (RAP 2014) or from previous efforts at Camp Pendleton (Wolf et al. 2013). Other than the occasional occurrence, plovers are expected to be absent from the onshore portion of project area.

There were no records in the Northwest Atlantic Seabird Catalog of piping plovers in the vicinity of the Lease Area (COP Appendix O-1; Dominion Energy 2022). Due to their proximity to shore during breeding, piping plover occurrence within the Offshore Project area, including the Lease Area, is limited to migration. The offshore component of the Action Area lies within the migratory corridor for plovers leaving nesting and staging grounds in New England in the fall, and a small percentage of adult and subadult migrant piping plovers may fly over the offshore component of the Action Area (Figure 4-9). Loring et al. (2019) found that 1.4 percent (1 out of 70) of the tagged plovers leaving breeding areas in Massachusetts and Rhode Island during fall migration flew close to the lease area off Virginia. In spring, plovers fitted with transmitters in the Bahamas traveled north close to shore and west of the Project (Appendix I in Loring et al. 2019). Most migratory flights were above the turbine height with 15.2 percent of the piping plover flights within the rotor-swept zone (RSZ) (Figure 4-10). The green-dashed-lines in Figure 4-10 represent the lower and upper limits of the rotor-swept zone (82–820 feet [25-250 meters]; Loring et al. 2019). For this Project, the RSZ is at minimum 82 to 869 feet (25 to 265 meters). Therefore, very little, if any, piping plover activity is expected, as relatively few would be flying through or over the Action Area during migration.



Source: Loring et al. 2020.

Figure 4-9 Modeled Migratory Routes of Tagged Piping Plovers from Breeding Areas in Rhode Island (n = 6) and Massachusetts (n = 11), Tracked Across a Broader Portion of the Mid-Atlantic Bight



Source: Loring et al. 2019.

Figure 4-10 Estimated Flight Altitude Ranges (meters) of Piping Plovers During Exposure to Federal Waters (altitude when crossing from state into federal waters) and Wind Energy Areas (altitude when flying day and night)

4.8. Rufa Red Knot

4.8.1 Species Description

The rufa red knot is a medium-sized member of the sandpiper family with one of the longest migrations in the world from its breeding grounds in the Canadian Arctic and wintering habitat along the southeastern Atlantic coast, the Gulf of Mexico and Caribbean, northern Brazil, and Tierra del Fuego at the southern tip of South America in Argentina and Chile (USFWS 2014a). In 2015, the USFWS listed the species as Threatened under the ESA (79 *FR* 73706) and proposed critical habitat for the rufa red knot in 2021 (86 *FR* 37410). Over the last 20 years, the Atlantic flyway subspecies (*Calidris canutus rufa*) has declined from an estimated 100,000–150,000 birds to 18,000–33,000 birds (Niles et al. 2010). The rufa red knot is composed of three distinct populations in Argentina/Chile (Southern), Northern Brazil, and the Southeast U.S./Caribbean and is defined by where they overwinter and their genetics (Verkuil et al. 2022). The best available population estimates in the wintering areas are 15,500 in the Southeast U.S./Caribbean, 31,000 in Northern Brazil and 11,600 in Argentina/Chile (see Table 6 in USFWS 2020e).

The primary threat to the rufa red knot population is the reduced availability of horseshoe crab (*Limulus polyphemus*) eggs in Delaware Bay arising from overharvesting of adult crabs in the late 1990s (Niles et al. 2008). Horseshoe crab eggs are an important dietary component during spring migration. Climate change is also a major threat because the timing of horseshoe crab eggs and other food resources (e.g., insect prey or mollusks) at stopover areas is a critical need during long migrations. Warming and acidifying coastal waters may cause shifts to their prey species' ranges or seasonal reproductive timing (USFWS 2020e). The rufa red knot is one of 72 species populations (out of 177 species on the Atlantic OCS) ranked "medium" in relative vulnerability to collision with offshore wind turbines (Robinson Willmott et al. 2013).

4.8.2 Rufa Red Knot in the Action Area

Critical habitat for the rufa red knot was proposed in 2021 (86 *FR* 37410) and includes portions of coastal Virginia; no critical habitat exists within the Action Area and the nearest proposed area is Unit VA–13 Smith Island, located approximately 21 miles (33 kilometers) north of the cable landfall location. The Virginia barrier islands represent a spring stopover area for the rufa red knot, whose seasonal presence extends from late April to mid-June (Watts and Truitt 2015) and then again during fall migration. The Project's cable landfall area is not a known staging area for red knots. It is possible that some rufa red knots may utilize the beach near the cable landing location during migration; however, it is not likely to be present in other Onshore Project areas.

The number of red knots passing through the Lease Area is not directly known but can be estimated based on what is known about the red knot overwintering populations, how they migrate in spring from nanotag telemetry studies, and how they migrate in fall from telemetry studies using nanotags (Loring et al. 2020) and Global Positioning Systems (GPS) (Feigin et al. 2022; BRI and Wildlife Restoration Partners 2022). In spring, short-distance migrants that overwintered in the Southeast U.S. are joined by others from the Caribbean to travel northward to Delaware Bay. Some birds may take an inland route while others will travel up the coast. After stopping in Delaware Bay, most will travel inland to breeding areas in Canada while some may continue to travel up the coast before turning west to head to breeding areas; these birds are not likely to cross the Lease Area during spring migration. After breeding, these birds fly back to stage on Atlantic coast beaches, working their way south down to their overwintering grounds. Red knots that are staging south of Delaware may continue to fly south near the coast or depart to the Caribbean. None of the birds from the Southeast U.S./Caribbean wintering population are likely to cross the Lease Area during spring, and it is unlikely that birds will cross the Lease Area during fall migration.

In spring, a total of 42,600 red knots from the South American wintering populations follow similar routes as the Southeast U.S./Caribbean birds but with some notable exceptions. Birds overwintering in the southern part of South America (Southern) travel northward and are joined by others from Northern Brazil. Birds from both populations then fly offshore heading to North America. Most red knots fitted with nanotags at Bahia Lomas, Chile (83.3 percent, 10 out of 12, Table 4-2) first made landfall south of Cape May, New Jersey, and none made first landfall near the project area. However, as a large percentage (83.3 percent; 10 out of 12) of South American birds made first landfall along a migration front spanning from Key West to Cape May (1,284 miles [2,067 kilometers]), it is possible that some birds were missed and flew over the Lease Area. The proposed wind farm overlaps with 12 miles (19 kilometers) (0.9 percent) of the migration front. Based on this information, the number of birds potentially passing through the wind farm can be calculated by multiplying the total long-distant migrant population size (42,600 birds) times the proportion of tracked birds making landfall between Key West and Cape May (0.833) times the proportion of the migration front that overlaps with the wind farm (0.009). A total of 319 birds could pass through the wind farm in spring (42,600 total birds × 0.833 proportion of birds making landfall between Cape May and Key West × 0.009 proportion of migration front by lease).

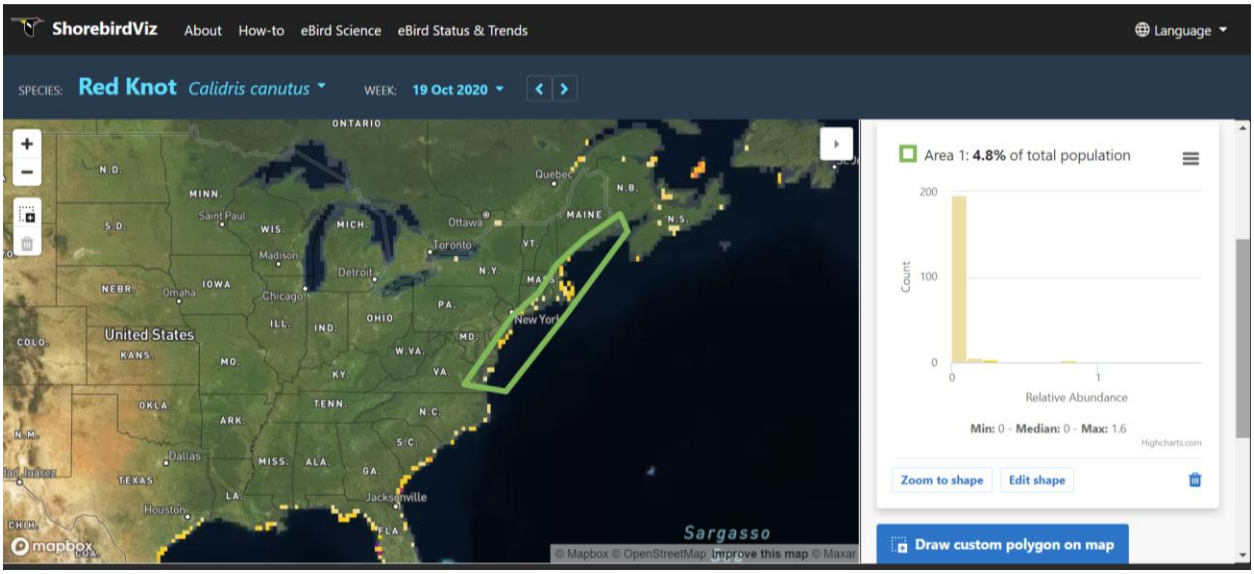
The southbound migration period is generally July through October but may extend as late as November for some individuals (Loring et al. 2018). In fall, red knots leave their breeding grounds in Canada to return to their overwintering grounds. Birds from the Southeast U.S. and Caribbean population reach the Atlantic coast and work their way south along the coast to the Southeast U.S. to remain or fly and overwinter in the Caribbean. In contrast, birds from the Southern and Northern Brazil populations migrate offshore to their overwintering grounds. The largest staging ground is along the Mingan Archipelago Quebec, Canada, where 9,450 birds use the area (Lyons et al. 2018). A recent telemetry study found that 97 percent (out 244 tagged birds) departed directly to South America on long-distance migratory routes that would take them beyond U.S. federal waters (Loring et al. 2018). Thus, out of the 58,100 red knots on the Atlantic, approximately 48,650 (58,100 - 9,450) depart to overwintering locations in South America from other locations on the Atlantic coast or work their way down the Atlantic coast (e.g., from staging areas in Cape Cod, New Jersey, and Virginia being considered for critical habitat by USFWS) and are among the Southeast U.S./Caribbean birds. The maximum weekly percent of the red knot population is present during fall on the shore spanning from Maine to the Virginia and North Carolina border is 4.8 (Figure 4-11) or 2,335 (48,650 number of birds on the Atlantic coast × 0.048 proportion of population stagging from Maine through Virginia). The modeled flight paths from various studies using the motus network suggest that some birds (3 out of 146) may pass through the area (Figure 4-12). Results from a telemetry study in New Jersey appear to support this observation where 2 out of the 40 red knots fitted with GPS tags were tracked passing through the Lease Area (Feigin et al. 2022). Another study in New Jersey reported similar results where 2 out of 17 red knots fitted with GPS tags also may have passed through the CVOW-C lease area; both birds appear to be flying below the RSZ (BRI and Wildlife Restoration Partners 2022). Combining the results of these studies, 7 percent of the tracked birds may have passed though the Lease Area. A total of 490 birds could pass through the wind farm in the fall (48,650 number of birds on the Atlantic coast × 0.048 proportion of population stagging from Maine through Virginia × 3-month fall migration period × 0.07 average proportion of tracked birds potentially passing through the Lease Area).

Table 4-2 Spring Migration Landfall Sites of Nano-Tagged Red Knots from the Bahia Loma Shorebird Project in South America

Tag ID	Landfall Date	Location
20914	5/05/19	South Carolina
20908	5/18/19	South Carolina
20866	5/17/19	South Carolina
20878	5/22/19	South Carolina

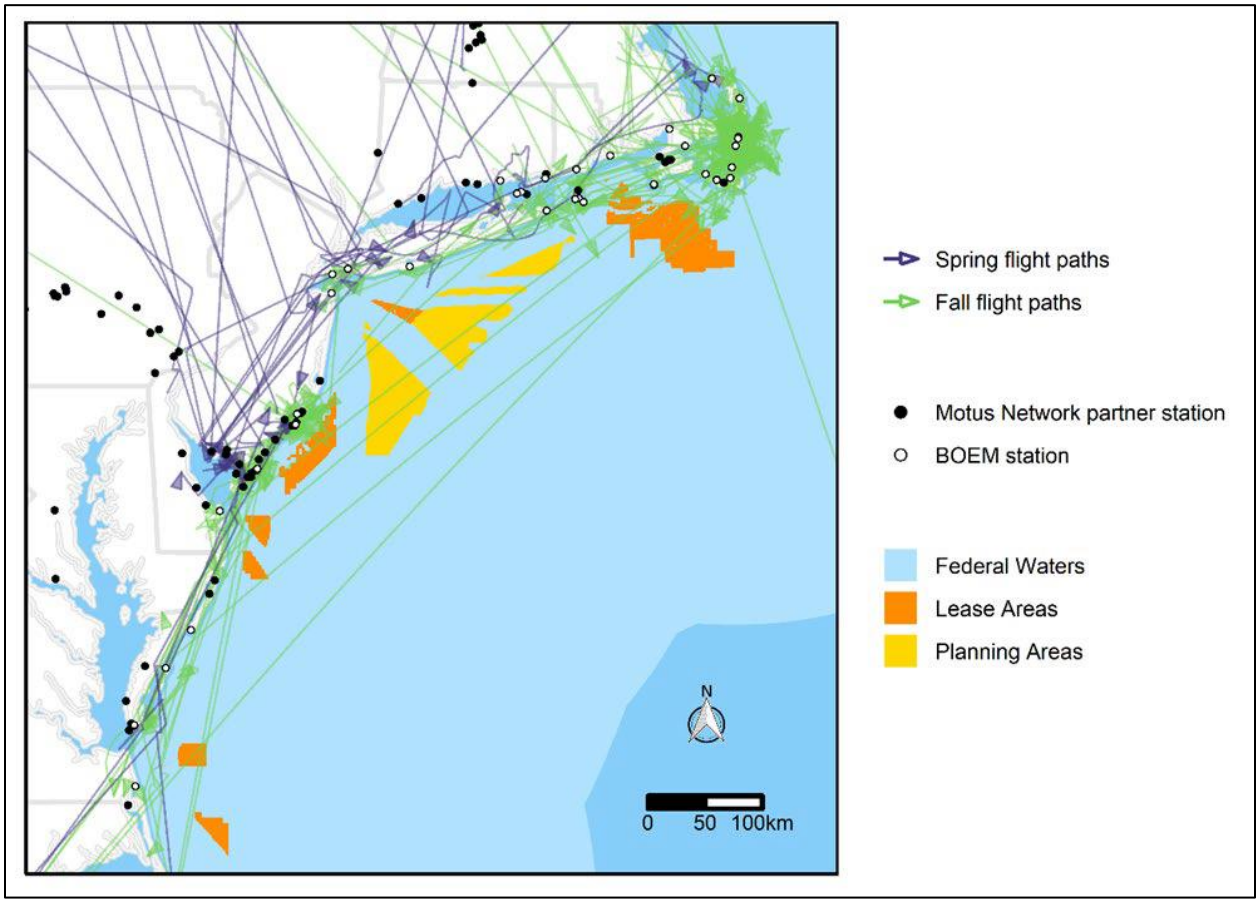
Tag ID	Landfall Date	Location
20953	5/18/19	South Carolina
20948	5/19/19	North Carolina
20959	5/23/19	Maryland
15656	5/18/18	Delaware Bay
20883	5/22/19	Cape May, NJ
20912	5/15/19	Cape May, NJ
15651	5/29/18	Pennsylvania
20958	5/23/19	Long Island, NY

Source: Mackenzie et al. 2017.
Additional information on the Bahia Loma Shorebird Project can be found at https://motus.org/data/project?id=174.



Source: Fink et al. 2021.
Screen Shot is from Shorebirdviz and shows the estimated percent of the population in the polygon during the week of October 19, 2020

Figure 4-11 Red Knot Staging Areas



Source: Loring et al. 2020

Figure 4-12 Modeled Flight Paths of Red Knots Crossing the Study Area During Spring Migration (*n* = 31) and Fall Migration (*n* = 146) from 2014 to 2017

4.9. Roseate Tern

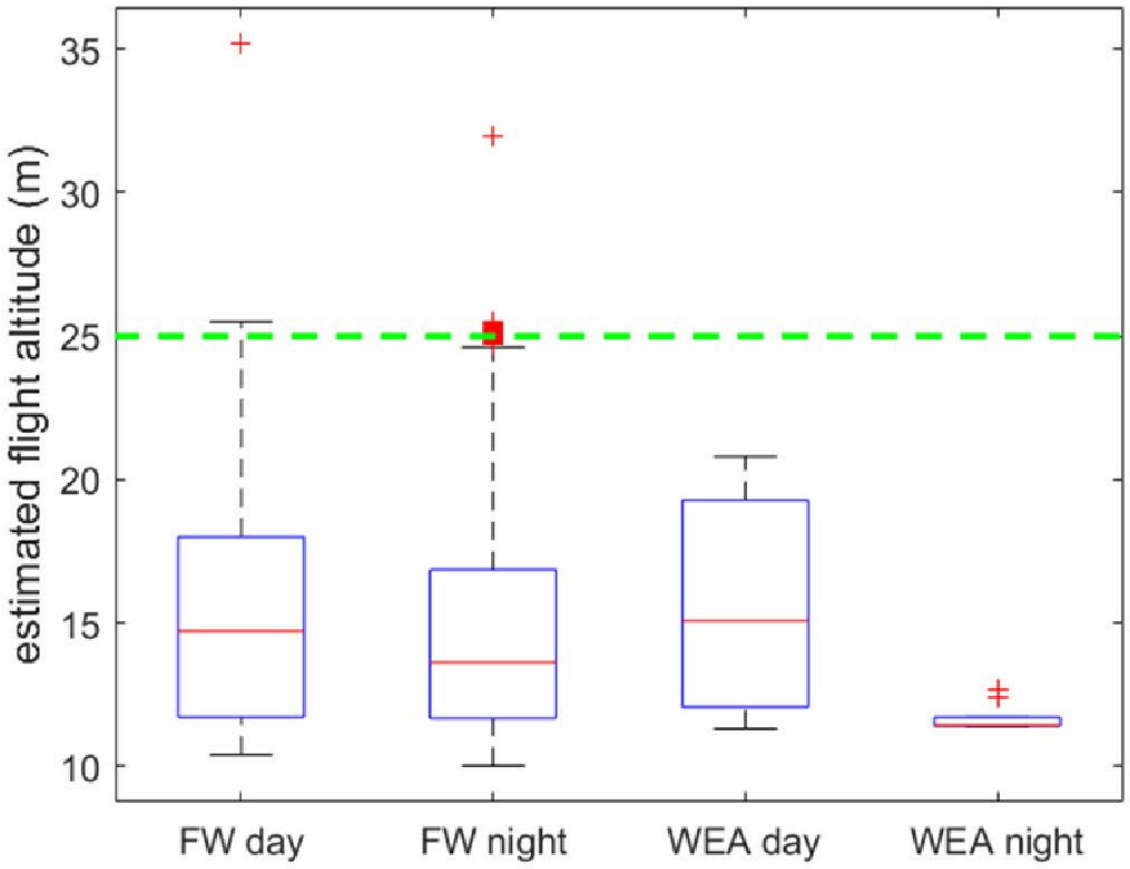
4.9.1 Species Description

The roseate tern is a small colonial tern, with Atlantic and Caribbean discrete population segments that breed from Long Island, New York, north and east to Quebec and Nova Scotia and the eastern and western Caribbean Sea, respectively, and winter along the northeastern coast of South America (USFWS 1998; USFWS 2010). Roseate terns in the northwestern Atlantic population are listed under the ESA as Endangered, while terns in the Caribbean population are listed as Threatened (USFWS 2010). No critical habitat has been designated for this species (52 *FR* 42064 [November 2, 1987]). The roseate tern is one among 61 species (out of 177 on the Atlantic OCS) that ranked high in its relative vulnerability to collision with wind turbines (Robinson Willmott et al. 2013). This high ranking is partially driven by the amount of time the species spends foraging on the ocean, and if time on the ocean was restricted to migration the population would be ranked medium. The historical population size in northeastern North America was estimated at a maximum of 8,500 breeding pairs in the 1930s (Gochfeld and Burger 2020). The most current range-wide estimate is 4,374 breeding pairs in 2019 in Canada and the United States (USFWS 2020e).

The Northeast roseate tern population breeds on small islands or on sand dunes at the ends of barrier beaches along the Atlantic coast, occurring in mixed colonies with common terns (*Sterna hirundo*). The species nests on the ground in dense colonies that can consist of hundreds to thousands of birds. The population is currently restricted to a small number of colonies on predator-free islands from Nova Scotia to Long Island, New York, with over 90 percent of remaining individuals breeding at just three colony locations (Bird Island and Ram Island in Buzzards Bay, Massachusetts, and Great Gull Island in Long Island Sound, New York) (Loring et al. 2019; Gochfeld and Burger 2020; USFWS 2020e). Historically, the Northeast roseate tern population was known to breed as far south as Virginia, but the species currently does not breed south of Long Island, New York (USFWS 1998).

Roseate tern foraging behavior and ecology are well described. Roseate terns dive less than 1.6 feet (0.5 meters) into the water to forage primarily for the inshore sand lance (*Ammodytes americanus*) in shallow, warmer waters near shoals, inlets, and rip currents close to shore (Safina 1990; Heinemann 1992; Rock et al. 2007). Roseate tern foraging flights are slow and range from 3 to 12 meters (10–39 feet) above the ocean surface.

Roseate terns appear to migrate well offshore (Burger et al. 2011; Mostello et al. 2014; Gochfeld and Burger 2020). Roseate terns generally migrate far offshore through the mid-Atlantic region and arrive at their northwest Atlantic breeding colonies in late April to late May, with nesting occurring between mid-May and late July. Given that roseate terns migrate mainly offshore during spring and fall (Nisbet et al. 2014), it is possible that some birds pass through the Lease Area during migration. However, none of the 145 roseate terns that were fitted with radio transmitters were tracked flying over the Lease Area during breeding and non-breeding dispersal periods by the network of tracking stations, which was also used to track piping plovers (Figure 4-9) and red knots (Figure 4-12) in Loring et al. (2019). The same telemetry study also found that terns flew offshore when visibility was greater than 3.1 miles and departed fall staging areas and consistently flew at low altitudes below the rotor swept area near the turbines in the Block Island Wind Farm (Figure 4-13).



m = meters; FW = federal waters; RSA = rotor swept area; WEA = wind energy area
The green-dashed line represents the lower limit of the RSA: 25 meters (82 feet) (Loring et al. 2019). Note that the lower limit for the proposed Project is 25 or 33 meters (82 or 108 feet).

Figure 4-13 Model-Estimated Flight Altitude Ranges of Roseate Terns During Exposure to Federal Waters and Atlantic Outer Continental Shelf Wind Energy Areas

4.9.2 Roseate Terns in the Action Area

Roseate terns have not bred in Virginia since the 1930s (Bales 1920; Gochfeld and Burger 2020); therefore, breeding roseate terns are not expected to be present during the spring and early summer months. Also, roseate terns overwinter in South America, and therefore are not expected to be present during the winter months. It is possible that some may utilize the beach near the cable landing location during the migration period; however, they are not likely to be present in other Onshore Project areas.

Despite intensive surveys in the region over the years and across seasons for marine birds (Figure 4-14), no roseate terns were detected in the Lease Area or in the proposed Offshore Project area (Figure 4-15). Modeling efforts based on those survey data predict that roseate terns are virtually absent from the Offshore Project area (Figure 4-16). This prediction is based on a statistical model that used 354 roseate tern sightings from many scientific surveys throughout the Atlantic OCS during the spring, summer, and fall months (Winship et al. 2018). The modeling effort only used roseate terns (i.e., terns that were not identified as roseates were excluded from the analysis) and are based on the relationship between roseate terns and surface chlorophyll *a*, distance from shore, turbidity, and other factors (Winship et al. 2018). Further, none of the 145 tracked roseate terns during post-breeding period crossed the Lease Area (Loring et al. 2019; in contrast to piping plovers that were also tracked in the same study [Figure 4-9]). Therefore,

given that roseate terns do not breed in Virginia and most terns in migration appear to be well offshore, any occurrence of roseate terns near onshore and offshore portions of the Project area is likely to be incidental.

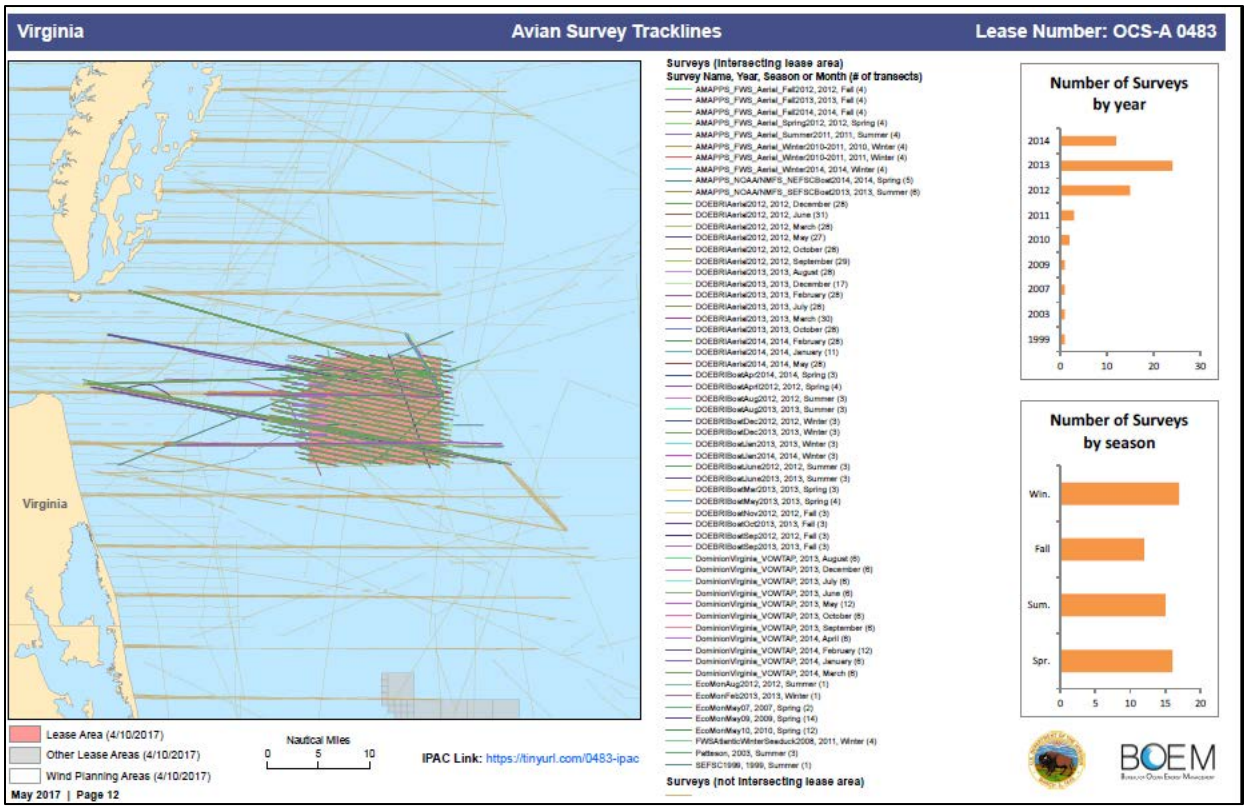
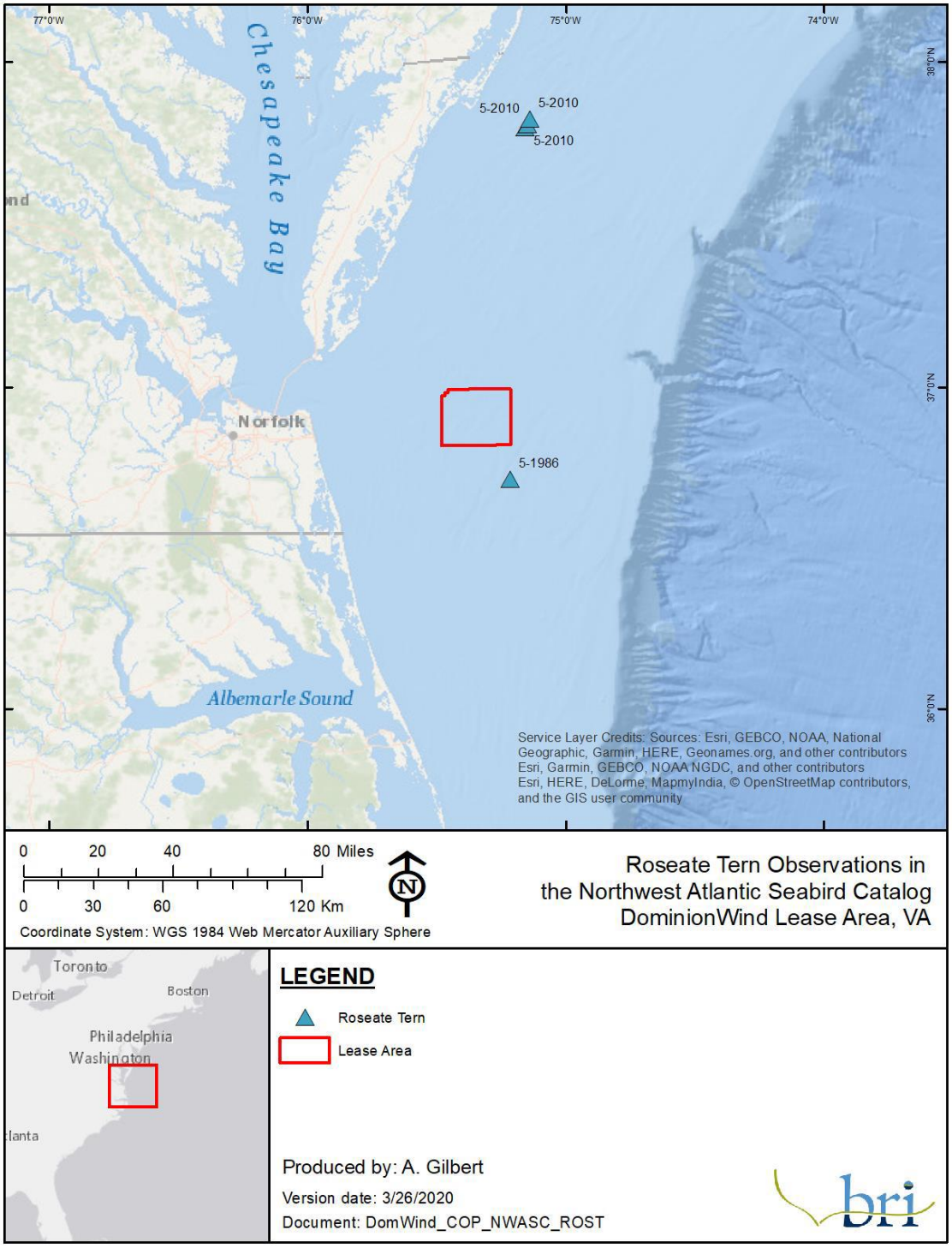
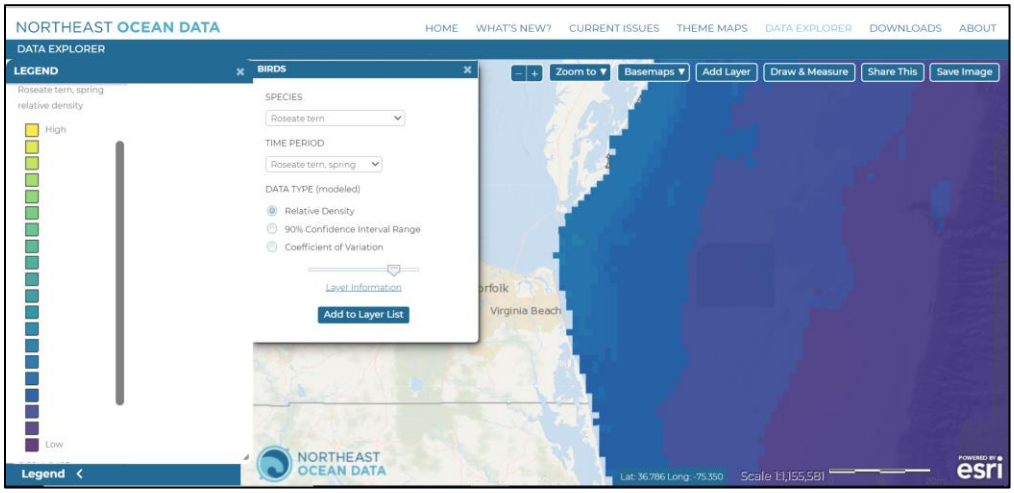


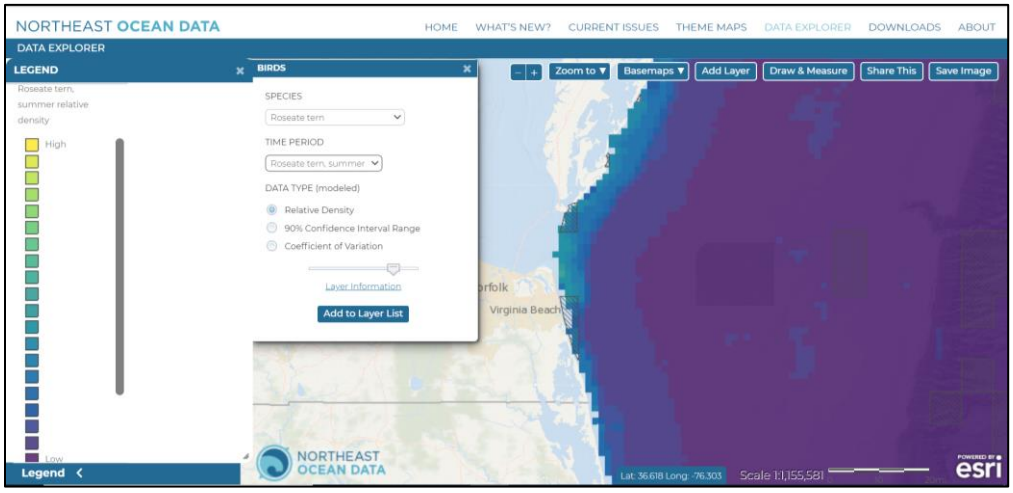
Figure 4-14 Avian Surveys Intersecting the Wind Development Area

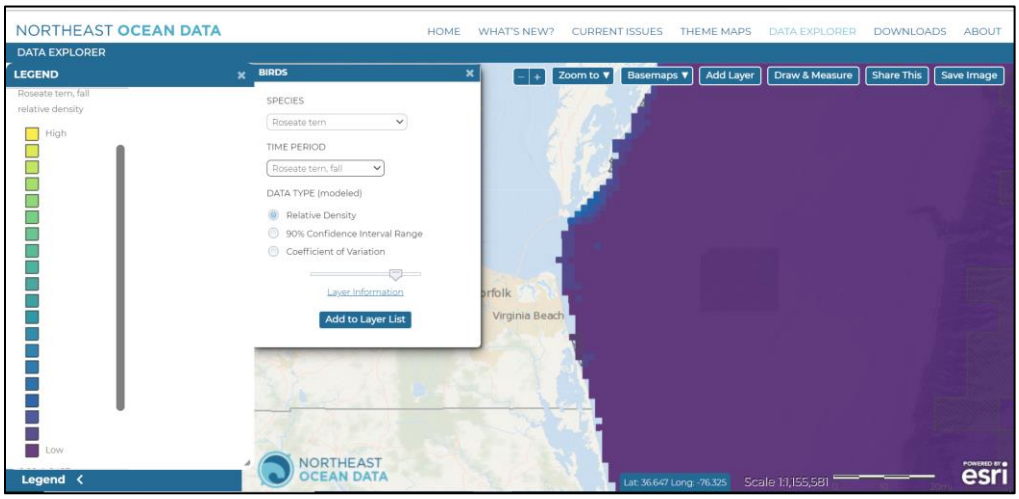


Source: COP Appendix O-1, Dominion Energy 2022

Figure 4-15 Roseate Tern Observations in the Northwest Atlantic Seabird Catalog in the Vicinity of the Lease Area







Source: Winship et al. 2018; Curtice et al. 2018

Figure 4-16 Predicted Relative Density of Roseate Terns During Spring (March–May), Summer (June–August), and Fall (September–November)

4.10. Monarch Butterfly

4.10.1 Species Description

The monarch butterfly (*Danaus plexippus*) occurs throughout the United States during the spring, summer, fall and is a Candidate species for federal listing (79 *FR* 78775). Candidate species are not required to be analyzed for Section 7 consultation, but the monarch butterfly is evaluated here to streamline consultation should this species become listed in the future. Monarch butterfly populations east of the Rocky Mountains, which is the largest of all populations, have declined by 88 percent from 1996 to 2020 and are facing declining overall health (USFWS 2020f). USFWS (2020f) estimated the Eastern North American population's probability of extinction in 60 years under current conditions ranges from 48 to 69 percent. The USFWS determined in 2020 that listing the monarch butterfly as an endangered or threatened species is warranted but precluded by higher priority actions (85 *FR* 81813). The species is listed as a Species of Greatest Conservation Need by the VDWR (2022a) and Endangered under the IUCN Red List (IUCN 2022). Because the monarch butterfly is not currently listed under the ESA, no critical habitat is designated for the species.

East of the Rocky Mountains, most monarch butterflies migrate north in successive generations from overwintering areas in central Mexico to as far north as southern Canada (USFWS 2020f). As monarch butterflies migrate north, they mate, deposit their eggs, and die. Monarch butterflies require a variety of blooming nectar resources throughout their migration and while on breeding grounds; milkweed is required for egg deposits and subsequent larval feeding. Successful migrations and breeding are succinctly linked with the availability of nectar plants and milkweed; a mismatch in timing of both plants and the monarchs is critical for the species' survival (USFWS 2020f).

Threats identified in the petition to list monarch butterflies include loss and degradation of habitat and loss of milkweed resulting from herbicide application, conversion of grasslands to cropland, loss to development and aggressive roadside management, loss of winter habitats from logging, forest disease, pesticides and contaminants, and climate change (Wilcox et al. 2019; USFWS 2020f). The reduced availability, spatial distribution, and quality of milkweed and nectar plants associated with breeding and use of insecticides are most responsible for their decline (85 *FR* 81813).

Additional information about the monarch butterfly can be found within the species profile page on the USFWS' ECOS website (USFWS 2022a).

4.10.2 Monarch Butterfly in the Action Area

Monarch butterflies arrive in the Mid-Atlantic region, including Virginia, in the spring and remain through the fall. Suitable habitat, which includes anywhere that milkweed and an abundance of native nectar plants occur, is present within the onshore portion of the Action Area. Large numbers pass through the region during their southward migration; monarch butterflies rest and refuel at stopover sites such as Chincoteague National Wildlife Refuge, located on Assateague Island, which is a barrier island on the Delmarva Peninsula located approximately 82 miles (132 kilometers) northeast of Virginia Beach. Average daily census counts at Chincoteague National Wildlife Refuge from 1997 to 2004 ranged from 0 to 932 monarch butterflies counted per hour, with an overall average of 88 monarchs per hour, though fluctuations from year to year are evident (Gibbs et al. 2006). Monarchs also utilize Kiptopeke State Park, on the Eastern Shore of Virginia National Wildlife Refuge (located approximately 21 miles [34 kilometers] north of Virginia Beach) and Fisherman Island National Wildlife Refuge (located approximately 16 miles [26 kilometers] northeast of Virginia Beach) as stopover sites during fall migrations (Brindza et al. 2008). Given that migrating monarchs may follow the coastline southward, the species is therefore expected to pass through the Action Area during fall migrations.

4.11. Loggerhead Sea Turtle

4.11.1 Species Description

The loggerhead sea turtle (*Caretta caretta*) is a large, globally occurring sea turtle found in subtropical and temperate waters in habitats ranging from coastal estuaries, bays, and lagoons to pelagic waters. There are nine listed distinct population segments (DPSs) for loggerhead sea turtles. The Northwest Atlantic Ocean DPS, which occurs in the Project area, was listed as Threatened in 2011 (NMFS 2022a). The global population is listed as Vulnerable under the Red List (IUCN 2022). The species is also listed as Threatened by the VDWR (2022a). Major threats to this population include loss of nesting and foraging habitat, nest predation, marine pollution, vessel strikes, disease, and fisheries bycatch (USFWS 2022d). In 2014, NMFS designated critical habitat for the Northwest Atlantic Ocean DPS in multiple locations along the U.S. East Coast and in the Gulf of Mexico. These areas include *Sargassum* spp. habitat, nearshore reproductive habitat, overwintering areas, breeding habitat, and migratory corridors located between North Carolina and Florida in the Atlantic Ocean (79 *FR* 39855). No designated critical habitat exists in the Action Area.

Loggerhead sea turtles mate from late April through early September. Individual females might nest several times within one season and usually nest at intervals of every 2 to 3 years. For their first 7 to 12 years of life, loggerhead sea turtles inhabit pelagic waters near the North Atlantic Gyre and are called pelagic immatures. When loggerhead sea turtles reach 16- to 24-inch (40- to 60-centimeter) straight-line carapace length, they begin recruiting to coastal inshore and nearshore waters of the continental shelf through the U.S. Atlantic and Gulf of Mexico and are referred to as benthic immatures. Benthic immature loggerheads have been found in waters from Cape Cod, Massachusetts, to southern Texas. Loggerhead sea turtles forage off the Northeastern U.S. and migrate south in the fall as temperatures drop. Most recent estimates indicate that the benthic immature stage ranges from ages 14 to 32 years; they reach sexual maturity at approximately 20 to 38 years of age. Prey species for omnivorous juveniles include crab, mollusks, jellyfish, and vegetation at or near the surface. Coastal subadults and adults feed on benthic invertebrates, including mollusks and decapod crustaceans (Turtle Expert Working Group [TWEG] 2009).

Loggerheads are the most common sea turtle found in Virginia waters and pass through the region enroute to northern summer foraging areas and southern overwintering grounds (Hawkes et al. 2007; Barco and Lockhart 2016; Swingle et al. 2016, 2017, 2018; Costidis et al. 2019). They begin appearing in mid-May when surface water temperatures approach 60°F (20°C). Loggerheads nest on Virginia's ocean-facing beaches between June and August, with an average of 5 to 15 nests observed annually (Barco and Swingle 2014). Juveniles use Virginia estuaries, bays, and sounds as developmental feeding habitat during summer months, and exhibit site fidelity, often returning to the same seasonal foraging areas in consecutive years (Barco and Swingle 2014). They typically leave Virginia waters when temperatures fall below 65°F (18°C), usually in October (Barco and Swingle 2014). Strandings have remained consistent in the past decade, with an average of between 125 and 165 annual strandings (Barco and Lockhart 2016; Swingle et al. 2016, 2017, 2018; Costidis et al. 2019).

4.11.2 Loggerhead Sea Turtles in the Action Area

Virginia is considered the northern limit of loggerhead nesting in the United States. Although the loggerhead sea turtle occasionally nests on ocean-facing Virginia beaches from early June through August, Virginia was not included in the designation of Critical Habitat for the Northwest Atlantic Ocean Distinct Population Segment of the Loggerhead Sea Turtle based on the very low number of nests known to be created—less than 10 annually from 2002 to 2011 (79 *FR* 39756). Of the 156 records of sea turtle nests on Virginia beaches from 1970 to 2013, almost all (154) were loggerhead sea turtles (Boettcher

2014). In the county of Virginia Beach, the overwhelming majority of sea turtle nests were found on or near the Back Bay National Wildlife Refuge (Boettcher 2014). There is a likelihood of loggerhead sea turtles in the Action Area and a potential for this species to nest on beaches in Virginia, including near the offshore export cable landfall site. Data obtained from VDWR for the period of 1998 through 2021 indicates one confirmed loggerhead turtle nest, and three relocated loggerhead turtle nests within 2-miles of the offshore export cable landfall site (Boettcher 2022; Figure 4-9). The confirmed turtle nest location was documented at the State Military Reserve Beach in 2020 while the three relocated nest locations were documented in 2015, 2018 and 2021 at Croatan beach (2015) and the Dam Neck Naval Base (2018 and 2021).

4.12. Green Sea Turtle

4.12.1 Species Description

Green sea turtles (*Chelonia mydas*) have a worldwide distribution and can be found in both tropical and subtropical waters (NMFS and USFWS 1991; NatureServe 2022). In the Western North Atlantic Ocean, they can be found from Massachusetts to Texas as well as in waters off Puerto Rico and the U.S. Virgin Islands (NMFS and USFWS 1991). Green sea turtles are divided into 11 DPSs with varying ESA statuses. The North Atlantic DPS, which is likely to occur in the Project area, was listed as Threatened in 1978 (NMFS 2022b). The global population is listed as Endangered under the IUCN Red List (IUCN 2022). The species is also listed as Threatened by the VDWR (2022a). Worldwide, green sea turtle populations have declined due to past harvesting for eggs and meat (USFWS 2022e). Currently, major risks to green sea turtles include loss of nesting and foraging habitat, nest predation, marine pollution, vessel strikes, and anthropogenic activity such as offshore dredging or fishing (USFWS 2022e). Critical habitat was designated by NMFS for the green sea turtles in 1998 in the coastal waters of Culebra Island, Puerto Rico, and its outlying Keys (USFWS 2022e). There is no designated critical habitat for green sea turtles in the Action Area.

Depending on the life stage, green sea turtles inhabit high-energy oceanic beaches, convergence zones in pelagic habitats, and benthic feeding grounds in shallow protected waters (NMFS and USFWS 1991). Green sea turtles are known to make long-distance migrations between their nesting and feeding grounds. Hatchlings occupy pelagic habitats and are omnivorous. Juvenile foraging habitats include coral reefs, emergent rocky bottoms, *Sargassum* spp. mats, lagoons, and bays (USFWS 2022e). Once mature, green sea turtles leave pelagic habitats and enter benthic foraging grounds, primarily feeding on seagrasses and algae (Bjorndal 1997). In the U.S., green sea turtles nest in North Carolina, South Carolina, Georgia, Florida, the U.S. Virgin Islands, and Puerto Rico (USFWS 2022e). Nesting seasons vary by region. On average, individual females nest every 2 to 4 years, laying an average of 3.3 nests per season at approximately 13-day intervals. The average clutch size is approximately 136 eggs and incubation ranges from 45 to 75 days (USFWS 2022e).

4.12.2 Green Sea Turtles in the Action Area

In Virginia, green sea turtles occur from spring through fall and are least common during the winter; their presence peaks during summer months when juveniles reside in summer developmental foraging habitats (Navy 2008). Since 2010, with the exception of 2015, green sea turtles have typically averaged 11 strandings per year (Barco and Lockhart 2016; Swingle et al. 2016, 2017, 2018; Costidis et al. 2019). In 2015, a fall mortality event of unknown origin resulted in 69 green turtle strandings (Swingle et al. 2016). Strandings reflect higher occurrences of juveniles than of adults and typically begin occurring in July (Barco and Lockhart 2016; Swingle et al. 2016, 2017, 2018; Costidis et al. 2019). Though Florida is near the northern extent of the green turtle's Atlantic nesting range, the first green turtle nest in Virginia was documented in 2005 at the Back Bay National Wildlife Refuge – several miles south of the offshore

export cable landfall site (USFWS 2005; BOEM 2014). There is a moderate likelihood of green sea turtles in the Action Area and a potential for this species to nest on beaches in Virginia, including near the offshore export cable landfall site. Data obtained from VDWR for the period of 1998 through 2021 indicates one unconfirmed green sea turtle nest within 2-miles of the offshore export cable landfall site (Boettcher 2022; Figure 4-17). This unconfirmed turtle nest location was documented at the Dam Neck Naval Base in 2017.

4.13. Kemp's Ridley Sea Turtle

4.13.1 Species Description

Kemp's ridley sea turtles occur off the coast of the Gulf of Mexico and along the U.S. Atlantic Coast (TEWG 2000). The Kemp's ridley sea turtle was listed as Endangered under the ESA throughout its range in 1970 and is currently listed as Critically Endangered under the IUCN Red List (NMFS 2022c; IUCN 2022). The species is also listed as Endangered by the VDWR (2022a). The decline in global Kemp's ridley populations is the result of human activity, such as harvesting adults and eggs for food and as fisheries bycatch (USFWS 2022d). There is no designated critical habitat for this species in the Action Area (NMFS 2022c).

Juveniles inhabit the U.S. Atlantic Coast from Florida to the Canadian Maritime Provinces. In late fall, Atlantic juveniles/sub adults travel northward to forage in the coastal waters off Georgia through New England, then return southward for the winter (Stacy et al. 2013; New York State Department of Environmental Conservation 2022). Preferred habitats include sheltered areas along the coastline, such as estuaries, lagoons, and bays (NMFS 2022c). Sixty percent of Kemp's ridley nesting occurs on beaches near Rancho Nuevo, Tamaulipas, Mexico. The nesting season spans from April through July (NMFS and USFWS, 2007). On average, individual females nest every 1 to 2 years, with an average of 1 to 3 clutches every season and an average clutch size of 110 eggs per nest (NMFS and USFWS 2007).

4.13.2 Kemp's Ridley Sea Turtles in the Action Area

There are three records of nests in Virginia in the past decade, marking the northernmost extent of their nesting territory: one on Dam Neck Naval Base in June 2012, one on False Cape State Park near the North Carolina/Virginia Border, and one at Sandbridge Beach (Boettcher 2022). While there are no records of Kemp's Ridley sea turtle nesting sites within 2-miles of the offshore export cable landfall area, there is a likelihood of this species in the Action Area and a potential for this species to nest on beaches in Virginia.

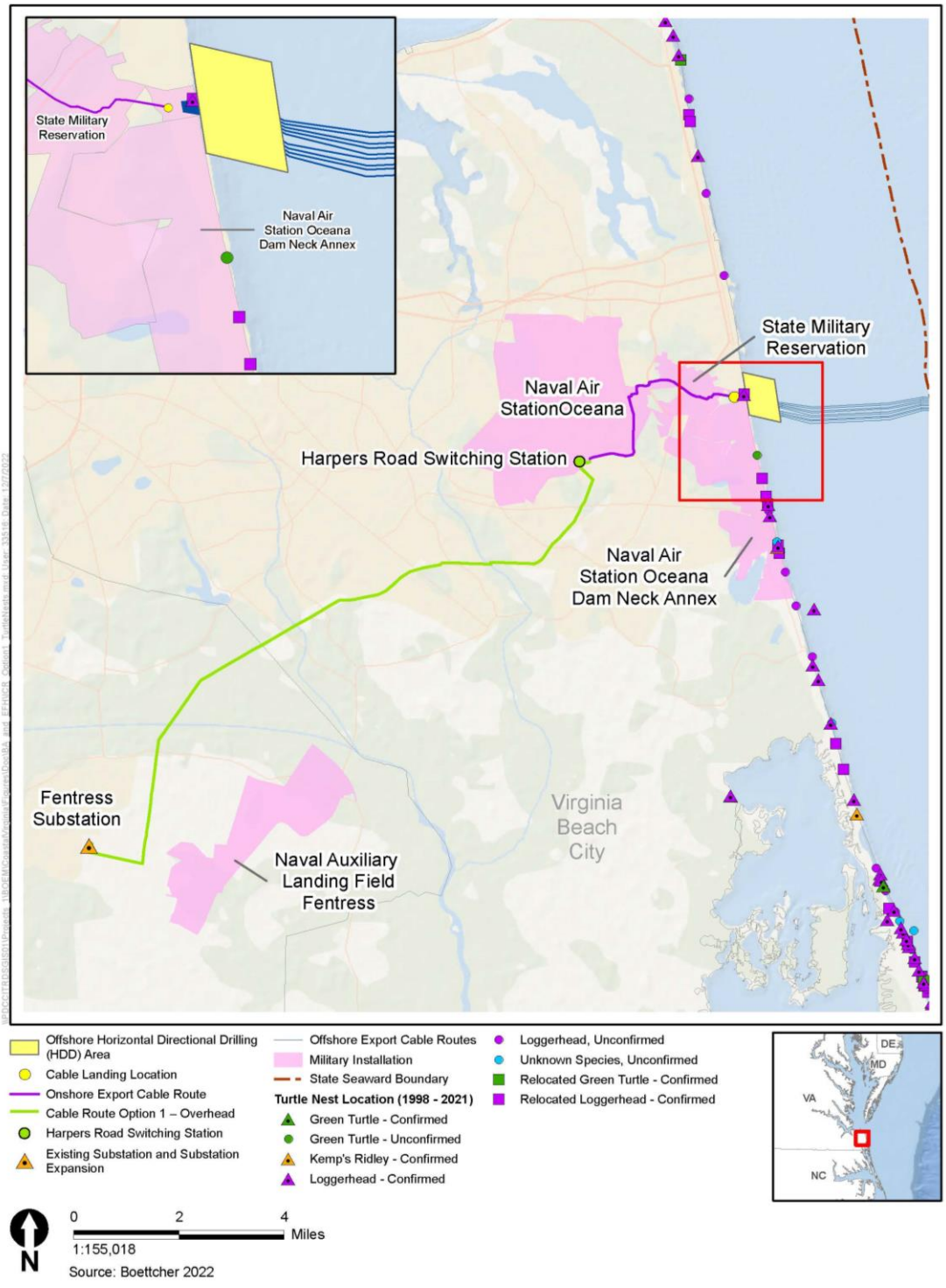


Figure 4-17 Sea Turtle Nest Locations and CVOW-C Onshore and Nearshore Project Area

5. Effects of Proposed Action

This section analyzes the potential direct and indirect effects of the Proposed Action on the relevant species identified above in Section 4 and summarizes the species or habitat that are likely to be adversely affected by the Action (50 CFR § 402.12). This BA incorporates information by reference found in previous assessments of project-related impacts on these same species resulting from actions associated with the construction, O&M, and eventual decommissioning of offshore wind facilities that have been completed by BOEM, which includes BAs (BOEM 2014, 2016, 2019, 2021, 2022) and other environmental assessments (BOEM 2015, 2016) (see also Section 1.2). In addition to this analysis, COP Appendix O-1 provides an "Avian and Bat Impact Assessment" and is provided as Appendix B of this BA.

The impact producing factors (IPFs) of Project construction, O&M, and decommissioning that have the potential to affect federally listed species under USFWS jurisdiction are summarized in Table 5-1.

Table 5-1 Impact-Producing Factors of Coastal Virginia Offshore Wind Commercial Project Construction, Operations and Maintenance, and Decommissioning on Federally Listed Species

Impact Producing Factor	Potentially Affected Species	Potential Type of Exposure	Level of Effect
Collision risk	Indiana bat Northern long-eared bat Tricolored bat Piping plover Rufa red knot Roseate tern Monarch butterfly	Direct: injury and mortality Direct: behavioral	Insignificant
Airborne noise	Indiana bat Northern long-eared bat Tricolored bat Piping plover Rufa red knot Roseate tern	Direct: Behavioural	Insignificant
Vessel traffic	Indiana bat Northern long-eared bat Tricolored bat Piping plover Rufa red knot Roseate tern	Direct: behavioral	Insignificant
Underwater noise	Roseate tern	Indirect: prey availability	Insignificant
Seabed and water column disturbance			
Construction vehicle traffic	Indiana bat Northern long-eared bat Tricolored bat Piping plover Rufa red knot Roseate tern Monarch butterfly	Direct: injury and mortality Direct: Behavioural Indirect: reduced habitat quality	Insignificant
Upland habitat disturbance	Indiana bat Northern long-eared bat Tricolored bat Monarch butterfly	Indirect: habitat modification	Insignificant

Impact Producing Factor	Potentially Affected Species	Potential Type of Exposure	Level of Effect
Lighting	Indiana bat Northern long-eared bat Tricolored bat Piping plover Rufa red knot Roseate tern	Indirect: behavioral	Insignificant
Electromagnetic fields	Indiana bat Northern long-eared bat Tricolored bat	Direct: Behavioural	Insignificant

5.1. Bats (Indiana Bat, Northern Long-eared Bat, Tricolored Bat)

5.1.1 Direct Effects

Potential direct IPFs from the construction, operation, and decommissioning of the proposed Project on the Indiana bat and northern long-eared bat include:

- Collision Risk
- Airborne Noise
- Vessel Traffic
- Construction Vehicle Traffic
- Electromagnetic Fields (EMF)

The likelihood of exposure to and significance of these potential effect mechanisms are evaluated in the following sections.

5.1.1.1 Collision Risk

Bat mortality has occurred from collisions at onshore wind farms in North America. Bats at onshore wind facilities have been documented showing higher attraction and more frequent approaches to turbines when the blades are not spinning (Cryan et al. 2014). Bats flying over the open ocean are attracted to available structures, including vessels and, potentially, the OSS and WTG towers (Stantec 2016). However, due to their use of echolocation, stationary objects are not generally considered a collision risk for bats (Horn et al. 2008). As such, individual bats are unlikely to collide with construction equipment or offshore facility structures during construction. While bat mortality could arise from collision with operational WTGs, cave-hibernating bats such as the Indiana bat, northern long-eared bat, and tricolored bat are unlikely to occur over the open ocean and thus unlikely to encounter offshore wind turbines.

5.1.1.1.1 Indiana Bat

As discussed in Section 4.2.2, the occurrence of the Indiana bat offshore or within the Lease Area is highly unlikely. This species is closely associated with forests and rarely travels more than 1,000 feet (305 meters) from forested habitats (USFWS 2011). Like other cave-hibernating bats, they do not regularly use the offshore environment for foraging or migrating (Dowling et al. 2017; Sjollema et al. 2014; Solick and Newman 2021; Stantec 2016). If they were to fly over water, movements would likely be in close proximity to the mainland. The species was not detected in the Project's offshore acoustic surveys (COP, Appendix O-2; Dominion Energy 2022). In addition, no northern long-eared bats were detected during acoustic bird and bat post-construction monitoring (August 2021 to November 2021) of turbines for the CVOW-Pilot Project (Dominion Energy 2022). Given this information, it is unlikely that these bats will encounter offshore construction vessels during construction or maintenance activities and operating WTGs. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action would be insignificant and discountable, and the proposed action is not likely to adversely affect Indiana bat.

5.1.1.1.2 Northern Long-eared Bat and Tricolored Bat

There has been limited work studying the movements of northern long-eared bats near the ocean, but all evidence to date suggests that the species does not forage offshore and are unlikely to occur over open ocean (Dowling et al. 2017). During the offshore construction of the Block Island Wind Farm, bats were monitored with acoustic detectors on boats; no northern long eared bats were detected among the 1,546 passes of bats (Stantec 2018). During post-construction monitoring from August 2017 to February 2020, no northern long-eared bats were detected out of the 2,294 passes recorded by bat acoustic detectors mounted on two Block Island WTGs. The species was also not detected in the Project's offshore acoustic surveys in the CVOW-C lease (COP, Appendix O-2; Dominion Energy 2022). In addition, no northern long-eared bats were detected during acoustic bird and bat post-construction monitoring (August 2021 to November 2021) of turbines for the CVOW-Pilot Project (Dominion Energy 2022). If northern long-eared bats were to migrate over water, movements would likely occur in close proximity to the mainland and not 27 miles (44 kilometers) offshore where Project WTGs are proposed. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action would be insignificant and discountable, and the proposed action is not likely to adversely affect to northern long-eared bat.

5.1.1.2 Noise Effects

Onshore construction would produce noise in excess of ambient conditions in the Action Area due to vehicles and heavy equipment used to construct the cable landfall adjacent to the nearshore zone, the onshore export cables, and the substations. In-air acoustic modelling was conducted for the Project to assess potential noise impacts associated with construction and operation activities (COP Appendix Y; Dominion Energy 2022). Concurrent use of the loudest construction equipment sources could reach noise levels of 80 to 90 decibels or more and exceed ambient conditions, particularly in terrestrial portions of the Action Area. However, construction noise of these levels would attenuate to ambient levels in most scenarios within or less than 1,000 feet (305 meters) of the source. Noise impacts due to construction activities will primarily be limited to daytime hours.

Indiana bats and northern long-eared bats may be exposed to noise levels, or noise and vibration levels at an intensity that they may not have experienced in the past, depending on the proximity of their roost sites to the proposed landfall sites, onshore cable route corridors, and substations. Both bat species forage and are otherwise active during the dusk-to-dawn time period and typically roost during daytime hours. While foraging activities are unlikely to be impacted given the species' nocturnal behavioral patterns, the increased noise and vibrations could affect individual bats that are unaccustomed to such disturbance while roosting, thereby reducing the suitability of habitat adjacent to the Project footprint. Although it is

difficult to predict the degree to which the bats could be disturbed by construction noise and vibrations, it is reasonable to assume that any effect could result in bats selecting roost trees further from the disturbance. Alternative roost sites are generally available in the immediate vicinity of suitable northern long-eared bat. The nearest documented Indiana bat maternity colony is located approximately 110 miles (177 kilometers) northwest of the Project area (St. Germain et al. 2017), far beyond the noise propagation extent of Project construction activities.

The majority of noise effects would be temporary, generated during construction and decommissioning, and be limited primarily to daytime hours. Overall, BOEM concludes that onshore noise from offshore wind development is not expected to impact individual fitness or populations as any displaced bats are expected to return once construction activity is complete.

Noise generated from pile driving for WTG and OSS foundations has the potential to temporarily disturb and displace bats from the affected area. However, pile-driving activities, which would produce the loudest noise in the Offshore Project area, will be short-term, temporary, and highly localized. Auditory impacts are not expected to occur as recent research has shown that bats may be less sensitive to temporary threshold shifts than other terrestrial mammals (Simmons et al. 2016). Impacts, if any, are expected to be limited to behavioral avoidance of pile driving and/or construction activity and no temporary or permanent hearing loss would be expected (Schaub et al. 2008; Simmons et al. 2016). While bats may avoid onshore and offshore construction areas, potential effects are expected to be insignificant.

5.1.1.3 Vessel and Construction Vehicle Effects

Construction of the onshore components of the Project will involve a range of equipment types, from standard pickup trucks to heavy-load vehicles. Interaction with Project-related vehicles for the Indiana bat and the northern long-eared bat would vary depending on time of year, location of roads and travel pathways in relation to roosting and foraging areas, the characteristics of individuals' flight, traffic volume, and whether young bats are dispersing. In most cases, USFWS (2016a) expects that wider roads pose less collision risk because there is a lower likelihood of bats crossing them. The road ROWs within which the Project's onshore export cables would be located include county and state roads with relatively high traffic volumes and limited habitat; thus, Indiana bats and northern long-eared bats would be unlikely to frequent the area and be exposed to potential collisions with vehicles Additionally, most vehicle activity would occur during daylight hours when bats are less active.

There is no information on vessel collision risk for the Indiana bat or the northern long-eared bat, but due to their unlikely occurrence in offshore areas, no effects are anticipated. Accordingly, BOEM finds the likelihood of vessel and traffic-related disturbance effects on Indian bats and northern long-eared bat to be unlikely and, therefore, insignificant.

5.1.1.4 Electromagnetic Fields Effects

The Project's transmission cables would produce an induced magnetic field in the immediate proximity of the cable path. Bats use the earth's magnetic field for spatial orientation during migration and foraging and are able to calibrate their magnetic compass against visual cues like the sky's polarization pattern and the location of the sun on the horizon (Greif et al. 2014; Holland et al. 2010). Bats are sensitive to magnetic fields at least as low as 100 milligauss (mG; Tian et al. 2015). Nicholls and Racey (2007) found an overall reduction in bat activity for habitats with intermediate and high EMF levels at military and civilian air traffic control radar stations and postulated that an adverse behavioral response could be a result of echolocation interference and thermal induction leading to a rise in internal body temperature and overheating risk.

Based on the magnetic field modelling report (COP Appendix BB; Dominion Energy 2022), which used field calculations made at an elevation of 3.3 feet (1 meter) above the ground surface, the magnetic fields at the edges of the underground onshore export cable route corridor are 119 mG on the left edge of the corridor and 44.5 mG on the right edge. The highest magnetic fields within the corridor will be 4,126 mG at 6 feet (1.8 meters) left of centerline. Outside of the corridor at 200 feet (61 meters) from the centerline on both sides, the magnetic fields drop to ambient background levels. The magnetic fields for the overhead interconnection cable route corridor will be 174 mG on one side of the corridor and 83 mG on the other. The highest magnetic fields will be 358 mG within the corridor. The magnetic fields drop to 16 mG and 10 mG at 200 feet (61 meters) from the corridor centerline.

Bats may be able to detect magnetic fields as low as 100 mG, electromagnetic fields would potentially be detectable to Indiana bats and northern long-eared bats occurring in the immediate vicinity of the underground and overhead onshore export cables. Based on species occurrence within and in proximity to the Action Area, it is possible that individual bats would encounter detectable electromagnetic levels from the onshore export cables and substations over the lifetime of the Project.

The potential significance of this exposure must be considered relative to existing conditions within the Action Area, which is characterized by high baseline levels of electromagnetic fields. Localized EMF levels in proximity to electrical power grid sources within 50 feet (15 meters) of distribution lines range from 10 mG to 20 mG for main feeders and 3 mG to 10 mG for laterals under typical loads, reaching as high as 40 mG to 70 mG under peak loads depending on the amount of current being carried (National Institutes of Health 2002). High voltage overhead transmission lines produce even higher EMF levels. As a result, bats experience baseline electromagnetic fields from existing sources that are comparable to those likely to result from the proposed Project. Bats persist in areas despite the presence of electromagnetic sources, indicating that the species can also adapt to the comparatively minimal electromagnetic field effects of the proposed Project without significant physiological or behavioral consequences. Bats' sensitivity to EMF may result in avoidance of the area with the highest magnetic field along the centerline of the onshore export cable route corridor. However, given the context of ambient conditions, potential EMF effects on Indiana bats and northern long-eared bats are likely insignificant.

Magnetic fields associated with transmission cables within the offshore portion of the Action Area do not exceed ambient conditions above the ocean's surface and thus are considered insignificant to bats that may occur in the area. At the landfall site, the offshore transmission cable would be buried, so induced electromagnetic fields on beach and shoreline habitats would be effectively unmeasurable and, therefore, insignificant.

5.1.2 Indirect Effects

Potential indirect IPFs from the construction, O&M, and decommissioning of the proposed Project on Indiana bat and northern long-eared bat include:

- Upland Habitat Disturbance
- Lighting

The likelihood of exposure to and significance of these potential effect mechanisms are evaluated in the following sections.

5.1.2.1 Upland Habitat Disturbance Effects

The Proposed Action could indirectly affect the Indiana bat and northern long-eared bat via habitat disturbance required to construct the onshore Project components, including limited cutting of trees that could eliminate suitable foraging and roosting habitat. Maternity roosts and active detections have been

reported for northern long-eared bats in areas around Virginia Beach, with the nearest reported maternity roosts located adjacent to the Fentress Air Field and within 2.57 miles (4.14 kilometers) of the closest portion of Interconnection Cable Route Option 1 (Figure 4-3). In addition, recent acoustic studies have documented year-round use by both northern long-eared bats and Indiana bats in nearby areas.

The cable landing location is unlikely to provide bat habitat and bats species are unlikely to use the urbanized, developed areas within the onshore portions of the Project area. While bats may be present in habitat adjacent to the onshore export cable route, the route is primarily co-located with existing development areas, which are unlikely to provide high quality foraging or roosting habitat. The interconnection cable route has the potential to provide core habitat, as they vary in their degree of co-location within existing disturbed areas (e.g., roads, transmission corridors) and pass through several areas that may provide valuable bat habitat. At the potential switching station locations there is some likelihood that bats could use the treed areas for foraging and roosting and open field areas for foraging during the bat active period (generally April to October), as well as potentially during the winter if non-hibernating populations persist in this area. The onshore substation is located in existing disturbed areas, which is unlikely habitat for bats.

Although constructing the onshore cables and substations would remove suitable foraging and roosting habitat for the Indiana bat and northern long-eared bat, the area of affected forest is considered insignificant relative to availability of forest habitat within the surrounding landscape. It may also result in increasing the "edge effect," which could improve foraging opportunities for bats in some situations.

Some habitat disturbance is anticipated during clearing and construction from the use of heavy equipment to clear surface material, dig the trench, install the duct bank, and lay the transmission line, followed by reburial and resurfacing. No direct impacts on northern long-eared bats are expected during Project operation. Primary habitat disturbance effects will occur during construction activities; temporary habitat modification is possible during operation maintenance activities though disturbances are expected to be similar to or less than those realized during construction. Project decommissioning would have effects similar to Project construction.

Construction activities would take place during daylight hours and, in the case of vegetation clearing in potentially suitable habitat, would require monitoring during all seasons to mitigate potential impacts to Indiana bats and northern long-eared bats as they may be present year-round. Project activities that include tree clearing can be assumed to incur incidental take of the northern long-eared bat. Dominion Energy will conduct presence/absence surveys for bats (acoustic and/or mist-net) along the interconnection cable route and develop avoidance and minimization measures in coordination with the VDWR, USFWS, and appropriate regulatory agencies to ensure protection of Indiana bats and northern long-eared bats.

5.1.2.2 Lighting Effects

Indiana bats and northern long-eared bats may be attracted to insect prey drawn by facility lighting around the onshore substation and vessel lights, but this would not represent a substantial behavioral alteration given the baseline levels of artificial lighting present in the onshore Project area.

Both species are unlikely to occur 27 miles (44 kilometers) offshore in the turbine area. Although red aviation lights on top of WTG towers have been considered to be a potential source of interest to bats (Voigt et al. 2018), studies have shown that mortality at land-based towers with aviation lights is similar to or even less than mortality at towers without aviation lights (Bennett and Hale 2014). Additionally, the occurrence of bats offshore is expected to be very low. Based on these factors, the indirect effects of lighting on Indiana bats and northern long-eared bats are likely to be insignificant.

5.2. Birds (Piping Plover, Rufa Red Knot, Roseate Tern)

5.2.1 Direct Effects

Potential IPFs factors from the construction, operation, and decommissioning of the proposed Project with potential direct effects on federally listed birds include:

- Collision Risk
- Airborne Noise
- Vessel Traffic
- Construction Vehicle Traffic

The likelihood of exposure to and significance of these potential effect mechanisms are evaluated in the following sections.

5.2.1.1 Collision Risk

This section discusses the potential for impacts on federally listed species resulting from collisions with WTGs, offshore substations, and construction and maintenance vessels, OSS, and construction/maintenance vessels associated with the Proposed Action. These species are agile flyers and are extremely unlikely to collide with stationary structures such as bridges, communication towers, lighthouses, light poles, or moving vessels (e.g., boats). Therefore, these birds will avoid colliding with fixed structures, such as WTG and OSS foundations, and project related vessels. As such, the likelihood of collisions with fixed structures or vessels associated with the Proposed Action to be insignificant and discountable.

The primary hazard posed to federally listed birds from offshore wind energy development is collision mortality (Everaert and Stienen 2007; Furness et al. 2013; Robinson Willmott et al. 2013). This section focuses on the collision risk from WTGs for the piping plover, rufa red knot, and roseate tern and uses the most relevant information about known occurrences and species' interactions with offshore wind on the Atlantic OCS. BOEM followed the parameterization of the Band Model (Band 2012) and Stochastic Collision Risk Assessment for Movement (SCRAM) (Gilbert et al. 2022) to evaluate the risk of bird collision with operating WTGs in offshore wind farms. These models factor bird size and flight behavior, the number individuals passing through the migratory corridor, the migratory corridor and wind farm width, the number of turbines, the RSZ area, the percentage of individuals flying at altitudes within the RSZ, the predicted operating time during the migration season by month, and a behavioral avoidance modifier to estimate collision risk. However, because relatively few individuals from each of these species are likely (if at all) to enter into the proposed Lease Area (see Sections 4.7.2, 4.8.2, and 4.9.2), collision risk is analyzed qualitatively below.

5.2.1.1.1 Piping Plover

The piping plover is among 72 species (out of 177 species on the Atlantic OCS) that is ranked "medium" in its relative vulnerability to collision with wind turbines (Robinson Willmott et al. 2013). However, the distance from shore to the Lease Area precludes the occurrence of nesting and foraging piping plovers in the vicinity of the Project WTGs, and non-migratory movements in May through August appear to be exclusively coastal (Burger et al. 2011). Therefore, piping plovers could be exposed to the Project during spring and fall migration.

Loring et al. (2019) studied the flight patterns of migratory plovers in proximity to BOEM wind energy lease areas using radio telemetry. They tagged 150 plovers captured in nesting areas in Rhode Island and Massachusetts from 2015 to 2017 with lightweight very-high frequency transmitters and tracked their fall

migratory behavior using an array of automated very-high frequency telemetry stations. Of 70 individuals that provided sufficient data, 19 (27 percent) may have crossed Atlantic wind energy areas. Figure 4-9 shows the modelled fall migratory tracks for 17 individuals where one individual was predicted to fly close to the CVOW-C Lease Area (Loring et al. 2020). It is important to note that 20 percent flew during wind speeds ≤4 meters per second (Loring et al. 2019), which is below the cut-in speed for an offshore wind turbine. Loring et al. (2019) noted that more information is needed to quantify routes and conditions associated with spring migratory flights across the Atlantic OCS.

It was assumed that this species tends to fly at altitudes above the typical RSZ of offshore windfarms when migrating. Loring et al. (2019) used the telemetry data to estimate the flight altitudes of piping plovers migrating over the OCS. The data indicate migratory flight heights of piping plovers was generally above 820 feet (250 meters). They estimated that 15.2 percent of piping plovers flew through the RSZ when exposed to offshore wind energy lease areas (Figure 4-10). In general, the flight heights may vary with weather where poor visibility and low cloud ceiling conditions may cause birds to fly at lower heights, potentially within the RSZ (Dirksen et al. 2000; Hüppop et al. 2006). However, Loring et al. (2019) found that piping plover fall migration typically occurs during favorable weather conditions with high visibility, little to no precipitation, and high atmospheric pressure. Piping plovers also have good visual acuity and maneuverability in the air (Burger et al. 2011). Given the relatively few piping plovers that are expected to cross the CVOW-C Lease Area and those that do will generally migrate at flight heights above the RSZ (Figure 4-10) during favorable weather conditions, the risk to piping plovers by the operating wind turbines is expected to be low.

Although *take* (a fatality due to colliding with a turbine) is unlikely due to reasons described above, a quantitative analysis was conducted. Typically, quantitative analyses are performed when take is expected and there is a need to estimate the amount of take. Nevertheless, the following quantitative analyses were conducted.

BOEM used the Band Model (Band 2012) to estimate the risk of bird collision with operating WTGs in offshore wind farms. The Band Model factors bird size and flight behavior, the number individuals passing through the migratory corridor (i.e., the WEA), migratory corridor and windfarm width, number of turbines, RSZ area, percentage of individuals flying at altitudes within the RSZ, predicted operating time during the migration season by month, and a behavioral avoidance modifier to estimate collision risk. The Band Model parameters used to explore the relative collision risk to piping plover are presented in Appendix D. Most of the model inputs (e.g., migration passage, proportion flying in the RSZ, turbine specifications, and facility dimensions) were obtained or calculated from the COP and Loring et al. 2019 (see Appendix D for a snapshot of the model inputs). Radio telemetry studies of piping plover migratory behavior in the vicinity of the Action Area indicate that piping plover could fly through the wind farm during the life of the project. Using interpolated flight paths from land-based tracking stations, Loring et al. (2019) found that 1.4 percent (1 out of 70) of tagged plovers leaving breeding areas during fall migration flew through the VA WEA. Extrapolating that percentage to recent population size[5] an estimated 145 piping plover could have migrated through the WEA in 2022, 63 in spring and 82 in fall.

A turbine avoidance rate of 95.01 percent was used for piping plover (Cook 2021). A total of 176 operating SG-14-222 DD turbines each with a 33-meter airgap between blade and water were used in the model. The developer provided the nominal rated revolutions per minute (rpm) for the turbine, and the average annual mean wind speed was obtained from the COP. The developer provided the average monthly proportion of time the turbines were expected to be operational (spinning) based on long-term wind time series at the site, the power-curve of the turbine, and operational information from the turbines

5 Based on counts in 2022, there were 2,250 breeding pairs recorded in E. Canada, NE, NY-NJ, DE-VA regions (USFWS 2022), a total of 4,500 adult birds, and an abundance-weighted mean productivity of 1.14 chicks fledged per pair (USFWS 2022), equating to 4,500 adults in spring and 7,065 adults and subadults in fall.

used in the CVOW-Pilot Project. The default value for pitch model was used. The flight height distribution was derived from the midpoints of 2,756 10-minute observations of 62 piping plovers flying nonstop over federal waters (Loring et al. 2018; note, the error associated with these observations was relatively large and overlapping with the RSZ and thus could inflate the number of fatalities). Given that the flight height distribution has been estimated for this species, modeled fatalities are based on calculations from the extended model (Option 3).

To further inform this ESA consultation, BOEM used SCRAM to estimate the likelihood of take or fatality due to collision with a rotating turbine blade—more specifically, to estimate the relative likelihood of the take of one individual in a year and during the 33-year operation period of the wind farm. SCRAM uses bird passage rates based on modeled flight paths of birds fitted with nanotag transmitters (Gilbert et al. 2022). The use of tracking data is representative of bird movements, because the locations are recorded day and night for weeks and even months regardless of weather conditions. The wind farm and turbine operational inputs were similar to those used in the analysis using the Band model. As recommended, the model was run for 1,000 iterations using Option 3 (Gilbert et al. 2022). The threshold number of collisions was set at one—this represents a take of one or more individuals.

The estimated annual mortality using the Band model was zero (Appendix D). The probability of at least one take from the SCRAM model for both scenarios was <0.001, thus a single collision during fall migration is extremely unlikely—in other words, a once in a thousand-year event (Appendix D). The probability of a collision event during the 33-year operational period is also very small (0.033) (1- (1-0.001)$^{33\ years}$).

Based on the results from both models, the chance of a fatality due to collision is extremely unlikely, and thus the estimated annual number of fatalities for migrating piping plover is zero. Likewise, the estimated number of fatalities during the 33-year operations term is also zero. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action would be too small to be measured or evaluated (insignificant) and unlikely to occur (discountable), and the Proposed Action is not likely to adversely affect piping plovers.

5.2.1.1.2 Roseate Tern

The roseate tern is one among 61 species (out of 177 species on the Atlantic OCS) that was ranked "higher" in its relative vulnerability to collision with wind turbines (Robinson Willmott et al. 2013). This high ranking is partially driven by the amount of time the species spends foraging on the ocean, and if time on the ocean was restricted to migration, the population would be ranked "medium." Even during migration periods, very few roseate terns are predicted to occur near the Project's WTGs.

Roseate terns are unlikely to experience adverse effects from the Proposed Action for several reasons. First, the Action Area is well beyond the foraging roseate terns that nest in New York and New England. Second, despite extensive offshore surveying efforts (Figure 4-14), there are no records of roseate terns in the Offshore Project area (Figure 4-15), and it is unlikely that roseate terns will be in the offshore turbine area (Figure 4-16). Third, although roseate terns only occur in the Action Area ephemerally during spring and fall migration (Burger et al. 2011), none of the migrating birds from a recent telemetry study traveled near the CVOW-C Lease Area (Loring et al. 2019), and based on the results of another telemetry study, it is likely that the offshore migratory routes used by the northeast roseate tern population are farther offshore than the Project (Mostello et al. 2014). Forth, the species typically migrates under high-visibility conditions and generally below turbine cut-in speed (Loring et al. 2019), and thus would be able to see and avoid the WTGs from considerable distance without significantly modifying their flight path. Finally, roseate terns typically fly below the RSZ (Figure 4-12). Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action would be insignificant.

To further inform this ESA consultation, BOEM used SCRAM to estimate the likelihood of take or fatality due to collision with a rotating turbine blade—more specifically, to estimate the relative likelihood of the take of one individual in a year and during the 33-year operation period of the wind farm. SCRAM uses bird passage rates based on modeled flight paths of birds fitted with nanotag transmitters (Gilbert et al. 2022). The use of tracking data is representative of bird movements, because the locations are recorded day and night for weeks and even months regardless of weather conditions. The wind farm and turbine operational inputs were similar to those used in the analysis using the Band model. As recommended, the model was run for 1,000 iterations using Option 3 (Gilbert et al. 2022). The threshold number of collisions was set at one—this represents a take of one or more individuals.

The estimated annual mortality using the Band model was zero (Appendix D). The probability of at least one take from the SCRAM model for both scenarios was <0.001, thus a single collision during fall migration is extremely unlikely—in other words, a once in a thousand-year event (Appendix D). The probability of a collision event during the 33-year operational period is also very small (0.033) (1-(1-0.001)$^{33\ years}$).

Based above information and the results from SCRAM, the chance of a fatality due to collision is extremely unlikely, and thus the estimated annual number of fatalities for migrating roseate tern is zero. Likewise, the estimated number of fatalities during the 33-year operations term is also zero. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action would be too small to be measured or evaluated (insignificant) and unlikely to occur (discountable), and the Proposed Action is not likely to adversely affect to roseate tern.

5.2.1.1.3 Rufa Red Knot

The rufa Red Knot is one of 72 species (out of 177 species on the Atlantic OCS) that was ranked "medium" in its relative vulnerability to collision with wind turbines (Robinson Willmott et al. 2013). Despite the presence of many onshore wind turbines along the red knot's overland migration route in the United States (Diffendorfer et al. 2017), there are no records of red knots colliding with turbines (78 *FR* 60024).

Although some rufa red knots may pass near the proposed Project on the Atlantic OCS, the distance from shore to the Lease Area where the WTGs would be sited precludes use by foraging red knots because their local movements while at stopover areas (e.g., commuting flights between foraging locations related to tidal changes) generally occur within 3 miles (4.8 kilometers) of the shore (Burger et al. 2011); this is confirmed by recent telemetry work confirm this (Loring et al. 2018, BRI and Wildlife Restoration Partners 2022, Feigin et al. 2022). Tracking indicates migrating rufa red knots arriving to and departing from Delaware Bay do not typically fly over the Lease Area and proportionally few red knots are likely to cross the offshore Action Area (Loring et al. 2018, 2020). Thus, rufa red knot exposure to the Project's WTGs would be limited to migrating individuals. Based on the best available information on rufa red knot migration (see Section 4.8.2), 319 red knots could pass through the Lease Area during spring migration, and 490 red knots could pass through during fall migration.

Although there is antidotal evidence of rufa red knots flying at great heights during migration, in the range of 3,281 to 9,843 feet (1,000 to 3,000 meters) (78 *FR* 60024; Burger et al. 2011; USFWS 2014a), recent telemetry studies suggest that red knot fly much lower (Loring et al. 2018; BRI and Wildlife Restoration Partners 2022; Feigin et al. 2022). Loring and others (2018) derived flight height estimates using data collected from red knots fitted with nanotags; these estimates were subject to large error bounds (typically 328 to 656 feet [100 to 200 meters]) that often overlap with RSZ and thus should be interpreted with caution. However, more recent telemetry studies near the Project using GPS satellite tags yielded more precise altitude estimates and found that none of the red knots near the Lease Area flew within the RSZ, but instead mostly flew below the RSZ (BRI and Wildlife Restoration Partners 2022;

Feigin et al. 2022). Therefore, the GPS flight height data suggest that it is unlikely that migrating red knots would encounter turbine blades. In addition, red knots migrate through federal waters of the Atlantic OCS primarily during clear skies with little to no precipitation and a tailwind blowing in their direction of travel (Loring et al. 2018; BRI and Wildlife Restoration Partners 2022; Feigin et al. 2022) and thus can easily see and avoid the turbines during daylight hours.

Although take is unlikely due to reasons described above, a quantitative analysis was conducted. Typically, quantitative analyses are performed when take is expected and there is a need to estimate the amount of take. Nevertheless, the quantitative analysis was conducted as an alternative approach to determine if there will be "take".

BOEM used the Band Model (Band 2012) to estimate the risk of rufa red knot collision with operating WTGs in the Lease Area. The input parameters and results are presented in Appendix D. Turbine avoidance rate of 95.01 percent was used for piping plover (Cook 2021). A total of 176 operating SG-14-222 DD turbines each with a 33-meter airgap between blade and water were used in the model. The developer provided the nominal rated rpm for the turbine, and the average annual mean wind speed was obtained from the COP. The developer provided the average monthly proportion of time the turbines were expected to be operational (spinning) based on long-term wind time series at the site, the power-curve of the turbine, and operational information from the turbines used in CVOW-Pilot Project. The default value for pitch model was used. The flight height distribution was derived from the midpoints of 379 10-minute observations of 51 red knots flying nonstop over federal waters (Loring et al. 2018).[6]

To further inform this ESA consultation, BOEM used SCRAM to estimate the likelihood of take or fatality due to collision with a rotating turbine blade—more specifically, to estimate the relative likelihood of the take of one individual in a year and during the 33-year operation period of the wind farm. SCRAM uses bird passage rates based on modeled flight paths of birds fitted with nanotag transmitters (Gilbert et al. 2022). The use of tracking data is representative of bird movements, because the locations are recorded day and night for weeks and even months regardless of weather conditions. The wind farm and turbine operational inputs were similar to those used in the analysis using the Band model. As recommended, the model was run for 1,000 iterations using Option 3 (Gilbert et al. 2022). The threshold number of collisions was set at one—this represents a take of one or more individuals.

The estimated annual mortality using the Band model was zero (Appendix D). The probability of at least one take from the SCRAM model for both scenarios was < 0.001, thus a single collision during fall migration is extremely unlikely—in other words, a once in a thousand-year event (Appendix D). The probability of a collision event during the 33-year operational period is also very small (0.033) (1- (1-0.001)$^{33\ years}$).

Based on the results from both models, the chance of a fatality due to collision is extremely unlikely, and thus the estimated annual number of fatalities for migrating red knot is zero. Likewise, the estimated number of fatalities during the 33-year operations term is also zero. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action would be too small to be measured or evaluated (insignificant) and unlikely to occur (discountable), and the proposed action is not likely to adversely affect to red knots.

5.2.1.2 Noise Effects

Federally listed bird species present within the Action Area may be exposed to periodic construction noise exceeding ambient levels due to construction of offshore wind turbine monopile foundations,

6 The flight height distribution derived from GPS tracked red knots from the BRI and Wildlife Restoration Partners (2022) and Feigin and others (2022) studies was not available at this time.

temporary cofferdam placement, and HDD and/or DSPT at the onshore landfall site, and construction vessel/vehicle operation. Combined with the visual disturbance created by construction activity, this exposure could theoretically lead to behavioral effects, including potential avoidance of the affected area. There are currently no established in-air noise exposure thresholds for the federally listed birds analyzed in this BA, so potential species effects are evaluated based on extent and magnitude of effects relative to baseline ambient conditions and the likelihood of species exposure.

Project construction vehicle use would not significantly alter baseline noise levels, and no vehicle use would occur on or in proximity to shoreline or marsh habitats known or potentially used by ESA-listed birds. ESA-listed birds in proximity to the offshore export cable landfall sites may be able to detect noise and visual disturbance created by construction and maintenance vehicles and associated activity, but that disturbance is likely insignificant relative to existing baseline conditions. Species responses may range from escape behavior to mild annoyance. The pile-driving noise impacts would be short term. Vessel and construction noise could disturb offshore bird species, but they would likely acclimate to the noise or move away, potentially resulting in a temporary loss of habitat (BOEM 2011). Construction and maintenance vehicle activity would also not significantly increase or alter the existing levels of disturbance within onshore areas; therefore, any noise-related effects on federally listed bird species in the vicinity would be temporary and insignificant.

Installation of offshore WTG and OSS foundations using an impact pile driver would produce the loudest airborne noise effects associated with the proposed Project. The area potentially impacted by pile driving at any given time would be limited to the effect radius around the pile being installed. The effect radius depends on the sea-surface and atmospheric parameters and mitigation to attenuate the noise. Rufa red knot and piping plover would only be exposed to impact hammer noise if monopile installation occurs during the migratory period. Very few, if any, roseate terns are likely to be present in the wind turbine area, and roseate terns are expected to be absent during the nesting season and during the winter months. Based on observed flight behavior, migrating birds would be able to detect and avoid noise-producing activities at a considerable distance with a minimal shift in flight path. Individual birds may hear project construction noise, including pile driving, but would be able to limit exposure without significantly altering behavior. This conclusion is supported by the fact that these species are periodically exposed to elevated baseline noise levels from sources like large ships without apparent harm. Once construction is completed, the WTGs would produce operational airborne noise in the offshore marine environment, which also would have no impacts on federally listed birds.

It is expected that noise levels associated with decommissioning activities would be similar in scope, nature, and intensity to noise impacts associated with pile driving and construction, as described above. Similarly, noise impacts resulting from decommissioning would be localized and of short duration, lasting only for the duration of structure removal. If these activities were to occur during red knot and piping plover migration periods, most individuals would be flying well above the Action Area. However, should any federally listed birds occur in the area, they are expected to avoid the area and fly around the noise source; therefore, the noise generated is not anticipated to impact bird movement or behavior through the Action Area.

5.2.1.3 Vessel and Construction Vehicle Effects

Ground disturbance and noise from construction equipment could impact federally listed birds if they were to occur in the vicinity of the offshore export cable landfall site, the onshore cable routes, or the onshore substation locations. Onshore export cable installation includes the onshore components that connect the offshore export cable to the onshore substation. Minimal surface disturbance would occur at the beaches, dunes, and tidal marsh habitats where the offshore export cables would make landfall because trenchless drilling methods would be used to install the export cable underground.

Beach and dune habitats surround the proposed landfall site within the Onshore Project area. Noise or human traffic associated with construction and trenchless drilling methods at the landfall sites could thus disturb individuals of any of the three species if performed when birds are present. However, presence is unlikely—piping plovers nest farther north along Virginia's Eastern Shore and not near the onshore cable landfall site; roseate terns and red knots would only occasionally be present in low numbers during migration periods. In conclusion, by avoiding beach and dune habitats through trenchless drilling methods and implementing best management practices, the offshore export cable landfall would have little to no impact on federally listed birds.

The onshore substation location is upland and thus provides no habitat capable of supporting federally listed birds. Indirect effects due to noise could occur, as described above, but no suitable habitat for federally listed birds occurs within or adjacent to the proposed substation location. Therefore, substation construction, operation, and decommissioning is not expected to have any direct effects on the piping plover, rufa red knot, or roseate tern.

5.2.2 Indirect Effects

Potential IPFs from the construction, operation, and decommissioning of the proposed Project with potential indirect effects on federally listed birds include:

- Underwater Noise
- Seabed and Water Column Disturbance
- Lighting

The likelihood of exposure to and significance of these potential effect mechanisms are evaluated in the following sections.

5.2.2.1 Underwater Noise/Seabed and Water Column Disturbance Effects

Roseate terns are not present in the area during the winter months and during late spring and early summer months. Some roseate terns may occasionally visit the area during the migration period. It is thus possible that a handful of individuals could be indirectly affected by the construction, operation, and decommissioning of the proposed Project. Potential IPFs for this species include short-term seabed and water column disturbance and underwater noise that could alter forage fish behavior and potentially impact foraging efficiency.

Disturbance to foraging roseate terns during their migration from July to mid-September could occur as a result of offshore export cable installation. Seabed disturbance during Project construction would result in temporary plumes of suspended sediments in the immediate construction area as a result of jet trenching, plowing, mechanical trenching, and dredging operations. These impacts are expected to be temporary and localized to the emplacement corridor. However, individual birds would be expected to successfully forage in nearby areas not affected by increased sedimentation during cable emplacement. The overall sediment deposition would be limited within a small area near the cable route. Impacts on benthic habitats and increased turbidity during cable-laying activities have the potential to affect sand lance, an important prey resource for roseate terns (USFWS 2008). Given the nature of the construction techniques, indirect impacts such as increased turbidity would be short term in duration and localized in nature and would not directly impact terns because the activity would be underwater. Water quality effects and disturbance resulting from the installation of offshore export cables are not expected due to the short-term duration of disturbance and water column sedimentation from submarine cable construction activities (USFWS 2008). It is estimated that water turbidity conditions would return to normal within a several hours of cable installation. Also, this disturbance is not expected to be different from typical construction equipment (barges or dredges) and cable installation, which are not believed to adversely affect roseate

terns (USFWS 2008). Additionally, the potential relocation of UXOs that are unable to be avoided through micrositing may result in areas of temporary elevated turbidity and displacement of prey species. However, relocation of UXOs would involve non-detonation methods (Tetra Tech 2022) so potential disturbances from underwater explosions are not included in the Proposed Action. Any adverse effects on roseate terns resulting from installation of the offshore export cables and UXO relocation would be temporary and insignificant.

Seafloor and benthic habitat disturbance resulting from the installation of the offshore export cables would not directly impact piping plovers, or rufa red knots, as these species are strictly terrestrial foragers and do not use aquatic habitats for foraging. There could be potential for indirect effects on rufa red knots and piping plover from cable emplacement due to benthic habitats being temporarily disturbed and some organisms important to their foraging being crushed or buried; however, the USFWS (2014) did not identify this as a threat and there is no information about the impacts of dredging on horseshoe crab populations. Thus, although there could be minor indirect impacts on benthic invertebrate prey availability in intertidal substrates, the impacts from dredging for cable installation would not be measurable.

5.2.2.2 Lighting Effects

Under poor visibility conditions (fog and rain), some migrating birds may become disoriented and circle around lighted communication towers instead of continuing on their migratory path, thus greatly increasing their risk of collision with the tower and guy wires (Huppop et al. 2006). Tower lighting would have the greatest impact on bird species during evening hours when nocturnal migration occurs. However, red flashing aviation obstruction lights are commonly used at land-based wind facilities without any observed increase in avian mortality compared with unlit turbine towers (Kerlinger et al. 2010). In accordance with Federal Aviation Administration (FAA) obstruction marking standards, the turbine nacelle would be equipped with two medium-intensity, red flashing lights, and a minimum of three low-intensity red flashing lights at the approximate mid-section of the tower; these lights would operate during nighttime hours only. All aviation obstruction warning lights would have a synchronized flash rate of 30 flashes per minute. Additionally, Dominion Energy may use Aircraft Detection Lighting System (ADLS) so that obstruction lights would only be activated when an aircraft is near the turbines (Dominion Energy 2022). The use of ADLS would dramatically reduce the amount of time the obstruction lights are on to an estimated 25 hours per year (COP, Appendix T; Dominion Energy 2022), thus attraction and entrapment of birds due to lighting would be extremely unlikely under this scenario. BOEM anticipates that any additional work lights on support vessels or Project structures would be hooded downward, directed when possible to reduce illumination of adjacent waters, and e used only when required to complete a Project task. Therefore, the potential impacts from artificial lighting of structures and vessels during construction, operations and maintenance, and decommissioning of the Proposed Action on listed bird species would be insignificant and discountable.

5.3. Monarch Butterfly

5.3.1 Direct Effects

Potential IPFs from the construction, operation, and decommissioning of the proposed Project with potential direct effects on monarch butterfly include:

- Collision Risk
- Construction Vehicle Traffic

The likelihood of exposure to and significance of these potential effect mechanisms are evaluated in the following sections.

5.3.1.1 Collision Risk

There have been reports of monarch butterflies on offshore oil platforms and ships at sea, suggesting that the species may fly over open water, but the species is generally reluctant to cross over water (Brower 1995). Although monarchs are far-ranging fliers, they are easily blown off course, likely by storms, into offshore waters. The occurrence of monarch butterflies over open-ocean areas would be a small proportion of the overall migratory population, and large numbers of monarch butterflies do not fly over the Atlantic OCS.

There is limited information about butterfly mortalities caused by collisions with wind turbines, especially for monarch butterflies in the offshore environment. Some studies have investigated the density of insect splatter on onshore wind turbine blades and concluded that there was a negligible effect on insects (Gipe 1995), while others have suggested that the impacts of wind turbines on insect populations, in general, may be significant (Trieb et al. 2018; Voigt 2021). Monarch butterfly migration is well studied, and the species has been recorded to fly at heights over 10,000 feet (3,048 meters) above ground elevation, taking advantage of favorable winds and moving downwind at high elevation, though the majority of travel occurs at approximately 800–1,200 feet (244–366 meters; Gibo 1981; Monarch joint Venture 2022). Thus, while their flight patterns could occasionally put them within the blade heights of the Project WTGs, monarch butterflies would not be unlikely to occur within the RSZ during migration. Migration is the only time period when monarch butterflies could occur offshore, and there is little to no evidence to suggest that collision with wind turbines on the Atlantic OCS poses a threat to the species. Because very few monarch butterflies are expected to occur within the Atlantic OCS, potential effects on individuals would be insignificant and no population-level effects would occur. Additionally, potential risk of monarch butterfly collision with other Project components is not expected, except for construction vehicle, which is discussed in the following section.

5.3.1.2 Construction Vehicle Effects

Potential effects to the monarch butterfly would only occur during facility construction in the vicinity of undeveloped lands where milkweed and other native nectar plants are present. While adult monarch butterflies have the mobility to avoid construction equipment, larval stages could be vulnerable to being crushed by construction equipment, particularly during land clearing and ground excavation. Some adult monarch butterflies could also be impacted by vehicle collisions (McKenna et al. 2001; Kantola et al. 2019). Also, there is limited evidence that monarch caterpillars exposed to highway noise for short periods had elevated heart rates, a sign that they may experience stress along loud roadsides (Davis et al. 2018).

Although Project construction, operation, and decommissioning would potentially affect a small number of monarch butterflies, impacts are anticipated to be limited to behavioral avoidance of construction activity. Collision with Project vehicles and equipment is unlikely because the Project would not cause a noticeable increase in traffic. Suitable habitat is not widespread in the Action Area and the project would not cause an increase in noise to the extent that it would adversely affect monarch butterflies. If any adult butterflies were disturbed by Project activities, they would likely utilize adjacent habitat and repopulate these areas once construction ceases. Based on this information, potential effects on monarch butterflies from construction vehicles would be unlikely, or insignificant and temporary if they were to occur; and population-level effects are not expected.

5.3.2 Indirect Effects

Potential IPFs from the construction, operation, and decommissioning of the proposed Project with potential indirect effects on monarch butterfly include:

- Upland Habitat Disturbance

The likelihood of exposure to and significance of this potential effect mechanism is evaluated in the following section.

5.3.2.1 Upland Habitat Disturbance Effects

Impacts on monarch butterflies from habitat disturbance, including habitat fragmentation, is possible if Project construction occurs where milkweed and other native nectar plants are abundant. Suitable habitat is not widespread in the Action Area, and the Proposed Action would not cause an increase in noise to the extent that it would adversely affect monarch butterflies. If any adult butterflies were disturbed by Project activities, they would likely utilize adjacent habitat and repopulate these areas once construction ceases. Based on this information, potential effects on monarch butterflies from construction vehicles would be unlikely, or insignificant if they were to occur. If suitable monarch butterfly habitat is present where substation construction would occur, the small permanent loss of habitat would be considered insignificant. Additionally, construction of the onshore export cable route could convert some shrub or forested areas to herbaceous areas, potentially resulting in a beneficial effect to monarch butterfly by creating suitable habitat.

5.4. Sea Turtles (Loggerhead Sea Turtle, Green Sea Turtle, Kemp's Ridley Sea Turtle)

5.4.1 Direct Effects

Because the National Oceanic and Atmospheric Administration, National Marine Fisheries Service and USFWS have shared jurisdiction for recovery and conservation of threatened and endangered sea turtles, this BA analyzes only those IPFs that would affect conservation and recovery of these animals on nesting beaches. Therefore, potential IPFs from the construction, operation, and decommissioning of the proposed Project with potential direct effects on sea turtles analyzed in this BA are the following:

- New Cable Emplacement/Maintenance

The likelihood of exposure to and significance of these potential effect mechanisms are evaluated in the following section.

5.4.1.1 New Cable Emplacement/Maintenance

Sea turtles in or near the Action Area would likely be foraging or migrating between foraging and nesting habitats. Prey items within the Action Area could include benthic species that could be affected by seabed disturbance associated with installation of the offshore export cables and inter-array cables. This disturbance would be short-term, and prey species would be expected to return to the area once the cables are installed. Similar levels of impact would be realized during cable maintenance. Because impacts during cable installation or maintenance would be temporary and localized, the effects of Project activities on sea turtles would be unlikely (discountable), and the size of any effect, were it to occur, would be too small to be measured or evaluated (insignificant).

Land disturbance could affect federally listed sea turtles if they were to occur in the vicinity of the Onshore Project elements during construction, O&M, and decommissioning, specifically in beach and

dune habitat around the offshore export cable landfall because this is where federally listed turtles have the potential to nest. However, Dominion Energy has committed to emplacement of the export cable transition from offshore to onshore using HDD trenchless drilling and the nearshore trenchless installation in the offshore direction would cross the duct of the existing CVOW Pilot Project, precluding the need for nearshore shallow-water crossings. This trenchless installation method would avoid the need to excavate the beach and dune system. The use of HDD is anticipated to eliminate most construction and decommissioning disturbance of the beach and dune habitat. In addition, VDWR restricts beach construction activities from May 1 to November 15 due to turtle nesting. Dominion Energy has sited the offshore export cable route corridor to avoid sensitive benthic habitats (including submerged aquatic vegetation) to minimize impacts on sea turtles, particularly juveniles (COP, Section 4.2; Dominion Energy 2022). As such, impacts on federally listed sea turtles resulting from the landfall location would be avoided and minimized. Therefore, because beach and dune habitat would be avoided and seasonal construction restrictions would be implemented, potential effects from land disturbance are extremely unlikely to occur (discountable) and the size of any impact, were it to occur, would be too small to be measured or evaluated (insignificant).

6. Effects Determinations

BOEM has concluded that the construction and O&M of the proposed Project would have ***no effect*** on the following species: Bermuda petrel, black-capped petrel, hawksbill sea turtle, and leatherback sea turtle. BOEM concluded the Project may affect all remaining ESA-listed threatened or endangered species under USFWS jurisdiction that may occur in the Action Area; however, the Proposed Action is ***not likely to adversely affect*** them. For the proposed tricolored bat, Section 7 requires BOEM to consult under a conference consultation if the Proposed Action would jeopardize the continued existence of the species. Based on the analysis, the proposed action would not jeopardize the continued existence of the species. Should the tricolored bat get listed at some point during the consultation process, BOEM would make a *not likely to adversely affect* determination for tricolored bat. These effect determinations are summarized by species in Table 6-1. Supporting rationale for the species with effect determinations of may affect, but not likely to adversely affect is summarized further below. There is no designated critical habitat for these species in the Action Area (see IPaC reports in Appendix A); therefore, the Proposed Action will have no effect on critical habitat.

Table 6-1 Effect Determination Summary for Threatened, Endangered, or Candidate Species that May Occur in the Action Area

Species	Status	Effect Determination
Mammals		
Indiana bat (*Myotis sodalis*)	E	***Not likely to adversely affect***
Northern long-eared bat (*Myotis septentrionalis*)	E	***Not likely to adversely affect***
Tricolored bat (*Perimyotis subflavus*)	P	***Would not jeopardize the continued existence of the species***
Birds		
Bermuda petrel (*Pterodroma cahow*)	E	***No effect***
Black-capped petrel (*Pterodroma hasitata*)	PT	***No effect***
Piping plover (*Charadrius melodus*)	T	***Not likely to adversely affect***

Species	Status	Effect Determination
Rufa red knot (*Calidris canutus rufa*)	T	***Not likely to adversely affect***
Insects		
Monarch butterfly (*Danaus plexippus*)	C	***Not likely to adversely affect***
Reptiles		
Loggerhead sea turtle (*Caretta caretta*)	T	***Not likely to adversely affect***
Green sea turtle (*Chelonia mydas*)	T	***Not likely to adversely affect***
Kemp's ridley sea turtle (*Lepidochelys kempii*)	E	***Not likely to adversely affect***
Leatherback sea turtle (*Dermochelys coriacea*)	E	***No effect***
Hawksbill sea turtle (*Eretmochelys imbricata*)	E	***No effect***

Status Codes: E = ESA-listed Endangered; T = ESA-listed Threatened; C = Candidate for ESA-listing; PT = Proposed Threatened

6.1. Bats (Indiana Bat, Northern Long-eared Bat, Tricolored Bat)

Given that the Indiana bat, northern long-eared bat, and tricolored bat have been documented in the vicinity of the Onshore Project area, the proposed Project may affect the Indiana bat, northern long-eared bat, or the tricolored bat, with the greatest level of potential impact occurring during installation of the onshore export cables and substation. Dominion Energy will conduct pre-construction presence/absence surveys for bats (acoustic and/or mist-net) along the interconnection cable route and develop avoidance and minimization measures in coordination with the VDWR, USFWS, and appropriate regulatory agencies to ensure protection of northern long-eared bats to minimize and avoid direct impacts. Incidental take of Indiana bat, northern long-eared bat, or tricolored bat due to the proposed Project would thus be excepted from take prohibitions in Section 9 of the ESA. Indirect impacts on Indiana bat, northern long-eared bat, and tricolored bat habitat would be negligible. Furthermore, there is little to no risk that Indiana bats, northern long-eared bats, or tricolored bats would collide with wind turbines because the species are not expected to occur within the offshore portion of the Action Area. For these reasons, BOEM anticipates that the Proposed Action ***may affect, but is not likely to adversely affect*** Indiana bat, northern long-eared bat, and tricolored bat.

For the proposed tricolored bat, Section 7 requires BOEM to consult under a conference consultation if the Proposed Action would likely jeopardize the continued existence of the species. Based on the analysis, the Proposed Action would not jeopardize the continued existence of the species. Should the tricolored bat get listed at some point during the consultation process, BOEM would make a *not likely to adversely affect* determination for the tricolored bat for the same reasons described for the northern long-eared bat.

6.2. Birds (Piping Plover, Rufa Red Knot, Roseate Tern)

Based on the analysis in Section 5, the construction, O&M, and eventual decommissioning of the proposed onshore facilities may affect piping plovers, rufa red knots, or roseate terns. Any effects would be discountable based on the facts that: (1) these species do not have a high risk of collision with offshore

wind turbines and are rarely expected to occur within the RSZ; (2) impacts to potential habitat in onshore areas would be temporary and insignificant, (3) all suitable nesting or foraging habitat in areas proposed to be disturbed would be surveyed and species monitoring plans would be developed, (4) most affected habitat already experiences relatively high levels of existing disturbance; and (5) potential impacts would be localized and short-term in nature, including noise. Therefore, BOEM anticipates that the Proposed Action ***may affect, but is not likely to adversely affect*** piping plover, rufa red knot, and roseate tern.

6.3. Monarch Butterfly

Based on the developed urban and suburban character of the majority of the Action Area, the monarch butterfly's specific habitat preferences, and considering avoidance measures and post-construction habitat restoration, the potential effects on monarch butterfly would be insignificant. Therefore, BOEM anticipates that while the Proposed Action ***may affect, but is not likely to adversely affect*** monarch butterfly.

6.4. Sea Turtles (Loggerhead Sea Turtle, Green Sea Turtle, Kemp's Ridley Sea Turtle)

Based on the analysis in Section 5, the construction, O&M, and eventual decommissioning of the proposed onshore facilities may affect loggerhead sea turtles, green sea turtles, and Kemp's ridley sea turtles. Any effects would be discountable based on the facts that: (1) there is a lack of sensitive life stage of sea turtles present in the Action Area; (2) impacts on potential habitat would be temporary and insignificant; (3) impacts on beach and dune habitat would be avoided and seasonal construction restrictions would be implemented; and (4) potential impacts would be localized and short term in nature. Therefore, BOEM anticipates that the Proposed Action ***may affect, but is not likely to adversely affect*** loggerhead sea turtle, green sea turtle, and Kemp's Ridley sea turtle.

7. Avoidance, Minimization, and Mitigation Measures

This section outlines the standard operating conditions that are part of the Proposed Action that could minimize or eliminate potential impacts on federally listed species. The measures that Dominion Energy has proposed specific to birds and bats are listed in Table 7-1. Although no measures specific to monarch butterflies are identified, the following measures are intended to minimize impact to terrestrial species and onshore habitat, including the monarch butterfly and other protected species:

Vegetation removal associated with installation of all Onshore Project Components. Construction activities would include belowground installation of cables, overhead installation of transmission cables, nearshore trenchless installation and HDD work areas, site clearing and grading, and work-yard areas for staging of equipment and supplies. On-site and adjacent vegetation would be temporarily impacted until construction activities are completed.

In order to avoid, minimize, and/or mitigate potential impacts, the following measures would be employed:

- Dominion Energy would collocate/site onshore project components in or adjacent to existing ROWs, existing roads, previously disturbed areas, and other urbanized locations to the maximum extent practicable;
- Dominion Energy would seed and stabilize construction areas involving temporary vegetation clearing with an appropriate grass seed mix (in urban areas) or native seed mix (in natural areas) and in accordance with Virginia Erosion and Sediment Control Law and Regulations (VDEQ 2017) and the Virginia Erosion and Sediment Control; Handbook (VDEQ 2022);
- Dominion Energy would prepare and submit a mitigation planting plan to The City of Virginia Beach for approval to address unavoidable temporary impacts that would occur within sensitive ecological areas (such as within the Southern Rivers Watershed). The City of Virginia Beach may require native plantings; and
- Dominion Energy would plant or seed larval host plants and forage plants in the interconnection cable route after construction efforts have been completed in order to avoid and minimize impacts to pollinator species. A list of regionally appropriate species as well as regional suppliers of native seed mixes are available from the U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS 2020).

A full list of Dominion Energy's proposed measures for avoiding, minimizing, reducing, eliminating, and monitoring environmental impacts are presented in COP Table ES-1 (Dominion Energy 2022). Additional conditions, including mitigation, monitoring, or reporting measures, may be included in any BOEM-issued lease or other authorization, including those resulting from the ESA Section 7 consultation process.

BOEM considered additional avoidance and minimization measures that could further reduce potential effects of the Proposed Action on ESA-listed animals and plants during the development of this BA. These potential measures are listed in Table 7-2. Some or all of these measures may be required as a result of ESA Section 7 consultation with USFWS. Any measures imposed through consultations will be included in the Final BA. The additional measures presented in Table 7-2 may not all be within BOEM's statutory and regulatory authority to require; however, other jurisdictional governmental agencies may potentially require them. BOEM may choose to incorporate one or more additional measures in the record of decision on the Final EIS and adopt those measures as conditions of COP approval.

Table 7-1 Summary of Avoidance, Minimization, and Mitigation Measures Specific to Birds and Bats

Project Stage	Location	Impact	Avoidance, Minimization, and Mitigation
Construction; Decommissioning	Offshore Project area	• Short-term attraction to, and potential collision with, Project-related vessels, and partially installed Offshore Project Components • Short-term disturbance of, and displacement from, offshore habitat	• To mitigate impacts from lighting, Dominion Energy would use best management practices (BMPs) identified by the BOEM COP guidelines and would comply with FAA and U.S. Coast Guard (USCG) requirements for lighting while, to the extent practicable, using lighting technology (e.g., low-intensity strobe lights) that minimize impacts on avian and bat species; and • Dominion Energy would document any dead or injured birds or bats found on Project vessels or structures during the construction stage of the Project and would submit an annual report to BOEM and USFWS (any birds found with federal bands will be reported to the U.S. Geological Survey [USGS] Bird Band Laboratory). Any occurrence of dead ESA birds or bats must be reported to BOEM, Bureau of Safety and Environmental Enforcement (BSEE), and USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and if practicable, carefully collect the dead specimen and preserve the material in the best possible state (BOEM requirement).
Construction; Decommissioning (continued).	Onshore Project area	• Disturbance of, and displacement from, onshore habitat	• Dominion Energy would avoid potential effects to birds and bats by using trenchless installation techniques in coastal areas at the cable landing location; collocating the onshore export cable route with existing roads as much as possible; and timing construction activities to avoid critical periods when endangered and threatened species may be affected to the extent practicable; • The Harpers or Chicory switching stations would be constructed within either previously developed areas associated with an existing golf course or small areas of mixed forest and woody wetland. Some tree and vegetation clearing will be required, but will be minimized to the extent practicable; • To the extent practicable, Dominion Energy would collocate the interconnection cable route within or adjacent to existing transmission line corridors and rights-of-way as much as possible, timing construction activities to avoid critical periods when endangered and threatened species may be affected; • Tree/vegetation clearing would avoid trees favorable for bat maternity roosting locations and would be conducted outside of the breeding/roosting season to avoid nesting birds and bat maternity roosting locations to the extent practicable; • Dominion Energy will conduct presence/absence surveys for bats (acoustic and/or mist-net) along the Onshore Project area, pursuant to discussions with VDWR, USFWS, and appropriate regulatory agencies beginning in May 2022 and approval of a bat survey plan; • Dominion Energy conducted an eagle/osprey/raptor/owl nest survey along the interconnection cable route in March 2022 along the Onshore Project area, pursuant to discussions with VDWR, USFWS, and appropriate regulatory agencies; • Where surveys indicate the presence of species of conservation concern, Dominion

Project Stage	Location	Impact	Avoidance, Minimization, and Mitigation
			Energy would work with the VDWR and USFWS to minimize potential impacts prior to construction; • Dominion Energy will conduct presence/absence surveys for bats (acoustic and/or mist-net) along the interconnection cable route and develop avoidance and minimization measures in coordination with the VDWR, USFWS, and appropriate regulatory agencies to ensure protection of Indiana bats and northern long-eared bats. • Dominion Energy would develop avoidance and minimization measures in coordination with the VDWR, USFWS, and appropriate regulatory agencies to ensure protection of threatened and endangered species or to address the potential for incidental take, that may occur within the Project area; and • Dominion Energy would ensure avoidance, minimization, and mitigation measures protective of wetlands, vegetation, and other wildlife species discussed in COP Section 4.2.1, *Wetlands and Waterbodies*, and COP Section 4.2.2, *Terrestrial Vegetation and Wildlife*, also would be protective of bird and bat species and their habitats.
Operations and Maintenance	Offshore Project area	• Long-tern risk of collision with Wind Turbines Generators (WTGs) and Offshore Substations • Long-term displacement from the Lease Area due to presence of WTGs and Offshore Substations • Long-term attraction to and displacement from Project-related maintenance vessels	• To mitigate the potential for collision with WTGs and OSSs during the O&M stage of the Project, Dominion Energy would use BMPs identified by BOEM COP guidelines and comply with FAA and USCG requirements for lighting and, to the extent practicable, use lighting technology (e.g., low-intensity strobe lights, flashing red aviation lights) that minimize impacts on bat species • To continue the advancement of the understanding of avian and bat activity in the offshore environment, Dominion Energy will continue operation of one Acoustic Thermographic Offshore Monitoring system (ATOM™) two additional years to inform the development of the CVOW-C Project as the CVOW Pilot WTGs are installed adjacent to the west side of the CVOW-C lease; • Dominion Energy will provide Motus Wildlife Tracking tags to the USFWS, which is currently studying the movements of piping plovers in the region. The specific deployment location will be determined in consultation with the USFWS; • Dominion Energy will purchase Satellite Tags to be attached to red knots (*Calidris canutus*; rufa subspecies). These tags will provide accurate data on Rufa red knot movements onshore, offshore, and flight heights that can be related to weather data. The deployment location will be determined in consultation with USFWS; • Dominion Energy upgraded the Motus network/antennas on both CVOW Pilot WTG platforms to a “dual-mode” (166 and 434 megahertz [MHz]) system with one station prioritized for 434 MHz and the other prioritized for 166 MHz in accordance with the updated USFWS guidance document. This antenna upgrade increases the monitoring range from approximately 1 mile (2 kilometers) to approximately 9 miles (15 kilometers) and will remain in place for 2 years; • Dominion Energy would reduce perching opportunities on offshore structures to the extent practicable and, where possible, in compliance with health and safety requirements for the WTGs and Offshore Substations; • Dominion Energy would develop a robust postconstruction monitoring plan with clear

Project Stage	Location	Impact	Avoidance, Minimization, and Mitigation
			goals, monitoring questions, and methods, including monitoring that focuses on areas of uncertainty such as bird and bat presence offshored, and would install automated radio telemetry receiver stations (i.e., Motus towers) on select offshore structures; • Dominion Energy would document any dead or injured birds or bats found on Project vessels or infrastructure (offshore and onshore) during construction, O&M, or decommissioning, in an annual report submitted to BOEM and USFWS (any birds found with federal bands would be reported to the USGS Bird Band Laboratory); Any occurrence of dead ESA birds or bats must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and if practicable, carefully collect the dead specimen and preserve the material in the best possible state (BOEM requirement). • Dominion Energy would limit risks of long-term displacement of offshore bird species, to the extent practicable; and • Potential impacts would be further minimized by reducing lighting on O&M vessels to the extent practicable.
Operations and Maintenance (continued)	Onshore Project area	• Long-term risk of collision with overhead Interconnection Cables • Long-term displacement from onshore habitat at Onshore Project Components	• Dominion Energy would reduce potential impacts of the overhead lines by complying with Avian Power Line Interaction Committee (https://www.aplic.org/) best practices to reduce collision and electrocution.

Source: Dominion Energy 2022.

Table 7-2 Additional Measures Proposed to Avoid and Minimize Potential Effects of the Proposed Action

No.	Description
1.a.	To minimize attracting birds to operating turbines, Dominion Energy must install bird perching-deterrent devices on WTGs and OSSs. The location of bird-deterrent devices must be proposed by Dominion Energy based on best management practices applicable to the appropriate operation and safe installation of the devices. Dominion Energy must confirm the locations of bird perching-deterrent devices with a monitoring plan to track the efficacy of the deterrents as part of the as-built documentation it must submit with the FDR.
1.b.	Dominion Energy must use an FAA-approved vendor for the Aircraft Detection Lighting System (ADLS), which will activate the FAA hazard lighting only when an aircraft is in the vicinity of the wind facility to reduce visual impacts at night. Dominion Energy must confirm the use of an FAA-approved vendor for ADLS on WTGs and OSSs in the FDR. (Tentative)
1.c.	Dominion Energy must light each WTG and OSS in a manner that is visible by mariners in a 360-degree arc around the WTG and OSS. To minimize the potential of attracting migratory birds, the top of each light shall be shielded to minimize upward illumination (Conditional on USCG approval).
2	BOEM will require that Dominion Energy develops and implements a Post-Construction Monitoring [PCM] plan based on Dominion Energy's Proposed Bird and Bat Monitoring Framework in coordination with USFWS and other relevant regulatory agencies. Annual monitoring reports will be used to determine the need for adjustments to monitoring approaches, consideration of new monitoring technologies, and/or additional periods of monitoring. Prior to commencing offshore construction activities, Dominion Energy must submit the PCM for BOEM and USFWS review. BOEM and USFWS will review the PCM and provide any comments on the plan within 30 calendar days of its submittal. Dominion Energy must resolve all comments on the PCM to BOEM and USFWS's satisfaction before implementing the plan. a. Monitoring. Dominion Energy must conduct monitoring as outlined in Dominion Energy's Proposed Bird and Bat Monitoring Framework, which will include acoustic monitoring of bat presence, the use of motus receivers and tags to monitor bird and bat movements, and others TBD. b. Annual Monitoring Reports. Dominion Energy must submit to BOEM (at renewable_reporting@boem.gov), USFWS, and BSEE (at OSWSubmittals@bsee.gov) a comprehensive report after each full year of monitoring (pre- and post-construction) within 6 months of completion of the last avian survey. The report must include all data, analyses, and summaries regarding ESA-listed and non-ESA-listed birds and bats. BOEM, USFWS, and BSEE will use the annual monitoring reports to assess the need for reasonable revisions (based on subject matter expert analysis) to the PCM. BOEM, BSEE, and USFWS reserve the right to require reasonable revisions to the PCM and may require new technologies as they become available for use in offshore environments. c. Post-Construction Quarterly Progress Reports. Dominion Energy must submit quarterly progress reports during the implementation of the PCM to BOEM (at renewable_reporting@boem.gov) and the USFWS by the 15th day of the month following the end of each quarter during the first full year that the Project is operational. The progress reports must include a summary of all work performed, an explanation of overall progress, and any technical problems encountered. d. Monitoring Plan Revisions. Within 15 calendar days of submitting the annual monitoring report, Dominion Energy must meet with BOEM and USFWS to discuss the following: the monitoring results; the potential need for revisions to the PCM, including technical refinements or additional monitoring; and the potential need for any additional efforts to reduce impacts. If BOEM or USFWS determines after this discussion that revisions to the PCM are necessary, BOEM may require Dominion Energy to modify the PCM. If the reported monitoring results deviate substantially from the impact analysis included in the

No.	Description
	Final BA, Dominion Energy must transmit to BOEM recommendations for new mitigation measures and/or monitoring methods. e. Operational Reporting (Operations). Dominion Energy must submit to BOEM (at renewable_reporting@boem.gov) and BSEE (at OSWSubmittals@bsee.gov) an annual report summarizing monthly operational data calculated from 10-minute SCADA data for all turbines together in tabular format: the proportion of time the turbines were operational (spinning at >x rpm) each month, the average rotor speed (monthly revolutions per minute (rpm)) of spinning turbines plus 1 standard deviation, and the average pitch angle of blades (degrees relative to rotor plane) plus 1 standard deviation. BOEM and BSEE will use this information as inputs for avian collision risk models to assess whether the results deviate substantially from the impact analysis included in the Final BA. f. Raw Data. The Lessee must store the raw data from all avian and bat surveys and monitoring activities according to accepted archiving practices. Such data must remain accessible to BOEM, BSEE and USFWS, upon request for the duration of the Lease. The Lessee must work with BOEM to ensure the data are publicly available. The USFWS may specify third-party data repositories that must be used, such as the Motus Wildlife Tracking System or MoveBank, and such parties and associated data standards may change over the duration of the monitoring plan.
3	Dominion Energy must provide an annual report to BOEM and USFWS documenting any dead (or injured) birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the United States Geological Survey Bird Band Laboratory, available at https://www.pwrc.usgs.gov/bbl/. Any occurrence of a dead ESA-listed bird or bat must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and, if practicable, the dead specimen will be carefully collected and preserved in the best possible state.
4	To minimize potential impacts to northern long-eared bats and Indiana bats, which may be present year-round, Dominion Energy must (1) conduct surveys (mist-net) and (2) develop avoidance and minimization measures, possibly including time of year restrictions (pending the results of site-specific surveys) or potential waivers of such restrictions, in coordination with BOEM, USFWS, and VDWR.

8. References

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9. Appendices

Appendix A – USFWS Information for Planning and Consultation (IPaC) Threatened and Endangered Species Results

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032

In Reply Refer To:
Project Code: 2022-0081502
Project Name: CVOW-C Offshore Lease Area

September 01, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Project Code in the header of this

letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

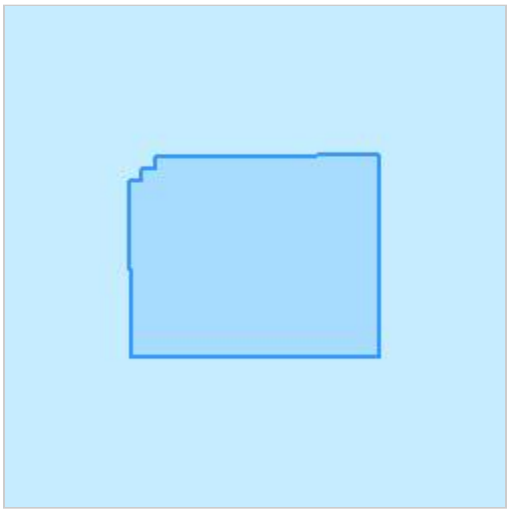
This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Project Code: 2022-0081502
Project Name: CVOW-C Offshore Lease Area
Project Type: Power Gen - Wind - Offshore
Project Description: Coastal Virginia Offshore Wind Commercial Project - Lease Area
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@36.9086106,-75.35023650301888,14z



Counties:

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Roseate Tern *Sterna dougallii dougallii* Population: Northeast U.S. nesting population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2083	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Black Scoter *Melanitta nigra* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Black-legged Kittiwake *Rissa tridactyla* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

NAME	BREEDING SEASON
Brown Pelican *Pelecanus occidentalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6034	Breeds Jan 15 to Sep 30
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31
Cory's Shearwater *Calonectris diomedea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Dovekie *Alle alle* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6041	Breeds elsewhere
Manx Shearwater *Puffinus puffinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 15 to Oct 31
Red-necked Phalarope *Phalaropus lobatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Ring-billed Gull *Larus delawarensis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Royal Tern *Thalasseus maximus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 31
Surf Scoter *Melanitta perspicillata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

NAME	BREEDING SEASON
White-winged Scoter *Melanitta fusca* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Wilson's Storm-petrel *Oceanites oceanicus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

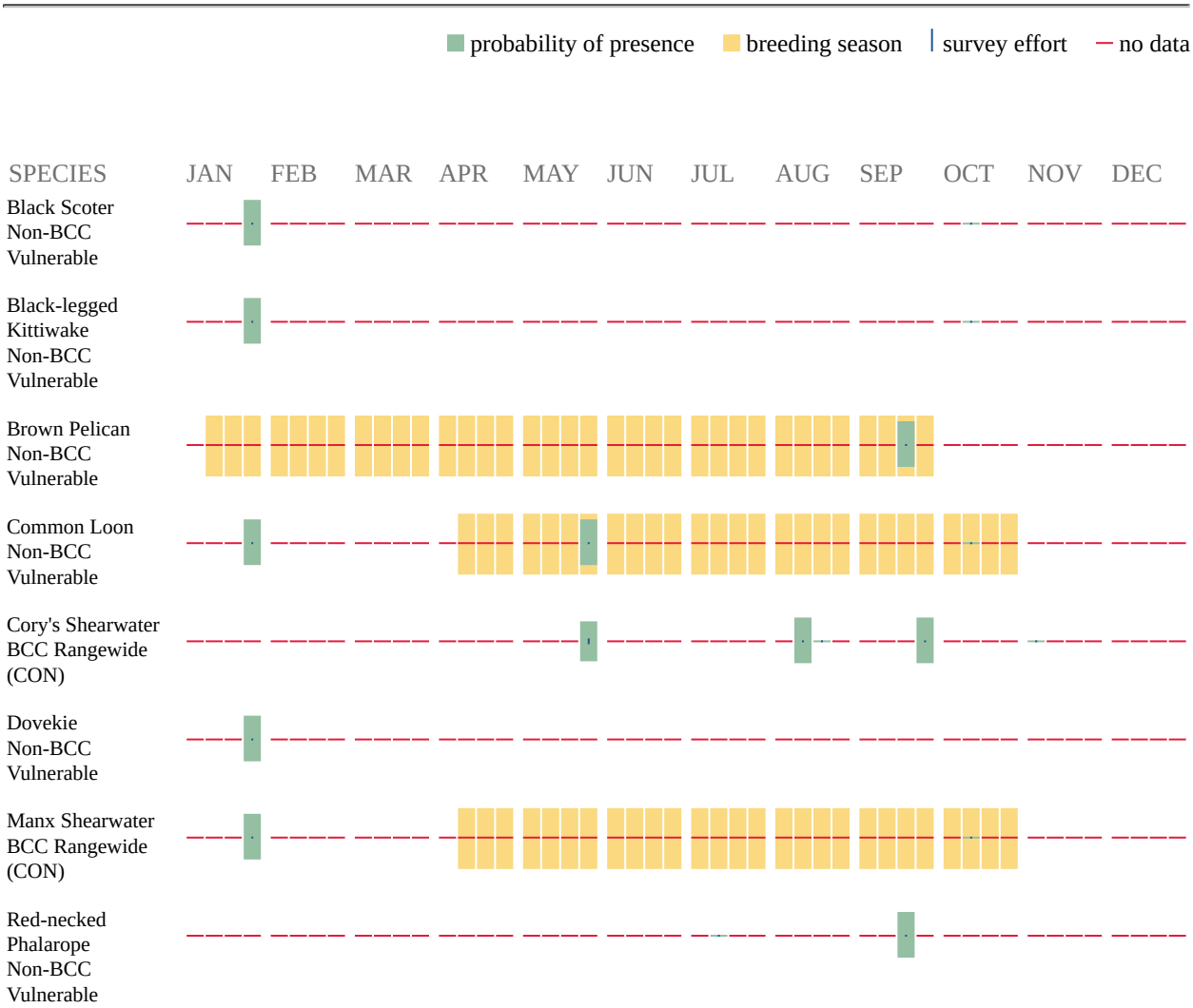
Breeding Season (■)

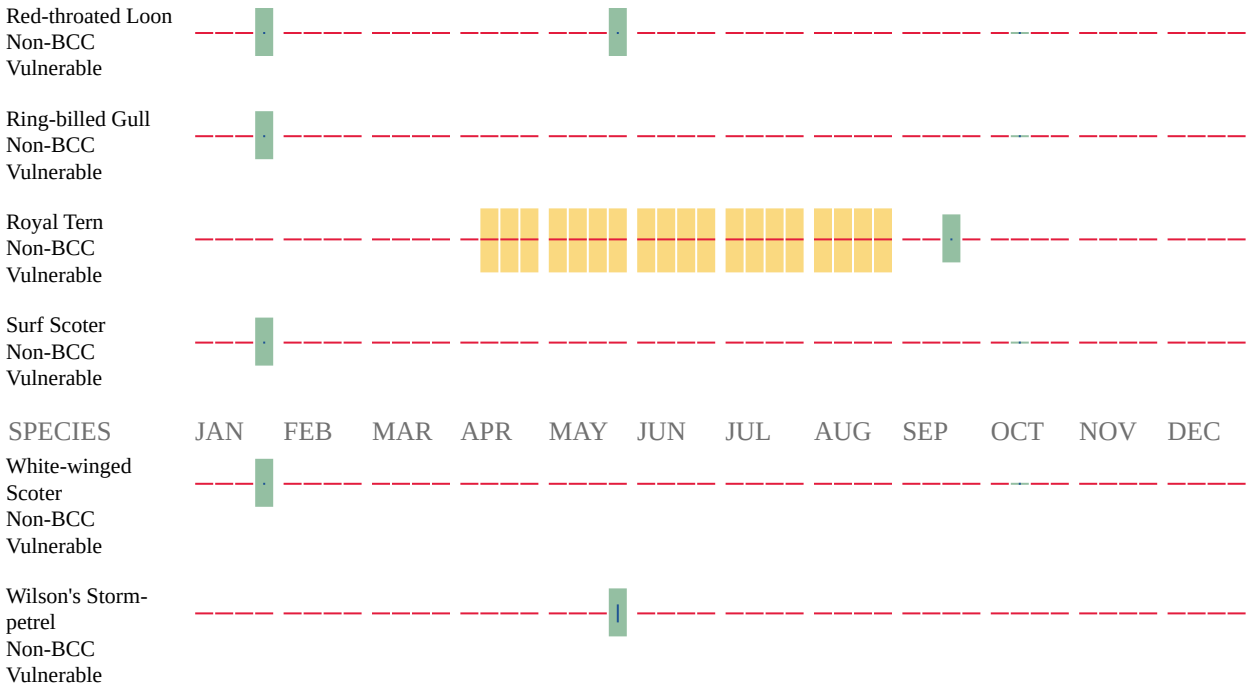
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

IPaC User Contact Information

Agency: Bureau of Ocean Energy Management
Name: Alex Bartlett
Address: 14123 Denver West Parkway, Ste. 100
City: Golden
State: CO
Zip: 80401
Email alex.bartlett@icf.com
Phone: 3037927827

Lead Agency Contact Information

Lead Agency: Bureau of Ocean Energy Management

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032

In Reply Refer To:
Project Code: 2022-0081510
Project Name: CVOW-C Offshore Export Cable

September 01, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Project Code in the header of this

letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

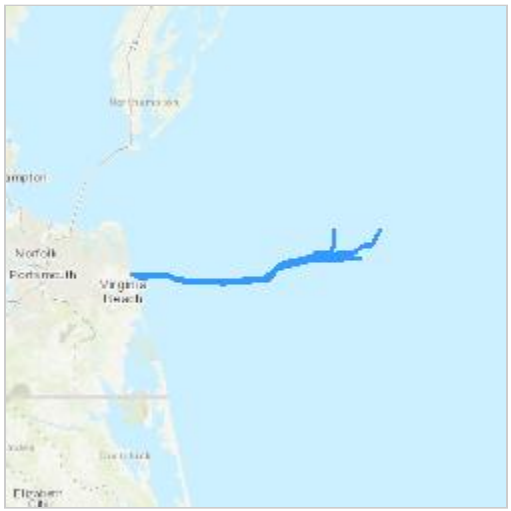
This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Project Code: 2022-0081510
Project Name: CVOW-C Offshore Export Cable
Project Type: Transmission Line - New Constr - Below Ground
Project Description: Coastal Virginia Offshore Wind Commercial Project offshore export cable
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@36.8569008,-75.45495631963868,14z



Counties: Virginia Beach County, Virginia

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032

In Reply Refer To:
Project Code: 2022-0081502
Project Name: CVOW-C Offshore Lease Area

September 01, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

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A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

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We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Project Code in the header of this

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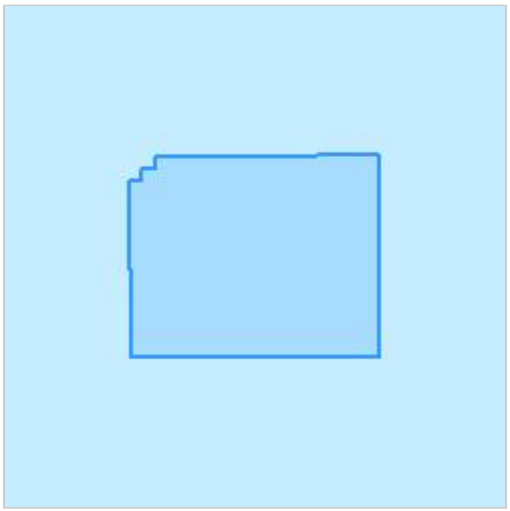
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Project Code: 2022-0081502
Project Name: CVOW-C Offshore Lease Area
Project Type: Power Gen - Wind - Offshore
Project Description: Coastal Virginia Offshore Wind Commercial Project - Lease Area
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@36.9086106,-75.35023650301888,14z



Counties:

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Roseate Tern *Sterna dougallii dougallii* Population: Northeast U.S. nesting population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2083	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

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2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Black Scoter *Melanitta nigra* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Black-legged Kittiwake *Rissa tridactyla* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

NAME	BREEDING SEASON
Brown Pelican *Pelecanus occidentalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6034	Breeds Jan 15 to Sep 30
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31
Cory's Shearwater *Calonectris diomedea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Dovekie *Alle alle* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6041	Breeds elsewhere
Manx Shearwater *Puffinus puffinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 15 to Oct 31
Red-necked Phalarope *Phalaropus lobatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Ring-billed Gull *Larus delawarensis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Royal Tern *Thalasseus maximus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 31
Surf Scoter *Melanitta perspicillata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

NAME	BREEDING SEASON
White-winged Scoter *Melanitta fusca* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Wilson's Storm-petrel *Oceanites oceanicus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

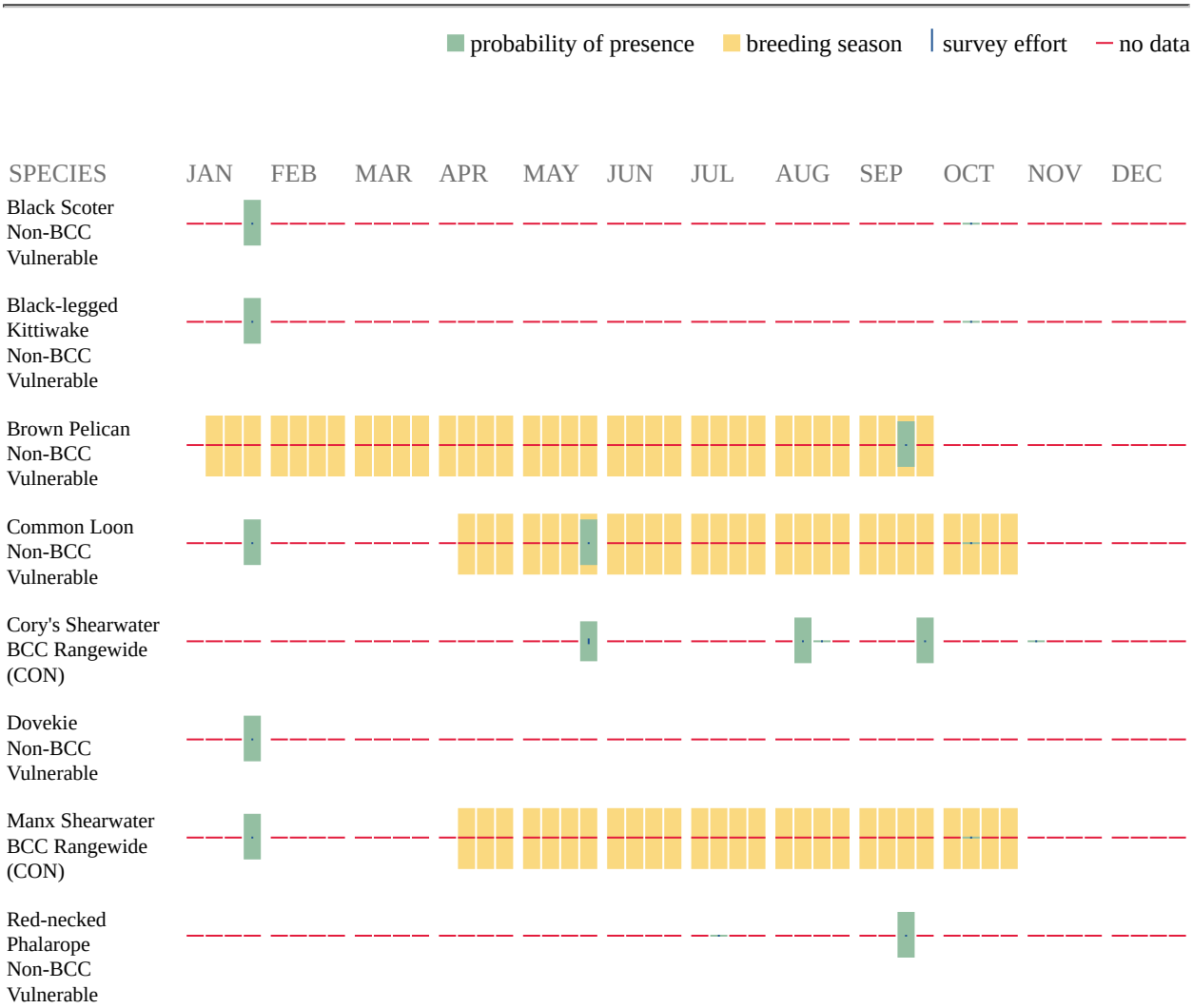
Breeding Season (■)

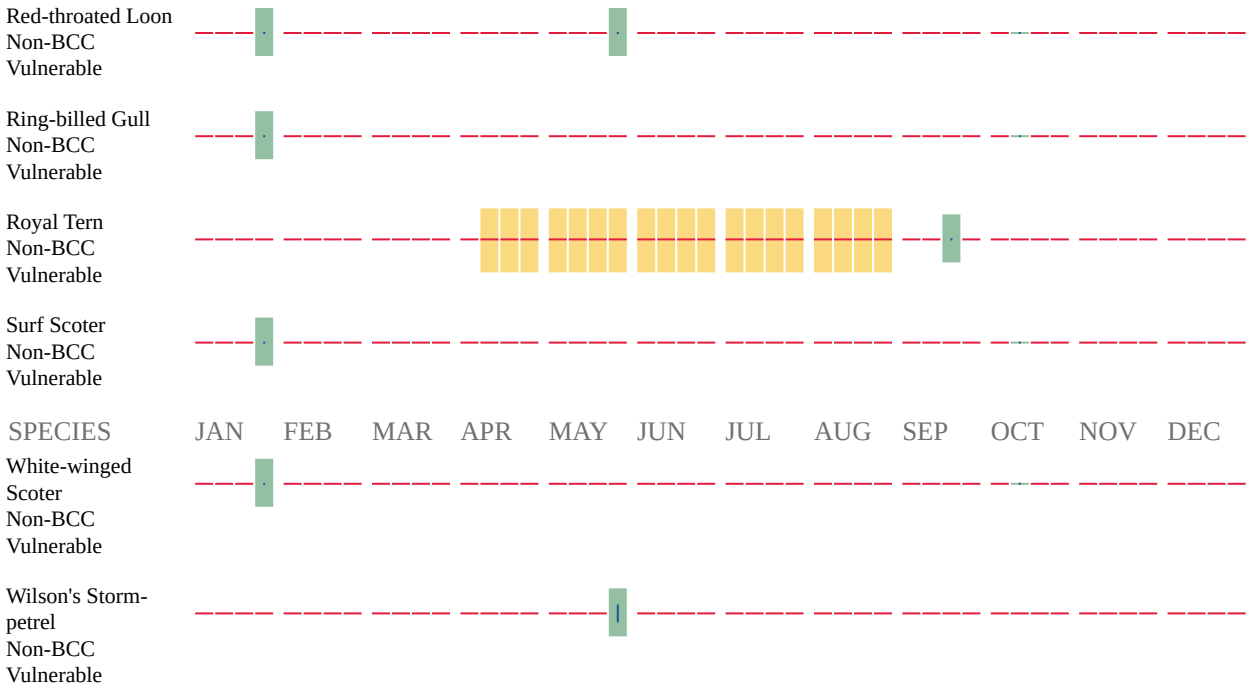
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

IPaC User Contact Information

Agency: Bureau of Ocean Energy Management
Name: Alex Bartlett
Address: 14123 Denver West Parkway, Ste. 100
City: Golden
State: CO
Zip: 80401
Email alex.bartlett@icf.com
Phone: 3037927827

Lead Agency Contact Information

Lead Agency: Bureau of Ocean Energy Management

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032

In Reply Refer To:
Project Code: 2022-0081510
Project Name: CVOW-C Offshore Export Cable

September 01, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Project Code in the header of this

letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

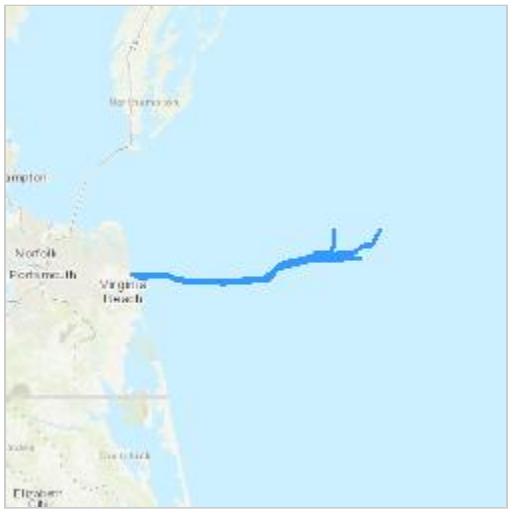
This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Project Code: 2022-0081510
Project Name: CVOW-C Offshore Export Cable
Project Type: Transmission Line - New Constr - Below Ground
Project Description: Coastal Virginia Offshore Wind Commercial Project offshore export cable
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@36.8569008,-75.45495631963868,14z



Counties: Virginia Beach County, Virginia

Endangered Species Act Species

There is a total of 10 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Roseate Tern *Sterna dougallii dougallii* Population: Northeast U.S. nesting population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2083	Endangered

Appendix B – Dominion Energy CVOW Commercial - Avian and Bat Work Plan

AVIAN AND BAT WORK PLAN
Addendum
Coastal Virginia Offshore Wind Commercial Project

Prepared for:

Dominion Energy®

707 East Main Street
Richmond, Virginia 23219

Prepared by:

TETRA TECH

Tetra Tech, Inc.
4101 Cox Road, Suite 120
Glen Allen, VA 23060
www.tetratech.com

bri

Biodiversity Research Institute
276 Canco Road
Portland, ME 04103

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1 INTRODUCTION

Virginia Electric and Power Company, d/b/a Dominion Energy Virginia (Dominion Energy), submits this Avian and Bat Work Plan Addendum (Work Plan Addendum) in support of the Coastal Virginia Offshore Wind (CVOW) Commercial Project (the Project; Figure 1). Characterization of avian and bat resources is required by the U.S. Department of Interior's Bureau of Ocean Energy Management (BOEM) to support regulatory filings for renewable energy projects proposed on the Atlantic OCS (30 Code of Federal Regulations [CFR] § 585.627[3]).

In July 2020, Dominion Energy submitted an Avian and Bat Work Plan to BOEM, which included avian and bat characterization studies designed to facilitate a thorough understanding of existing conditions, inform project design and development, and inform an assessment of potential effects on biological resources resulting from the construction and operation of proposed offshore project facilities (i.e., wind turbine generators, offshore substations and supporting structures). In the time since the Avian and Bat Work Plan was submitted, onshore Interconnection Cable Routes were added to the Project to transport the energy from the Switching Station to the final point of interconnection at Fentress Substation, Dominion Energy received additional feedback from government agencies and stakeholders, and several studies have commenced. In the October 2021 Construction and Operations Plan (COP) revision, Dominion Energy submitted an updated Avian and Bat Risk Assessment and 2020–2021 Offshore Bat Acoustic Surveys were summarized. The COP described the avian and bat species (and their habitats) known or expected to be present, to traverse, or to incidentally occur throughout and around the Project Area. Potential impacts to avian and bat resources resulting from construction, operations and maintenance (O&M), and decommissioning of the Project were also discussed in the COP, as well as avoidance, minimization, and mitigation measures.

There are currently six Interconnection Cable Route alternatives under consideration for the Project, only one of which will be selected for construction. As such, this Work Plan Addendum focuses on the three most likely Interconnection Cable Route alternatives under consideration, which include Interconnection Cable Route alternatives one, three, and six (Figure 2). This Avian and Bat Work Plan Addendum describes the next steps required to characterize avian and bat resources and addresses the feedback that was received from government agencies and stakeholders. Detailed study plans have been developed as needed.

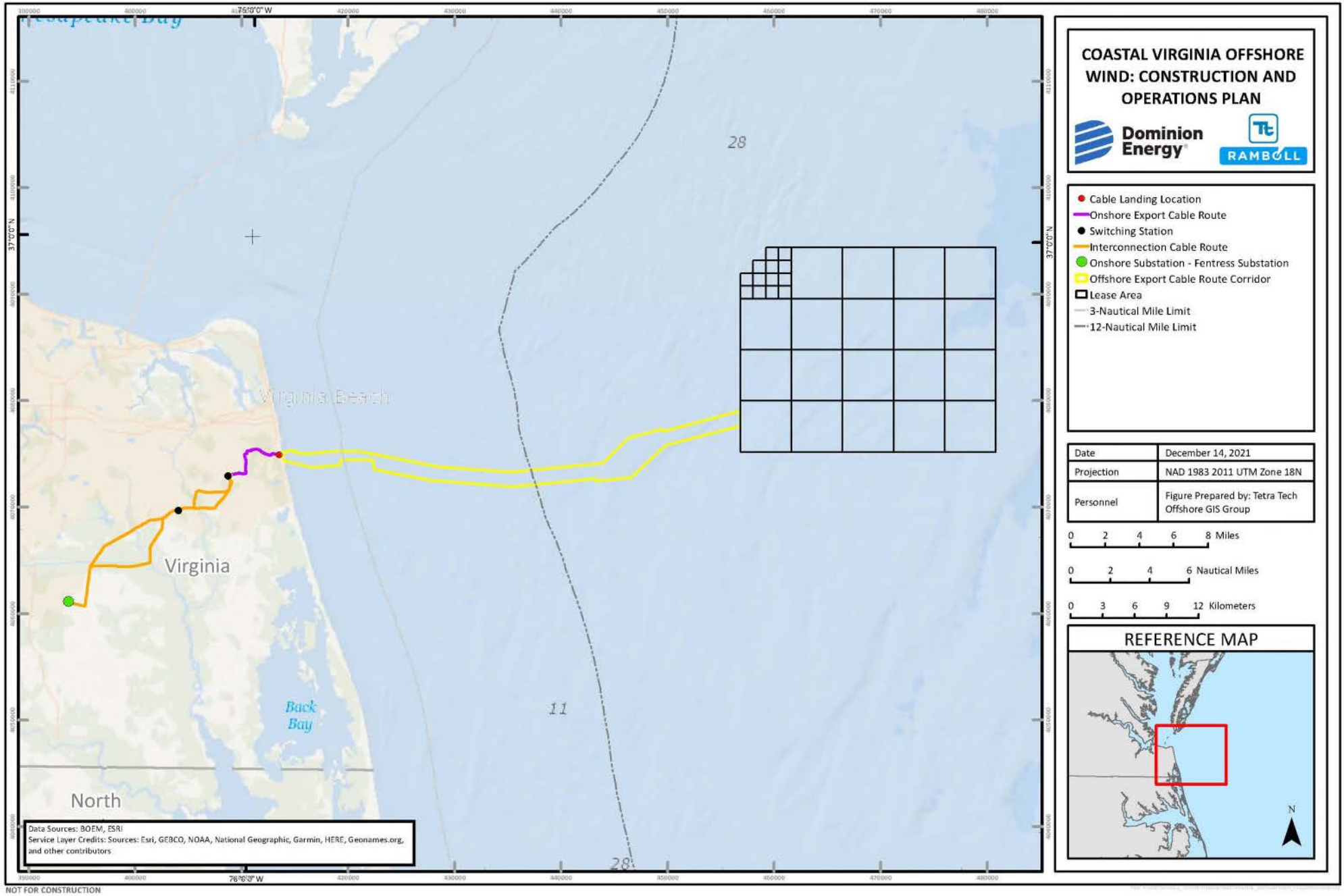

Figure 1. CVOW Commercial Project Overview.

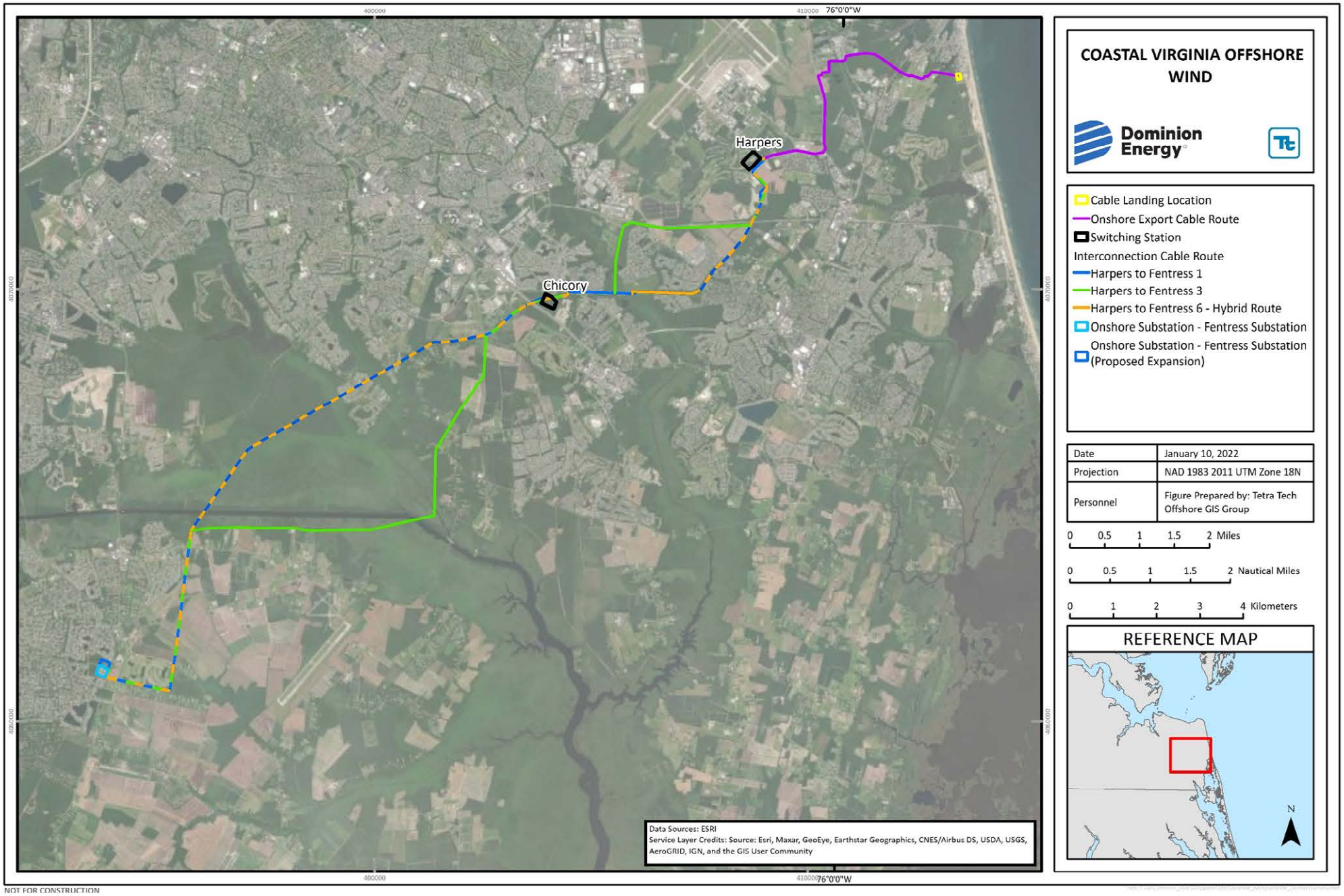

Figure 2. CVOW Commercial Project Onshore Survey Area.

2 AGENCY CONSULTATION

Dominion Energy views the continued development of the Avian and Bat Work Plan as a collaborative process in which Dominion Energy works with BOEM, U.S. Fish and Wildlife Service (USFWS), the Virginia Department of Wildlife Resources (DWR) and, to the extent practicable, the Navy and other stakeholders to ensure the design and execution of an appropriately scaled plan. Agency consultation related to birds and bats are summarized below.

- **July 2020**: Dominion Energy submitted an Avian and Bat Work Plan to BOEM.
- **February 2, 2021**: Dominion Energy received a letter from DWR with bird and bat survey recommendations for the Offshore Project Area.
- **April 14, 2021**: Dominion Energy met with USFWS to discuss study topics and next steps for the Offshore Project Area.
- **October 2021**: Dominion Energy submitted a revised COP to BOEM, which included an updated Avian and Bat Risk Assessment and a summary of the 2020–2021 Offshore Bat Acoustic Surveys.
- **January 28, 2022**: Dominion Energy submitted a draft Avian and Bat Work Plan Addendum to BOEM, USFWS, DWR, and the Navy.
- **February 15, 2022**: Navy provided feedback on the draft Avian and Bat Work Plan Addendum.
- **February 17, 2022**: Dominion Energy held an Avian and Bat Work Plan Agency Review meeting with BOEM, USFWS, and DWR.
- **February 21, 2021**: Dominion Energy submitted an Avian Survey Plan to the Navy to describe field surveys to assess potential impacts to sensitive bird species that may occur within the Onshore Export Cable Route Corridor as it pertains to Navy-owned properties from the Cable Landing Location to the Harpers Switching Station.
- **February 22, 2022**: An updated official species list for the Onshore Project Area was generated using the USFWS Information for Planning and Consultation (IPaC) online system.
- **February 25, 2022**: The Navy provided feedback on the Avian Survey Plan.
- **March 1, 2022**: Dominion Energy submitted a revised Avian Survey Plan to the Navy.
- **March 7, 2022**: USFWS reviewed the notes from the Avian and Bat Work Plan Agency Review meeting and provided written comments and recommendations.
- **March 8, 2022**: Tom Wittig, the USFWS Northeast Eagle Coordinator, approved Tetra Tech's protocol for aerial eagle surveys in the Onshore Project Area.
- **March 10, 2022**: DWR submits written comments about the Avian and Bat Work Plan to Dominion Energy.
- **March 18, 2022**: Tetra Tech submitted a Northern Long-eared Bat Study Plan to Sumalee Hoskin from the USFWS Virginia Field Office for review and approval.

- **March 22, 2022**: Dominion Energy held a conference call with Sumalee Hoskin from the USFWS Virginia Field Office and discussed surveys for bats and red-cockaded woodpecker in the Onshore Project Area.
- **April 21, 2022**: Dominion Energy submitted a Bat Survey Workplan to the Navy for review and approval.
- **May 11, 2022**: US Navy approves both the Bat Survey and Avian Survey plans.
- **May 19, 2022**: USFWS approves Northern Long-eared Bat Study Plan via email by Sumalee Hoskin.
- **June 16, 2022**: Dominion Energy held their bi-weekly call and provided an updated on the offshore radio-telemetry studies and equipment purchases. Due to supply chain issues, some of the studies will be pushed to 2023.

Dominion Energy has been hosting a bi-weekly Avian and Bat call with USFWS since February 2022, as additional agency consultation is ongoing for both the Offshore Project Area and Onshore Project Area. Dominion Energy will continue to coordinate with BOEM and other stakeholders on survey logistics (proposed Survey Area, dates, times, survey period length, weather limitations); field techniques and equipment; data acquisition systems; parameters to be measured; data processing, analysis, and interpretation; and report format. Detailed study plans will be developed and submitted to the appropriate agencies for review and approval and reports from completed studies will be submitted. This Avian and Bat Work Plan can be updated as necessary.

3 AVIAN AND BAT SURVEYS

The coastal and offshore waters and airspace of the Offshore Project Area include habitat where avian and bat species could be directly or indirectly affected by the construction, O&M, and decommissioning of the Project. Likewise, a variety of avian and bat species have the potential to occur within the Onshore Project Area throughout the year and could also be affected as described in the COP (Dominion Energy 2022). The following sections describe studies that will help further characterize the avian and bat resources within the Offshore Project Area and the Onshore Project Area (Table 1).

Table 1. Summary of Surveys and Recommended Actions to Advance Avian and Bat Surveys in Support of the CVOW Commercial Project.

Project Area	Survey	Recommended Time of Year for Conducting Study	Recommended Action(s)
Offshore	Motus Wildlife Tracking Station Upgrades CVOW Pilot Turbines	Continuous monitoring from Spring 2022 through Spring 2024	Consulting with USFWS for specific equipment upgrades and installation methods.
	Acoustic Thermographic Offshore Monitoring (ATOM™) Bird and Bat Data Collection systems	Continuous monitoring from Spring 2022 through Spring 2024	Continued operation of ATOM™ systems for 2 years. One system will be decommissioned and one will remain in place after summer 2022.
	Nanotags and Satellite Radio Telemetry	N/A	Consult with USFWS to determine equipment needs and where to deploy. • Purchase 40 Motus Wildlife Tracking nanotags for piping plover • Purchase 20 Pinpoint GPS Argos Satellite Tags manufactured by Lotek, or equivalent for Rufa red knot (smallest GPS transmitter for birds with precise GPS locations) Implement the Whimbrel study with The Nature Conservancy and Center for Conservation Biology. • Purchase 20 Pinpoint GPS Argos Satellite Tags manufactured by Lotek, or equivalent for Whimbrel
Onshore	Piping Plover Surveys	April–July	According to guidance from USFWS, piping plover surveys are not required for this Project.[1]
	Rufa Red Knot Surveys	March–May July–October	According to guidance from USFWS, Rufa red knot surveys are not required for this Project. [1]
	Breeding Bird Surveys	Mid-May–June	According to guidance from USFWS and DWR, breeding bird surveys are not required for this Project.
	Threatened and Endangered Habitat Surveys	May 15–August 15	See section 3.2.4.
	Aerial Nest Surveys	December 15–July 15	See section 3.2.5.
	Presence/Absence Bat Surveys	May 15–August 15	See section 3.2.6.
	Bat Acoustic Surveys	April 15 – April 14	See section 3.2.7.

[1] No field surveys are needed if Dominion Energy adheres to time of year restriction of March 1 to November 15.

3.1 Offshore

A diverse range of avian species may pass through the Offshore Project Area, including migrant birds, coastal, and marine birds according to Mid-Atlantic Baseline Studies (Figure 1; Dominion Energy 2022). While there is uncertainty on the specific movements of bats offshore in Virginia, bats have been documented in the marine environment in the U.S. (Dominion Energy 2022). The following studies will allow Dominion Energy to further characterize avian and bat resources in the Offshore Project Area.

3.1.1 Motus Tower Upgrades CVOW Pilot Project

Motus tower upgrades will be installed on both CVOW Pilot turbines within the Research Lease Area adjacent to the Project with a target in-service date prior to the fall 2022 migration season to detect tagged birds and bats in the vicinity of the Project. These detections provide data on the extent to which tagged federally listed species (and other tagged species) are migrating through the area, the timing of their exposure to Project impacts, the environmental conditions under which exposure occurs, and potentially, estimates of their flight heights. Dominion Energy plans to upgrade the current Motus network/antennas on both CVOW Pilot wind turbine generator (WTG) platforms to a "dual-mode" (166 and 434 MHz) system with one station prioritized for 434 MHz and the other prioritized for 166 MHz in accordance with the updated USFWS guidance document most recently provided to Dominion Energy on January 6, 2022. This upgrade will increase the monitoring range from approximately two kilometers to approximately 15 kilometers and will remain in place for two years, expected to begin summer 2022.

3.1.2 Acoustic Thermographic Offshore Monitoring (ATOM™) Bird and Bat Data Collection

Dominion Energy currently operates the only two Acoustic Thermographic Offshore Monitoring (ATOM™) Bird and Bat Data Collection systems in the world and are installed on the CVOW Pilot Research Lease WTG platforms. The ATOM™ collects thermographic, ultrasonic, and acoustic data and will continuously collect data, day and night, in all weather conditions, and in all seasons. For bats, the species, direction, speed, and altitude will be determined with the thermographic and acoustic data collected by ATOM™ systems. For birds, the species is identified by sound and measurements taken from the thermographic data. Each thermographic record includes the month, timestamp, altitude, direction, and speed. The thermographic and acoustic data together can determine how many birds are in a flock along with the date, time, and season.

The ATOM™ systems were originally installed in 2021 on the CVOW Pilot WTG platforms in accordance with the Research Activity Plan (RAP) approval by BOEM as part of the Post Construction Monitoring Plan (PCMP). The current PCMP compliance obligation ends on March 15, 2022. Once the MOTUS systems are upgraded, one of the ATOM™ systems will be decommissioned while the other system will remain in place for two more years to advance the understanding of avian and bat activity in the offshore environment. Data collected during the two additional years that the ATOM™ system is operational will inform the development of the CVOW Commercial Project as the CVOW Pilot WTGs are installed adjacent to the west side of the CVOW Commercial lease.

3.1.3 Nanotags and Satellite Radio Telemetry

The tag detections in the Motus network will provide information on movement patterns of these birds along the US Atlantic coast, and tags have the potential to be detected by the Project's upgraded receiver stations installed on the CVOW Pilot project. These tags will be provided on an annual basis for a 2-year period.

Dominion Energy will purchase 40 Motus Wildlife Tracking tags and provide them to researchers that are currently studying the movements of piping plovers (*Charadrius melodus*) in the region. The specific deployment location will be determined in consultation with the USFWS.

Dominion Energy will purchase 20 Pinpoint GPS Argos Satellite Tags manufactured by Lotek (2021), or equivalent to be attached to Rufa red knots (*Calidris canutus rufa*), which will provide up to 80 precise positions with associated altitude information. These tags will provide accurate data on Rufa red knot movements offshore, and flight heights that can be related to weather data. The deployment location will be determined in consultation with USFWS.

Dominion Energy was planning to purchase 30 bat nanotags to supplement DWR's study on coastal bat migration (De La Cruz and Ford 2018, 2020). However, now that study has been completed, Dominion Energy is conducting a baseline acoustic study instead.

In coordination with multiple Non-Government Organizations (NGOs), Dominion Energy will fund a research project to study the whimbrel (*Numenius phaeopus).* This study will be implemented by The Nature Conservancy (TNC) and Center for Conservation Biology (CCB) and will include purchasing 30 Pinpoint GPS Argos Satellite Tags manufactured by Lotek (2021), or equivalent, CCB and TNC staff time associated with project implementation including data analysis, seasonal staff capacity to implement field work, seasonal housing and travel costs, field supplies, and tagging technology.

3.2 Onshore

The Onshore Project Area and Onshore Project Components, including one Cable Landing Location, are located along or adjacent to existing public roadways, urbanized areas, agricultural lands, and natural landscapes in the cities of Virginia Beach and Chesapeake, Virginia (Figure 2). There are currently six Interconnection Cable Route alternatives under consideration for the Project, only one of which will be selected for construction. As such, this Work Plan Addendum focuses on the most likely Interconnection Cable Route alternatives under consideration, which include Interconnection Cable Route alternatives one, three, and six (Figure 2). The Interconnection Cable Route Corridors for the three alternatives addressed in this Work Plan travel between a common location north of Harpers Road to Fentress Substation for connection into the grid, which overlap for several sections (Interconnection Cable Route 1, Interconnection Cable Route 3, and Interconnection Cable Route 6 – Hybrid Route). Given the mobility of birds, a variety of species have the potential to occur within the Onshore Project Area throughout the year (Dominion Energy 2021). In addition, there are 17 species of bats known to occur in the state of Virginia; 14 of those species have been documented within or adjacent to the Onshore Project Area (Dominion Energy 2021). The following updated list of studies will allow Dominion Energy to further characterize avian and bat resources in the Onshore Project Area.

3.2.1 Piping Plover Surveys

On February 17, 2022, Dominion Energy held an Avian and Bat Work Plan Agency Review meeting with BOEM, USFWS, and DWR. Based on the agency feedback received at the meeting and in written comments provided by USFWS on March 7, 2022, and DWR on March 10, 2022, piping plover surveys are no longer included in this work plan as long as Dominion Energy adheres to a time of year restriction (TOY) from March 1 to November 15.

3.2.2 Rufa Red Knot Surveys

Project-related construction activities near the Cable Landing Location have the potential to disturb Rufa red knot during spring migration (March–May) and fall migration (July–October). On February 17, 2022, Dominion Energy held an Avian and Bat Work Plan Agency Review meeting with BOEM, USFWS, and DWR. Based on the agency feedback received at the meeting and in written comments provided by USFWS on March 7, 2022, and DWR on March 10, 2022, Rufa red knot surveys are no longer included in this work plan as long as Dominion Energy adheres to a time of year restriction (TOY) of March 1 to November 15.

3.2.3 Breeding Bird Surveys

On February 17, 2022, Dominion Energy held an Avian and Bat Work Plan Agency Review meeting with BOEM, USFWS, and DWR. Based on the agency feedback received at the meeting, written comments provided by USFWS on March 7, 2022 and DWR on March 10, 2022, and additional correspondence between Dominion Energy and USFWS, breeding bird surveys are no longer included in this work plan.

3.2.4 Threatened and Endangered Species Habitat Surveys

Project-related construction activities have the potential to impact threatened and endangered wildlife species. USFWS and DWR may recommend surveys to determine whether suitable habitat exists for federally listed wildlife species, particularly northern long-eared bat (*Myotis septentrionalis*) and red-cockaded woodpecker (*Leuconotopicus borealis*). For northern long-eared bat, methods follow the latest USFWS *Range-wide Indiana Bat Summer Survey Guidelines* (USFWS 2022). Indiana bat (*Myotis sodalis*) investigations were considered, but based on the agency feedback received at the February 17, 2022, Avian and Bat Work Plan Agency Review meeting with BOEM, USFWS, and DWR; and written comments provided by USFWS on March 7, 2022 and DWR on March 10, 2022, Indiana Bat surveys are no longer included in this work plan.

Red-cockaded woodpecker was not included on the official species list for the Onshore Project Area generated via IPaC, and thus, surveys for the species were not a requirement for the Project. A high-level assessment was completed in March 2022 because red-cockaded woodpecker was discussed as a potential concern in the Project's COP (Dominion Energy 2021). The Project lies just beyond the species range and known distribution. This region is on the fringe of the red-cockaded woodpecker range, and one of the limiting factors for habitat suitability within the Mid-Atlantic Coastal Plain is due to encroachment of midstory hardwoods (USFWS 2020). The results of the high-level assessment suggest that habitats required to support the species are not present within the Onshore Project Area and occurrence is unlikely. These findings are congruent with known distributions of RCW in Virginia. The findings of this assessment was submitted to USFWS on July 17, 2022 for concurrence and to determine if additional survey effort is warranted.

3.2.5 Aerial Nest Surveys

Project-related construction activities have the potential to impact nesting raptors and wading birds. USFWS and DWR recommended aerial nest surveys to document large stick nests, note nesting activity, and record species using each nest (e.g., raptors, wading birds). An aerial nest survey was conducted on March 11, 2022. Four active bald eagle (*Haliaeetus leucocephalus*) nests were observed during the aerial

flight. All eagle nests were in good condition and located in mature loblolly pines or cypress trees. Two active red-tailed hawk (*Buteo jamaicensis*) nests were observed, both of which were near the Project Area. Three additional raptor nests were observed within the Project Area, one of which was an old osprey nest in disrepair on a utility tower. The other two were smaller raptor nests located in loblolly pines. No evidence of waterbird colony nests or active osprey nests was observed during the aerial survey. USFWS and DWR were notified of these survey results and no additional monitoring is planned for this year. Depending on construction schedule aerial nest surveys may need to be performed on a yearly basis to document any new nests from the previous survey year. The findings of this assessment will be submitted to agencies for concurrence or to determine if additional survey effort is warranted.

3.2.6 Mist Netting Presence/Absence Bat Surveys

Dominion Energy is currently conducting presence/absence surveys for northern long-eared bats following guidance provided in the latest USFWS *Range-wide Indiana Bat Summer Survey Guidelines* (USFWS 2022). Mist netting surveys are being conducted along the Onshore Project Area at approximately 27 sites. Survey methods were developed in coordination with USFWS. A detailed study plan was developed and submitted for review and approved by the USFWS Virginia Field Office Survey. Results will be provided to the appropriate agencies once field surveys are complete. Twenty radio transmitters were purchased and available for this task and will be placed on targeted species as outlined in the study plan.

3.2.7 Bat Acoustic Surveys

Baseline bat acoustic surveys will be conducted along the Onshore Project Area to collect supplemental information to aid in permitting efforts. Bat acoustic survey will help understand bat use during the spring, summer maternity, fall swarming, and winter periods. Full spectrum detectors were deployed in April 2022 and will collect acoustic data nightly for up to one year. Location of the detectors were based on microhabitat conditions, forest structure and accessibility. Detectors will be visited on a monthly basis to service and download data. The first batch of data will be analyzed late fall/early winter and a final batch analysis will occur late spring. A summary report will be prepared.

4 DELIVERABLES

Dominion Energy will provide periodic updates as they relate to offshore Motus station upgrades and equipment purchases for satellite receiver, nanotags, and motus towers. An avian report encompassing the various survey efforts (i.e., threatened and endangered species and aerial nest surveys) carried out in 2022 will be compiled into a comprehensive year-end report. Separate bat survey reports will be prepared.

5 REFERENCES

BRI (Biodiversity Research Institute). 2021. Developing Plants to Track Animals Offshore. Available at https://briwildlife.org/offshore-motus-guidance/. Accessed December 2021.

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De La Cruz, J. L., and W. M. Ford. 2020. Occupancy and roost ecology of the northern long-eared bat and Indiana bat on the Coastal Plain of Virginia and North Carolina. Virginia Department of Game and Inland Fisheries Project EP2858740.

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Lotek. 2021. The world's smallest GPS Argos tags. Available at https://www.lotek.com/products/pinpoint-gps-argos/. Accessed December 2021.

USFWS (U.S. Fish and Wildlife Service). 2020. Recovery Plan for the Red-cockaded Woodpecker. Available at https://www.fws.gov/rcwrecovery/recovery_plan.html. Accessed December 2021.

_____.2022. *Range-wide Indiana Bat Summer Survey Guidelines*. Available at https://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html. Accessed May 2022.

Appendix C – Dominion Energy CVOW Commercial - Draft Avian and Bat Post-Construction Framework

To be developed in Consultation with the U.S. Fish and Wildlife Service

Appendix D – Band and SCRAM Model Inputs and Outputs

COLLISION RISK ASSESSMENT
Sheet 1 - Input data

used in overall collision risk sheet
used in migrant collision risk sheet
used in single transit collision risk sheet or extended model
used in available hours sheet
used in large array correction sheet
not used in calculation but stated for reference

	Units	Value	Data sources	Source
Bird data				
Species name		**Piping plover**		
Bird length	m	0.17		Gilbert et al 2022, Table A12
Wingspan	m	0.38		Gilbert et al 2022, Table A12
Flight speed	m/sec	9.3		Gilbert et al 2022, Table A12
Nocturnal activity factor (1-5)		4		Loring et al 2019, Fig 66; value = 4
Flight type, flapping or gliding		flapping		

Bird survey data		Data sources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daytime bird density	birds/sq km													
Proportion at rotor height	%													
Proportion of flights upwind	%	8.6%												

Birds on migration data			Data sources												
Migration passages	birds					21	21	21			82				Adult & fledgings derived from USFWS 2022, P.Loring et al 2019
Width of migration corridor	km	19													Length of VA WEA
Proportion at rotor height	%	15%													Loring et al 2019, Table 26
Proportion of flights upwind	%	8.6%													Loring et al 2019, Fig 72

	Units	Value	Data sources	Source
Windfarm data				
Name of windfarm site		**CVOW-C**		
Latitude	degrees	37.00		
Number of turbines		176		COP, Table 3.3-1, Developer's preferred Alt
Width of windfarm	km	19		Measured from BA Figure 1-1
Tidal offset	m	1		

Turbine data			Data sources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Source
Turbine model		**SG-14-222 DD**														BA, Table 2-1
No of blades		3														
Rotation speed	rpm	7.7														Nominal rated power, MM. Jabs email to B. Houghton 2022
Rotor radius	m	108														Product brochure
Hub height	m	144														COP, Table 3.3-1, Developer's preferred Alt
Monthly proportion of time operational	%			95%	95%	95%	95%	94%	91%	89%	88%	91%	93%	93%	95%	MM. Jabs email to B. Houghton 2022
Max blade width	m	5.770														Gaertner et al 2020, Table ES-2
Pitch	degrees	1														

Avoidance rates used in presenting results			Data sources (if applicable)
	95.01%	X	Cook 2021, Table A2 “All Gulls and Terns” Extended Band (2012) model
	98.00%		
	99.00%		
	99.50%		

COLLISION RISK ASSESSMENT (BIRDS ON MIGRATION)

Sheet 2 - Overall collision risk

All data input on Sheet 1:
no data entry needed on this sheet!
other than to choose option for final tables

from Sheet 1 - input data
from Sheet 6 - available hours
from Sheet 3 - single transit collision risk
from survey data
calculated field

Bird details:

Species		Piping plover
Flight speed	m/sec	9.3
Flight type		flapping

Windfarm data:

Number of turbines		176
Rotor radius	m	108
Minimum height of rotor	m	144
Total rotor frontal area	sq m	6449262

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year average
Proportion of time operational	%		95%	95%	95%	95%	94%	91%	89%	88%	91%	93%	93%	95%	92.8%
Stage A - flight activity															**per annum**
Migration passages			0	0	21	21	21	0	0	82	0	0	0	0	**145**
Migrant flux density	birds/ km		0	0	1.1053	1.1053	1.10526	0	0	4.31579	0	0	0	0	
Proportion at rotor height	%	15%													
Flux factor			0	0	33	33	33	0	0	129	0	0	0	0	
Option 1 -Basic model - Stages B, C and D															
Potential bird transits through rotors			0	0	5	5	5	0	0	20	0	0	0	0	**35**
Collision risk for single rotor transit	(from sheet 3)	3.8%													
Collisions for entire windfarm, allowing for non-op time, assuming no avoidance	birds per month or year		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**
Option 2-Basic model using proportion from flight distribution			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**2**
Option 3-Extended model using flight height distribution															
Proportion at rotor height	(from sheet 4)	30.8%													
Potential bird transits through rotors	Flux integral	0.3421	0	0	11	11	11	0	0	44	0	0	0	0	**78**
Collisions assuming no avoidance	Collision integral	0.01719	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**4**
Average collision risk for single rotor transit		5.0%													
Stage E - applying avoidance rates															
Using which of above options?	**Option 3**	0.00%	0	0	1	1	1	0	0	2	0	0	0	0	**4**
Collisions assuming avoidance rate	birds per month or year	95.01%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		98.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.50%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Collisions after applying large array correction		95.01%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		98.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.50%	0	0	0	0	0	0	0	0	0	0	0	0	**0**

COLLISION RISK ASSESSMENT
Sheet 1 - Input data

used in overall collision risk sheet
used in migrant collision risk sheet
used in single transit collision risk sheet or extended model
used in available hours sheet
used in large array correction sheet
not used in calculation but stated for reference

	Units	Value	Data sources	Source
Bird data				
Species name		**RedKnot**		
Bird length	m	0.24		Gilbert et al 2022, Table A12
Wingspan	m	0.50		Gilbert et al 2022, Table A12
Flight speed	m/sec	20.1		Gilbert et al 2022, Table A12
Nocturnal activity factor (1-5)		5		Table A-8, Robinson Willmott et al., 2013; Loring et al 2018
Flight type, flapping or gliding		flapping		

Bird survey data			Data sources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daytime bird density	birds/sq km														
Proportion at rotor height	%														
Proportion of flights upwind	%	34.6%													

Birds on migration data			Data sources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Migration passages	birds							319		163	163	163				see BA section 5.2.1.2
Width of migration corridor	km	19														assume all pass through turbine project area
Proportion at rotor height	%	0%														Feigin et al., 2022, Table A
Proportion of flights upwind	%	34.6%														Loring et al 2018, Fig. 14

	Units	Value	Data sources	Source
Windfarm data				
Name of windfarm site		**CVOW-C**		
Latitude	degrees	37.00		
Number of turbines		176		COP, Table 3.3-1, Developer's preferred Alt
Width of windfarm	km	19		Measured from BA Figure 1-1
Tidal offset	m	1		

Turbine data			Data sources	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Turbine model		**SG-14-222 DD**														BA, Table 2-1
No of blades		3														
Rotation speed	rpm	7.7														Nominal rated power, MM. Jabs email to B. Houghton 2022
Rotor radius	m	108														Product brochure
Hub height	m	144														COP, Table 3.3-1, Developer's preferred Alt
Monthly proportion of time operational	%			95%	95%	95%	95%	94%	91%	89%	88%	91%	93%	93%	95%	MM. Jabs email to B. Houghton 2022
Max blade width	m	5.770														Gaertner et al 2020, Table ES-2
Pitch	degrees	1														

Avoidance rates used in presenting results			Data sources (if applicable)
	95.01%	X	Cook 2021, Table A2 “All Gulls and Terns” Extended Band (2012) model
	98.00%		
	99.00%		
	99.50%		

COLLISION RISK ASSESSMENT (BIRDS ON MIGRATION)

Sheet 2 - Overall collision risk

All data input on Sheet 1:
no data entry needed on this sheet!
other than to choose option for final tables

from Sheet 1 - input data
from Sheet 6 - available hours
from Sheet 3 - single transit collision risk
from survey data
calculated field

Bird details:

Species		RedKnot
Flight speed	m/sec	20.1
Flight type		flapping

Windfarm data:

Number of turbines		176
Rotor radius	m	108
Minimum height of rotor	m	144
Total rotor frontal area	sq m	6449262

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year average
Proportion of time operational	%		95%	95%	95%	95%	94%	91%	89%	88%	91%	93%	93%	95%	92.8%
Stage A - flight activity															**per annum**
Migration passages			0	0	0	0	319	0	163	163	163	0	0	0	**808**
Migrant flux density	birds/ km		0	0	0	0	16.7895	0	8.57895	8.57895	8.57895	0	0	0	
Proportion at rotor height	%	0%													
Flux factor			0	0	0	0	501	0	256	256	256	0	0	0	
Option 1 -Basic model - Stages B, C and D															
Potential bird transits through rotors			0	0	0	0	0	0	0	0	0	0	0	0	**0**
Collision risk for single rotor transit	(from sheet 3)	3.8%													
Collisions for entire windfarm, allowing for non-op time, assuming no avoidance	birds per month or year		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Option 2-Basic model using proportion from flight distribution			**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Option 3-Extended model using flight height distribution															
Proportion at rotor height	(from sheet 4)	36.0%													
Potential bird transits through rotors	Flux integral	0.3421	0	0	0	0	171	0	88	88	88	0	0	0	**434**
Collisions assuming no avoidance	Collision integral	0.00846	**0**	**0**	**0**	**0**	**4**	**0**	**2**	**2**	**2**	**0**	**0**	**0**	**10**
Average collision risk for single rotor transit		2.5%													
Stage E - applying avoidance rates															
Using which of above options?	**Option 3**	0.00%	0	0	0	0	4	0	2	2	2	0	0	0	**10**
Collisions assuming avoidance rate	birds per month or year	95.01%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		98.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.50%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Collisions after applying large array correction		95.01%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		98.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.50%	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Summary of simulation results from SCRAM: a stochastic collision risk assessment for movement data

01 December 2022

SCRAM was developed by Biodiversity Research Institute, the University of Rhode Island, and the U.S. Fish and Wildlife Service with funding from the Bureau of Ocean Energy Management.

SCRAM run details

```
## SCRAM - the Stochastic Collision Risk Assessment for Movement version
## Version: 0.91.1 - Lyrical Brachycarpus
## Iterations: 1000
## Model option: Option 3: slower but more accurate assessment
## Project: CVOW-C
## Modeler: David Bigger
## The model run was started at: Thu Dec 01 11:36:00 2022 EST
## The model run was completed at: Thu Dec 01 11:57:51 2022 EST
## Run 1: the probability of exceeding specified threshold (1) is < 0.001.
```

Model inputs used for this analysis

Table 1: Species input parameters (mean and 95 perc. range).

Species	Turbine model	Avoidance	Wing span	Body length	Speed
Piping Plover	SG-14-222 DD	0.93 (0.92, 0.94)	0.38 (0.38, 0.38)	0.18 (0.17, 0.18)	11.86 (2.88, 21.2)

Table 2: Species monthly (Jan-Jun) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jan	Feb	Mar	Apr	May	Jun
Piping Plover	0 ± 0	0 ± 0	4578 ± 0	4578 ± 0	4578 ± 0	4578 ± 0

Table 3: Species monthly (Jul-Dec) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jul	Aug	Sep	Oct	Nov	Dec
Piping Plover	4578 ± 0	7423 ± 0	7423 ± 0	7423 ± 0	0 ± 0	0 ± 0

Population data assumptions/limitations:
1) Entire Atlantic coast population could be present in area during months listed.
2) Occurrence through October to include birds stopping over in mid-Atlantic (e.g. North Carolina). Number of birds still present in Atlantic likely lower.
3) Estimate of HY fledges, uses the 20-year (2002 - 2021) average productivity (unweighted).

Table 4: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Num. turbines	Rotor radius	Hub height (m)	Blade width (m)	Wind speed (mps)
Piping Plover	SG-14-222 DD	176 (176, 176)	108 (108, 108)	141 (141, 141)	5.77 (5.77, 5.77)	10.1 (9.16, 11.02)

Table 5: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Prop. upwind	Rotor speed (rpm)	Pitch (radians)	Farm width (km)	Lat.	Long.
Piping Plover	SG-14-222 DD	1 (1, 1)	4.91 (4.46, 5.36)	0.03 (0.03, 0.04)	19 (19, 19)	36.91	-75.35

Table 6: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jan Op.	Feb Op.	Mar Op.	Apr Op.	May Op.	Jun Op.
Piping Plover	SG-14-222 DD	95.2 (91.7, 98.9)	95.4 (92.1, 98.6)	95.2 (92.4, 98.3)	95.2 (92.1, 98.2)	93.8 (88.8, 98.9)	90.7 (86, 95.8)

Table 7: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jul Op.	Aug Op.	Sep Op.	Oct Op.	Nov Op.	Dec Op.
Piping Plover	SG-14-222 DD	89.1 (85.7, 92.7)	88.1 (82.3, 94.1)	90.5 (83.5, 97.6)	92.6 (86.5, 99.1)	92.7 (86.1, 98.9)	94.8 (90.5, 99)

Results for the SCRAM simulation

Table 8: The predicted mean and 95 perc. prediction intervals of the number of collisions per month and the total summed monthly number of collisions and 95 perc. prediction interval. Results are not shown for months that do not have movement data.

Species	Turbine model	month	Mean number of collisions	Lower pred. interval	Upper pred. interval
Piping Plover	SG-14-222 DD	Jan			
Piping Plover	SG-14-222 DD	Feb			
Piping Plover	SG-14-222 DD	Mar			
Piping Plover	SG-14-222 DD	Apr			
Piping Plover	SG-14-222 DD	May	0.001	0	0.001
Piping Plover	SG-14-222 DD	Jun	0.001	0	0.001
Piping Plover	SG-14-222 DD	Jul	0.001	0	0.001
Piping Plover	SG-14-222 DD	Aug	0.001	0	0.002
Piping Plover	SG-14-222 DD	Sep	0.001	0	0.001
Piping Plover	SG-14-222 DD	Oct			
Piping Plover	SG-14-222 DD	Nov			
Piping Plover	SG-14-222 DD	Dec			
Piping Plover	SG-14-222 DD	annual	0.004	0	0.005

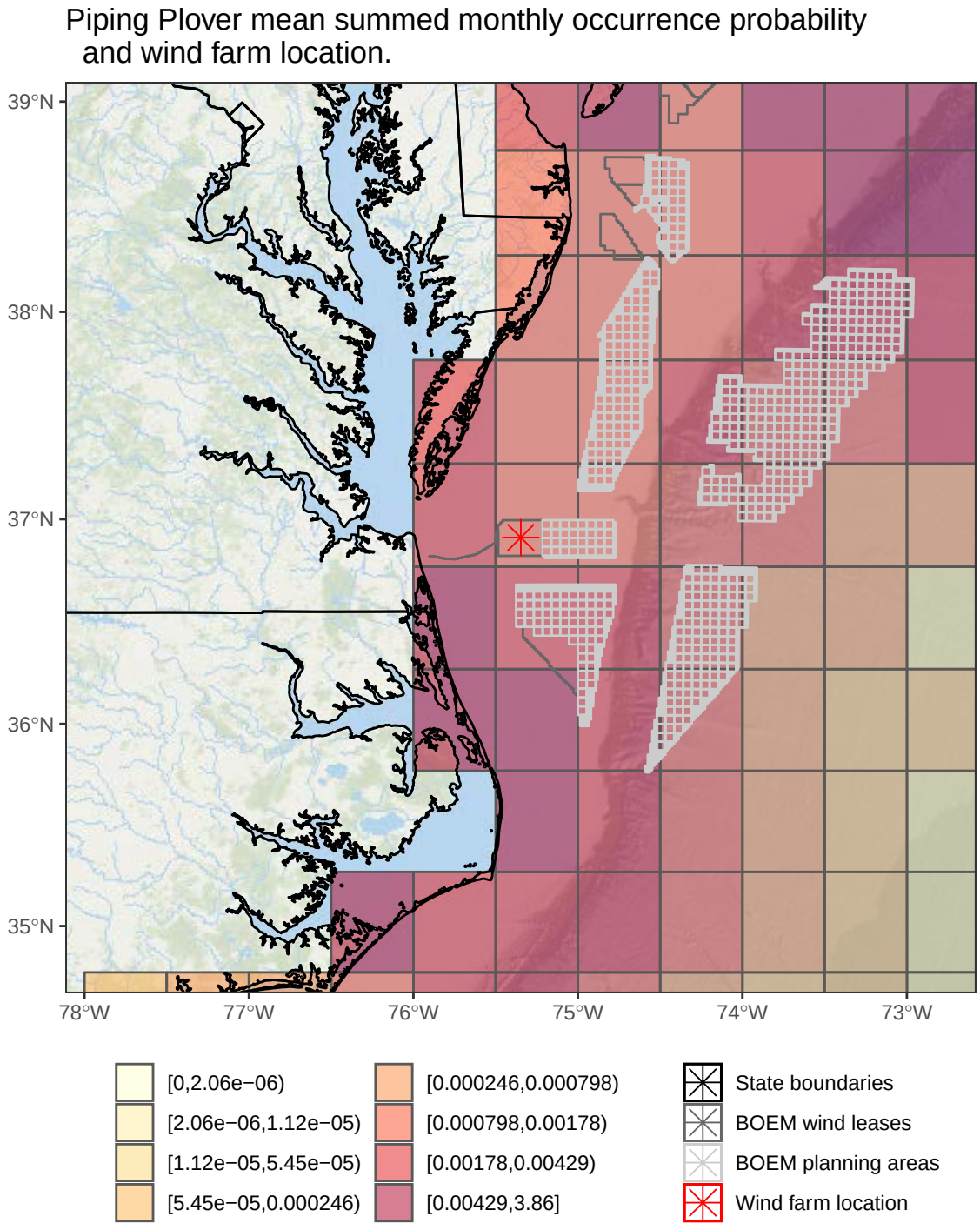


Figure 1: A map of the species occurrence probabities and wind farm location.

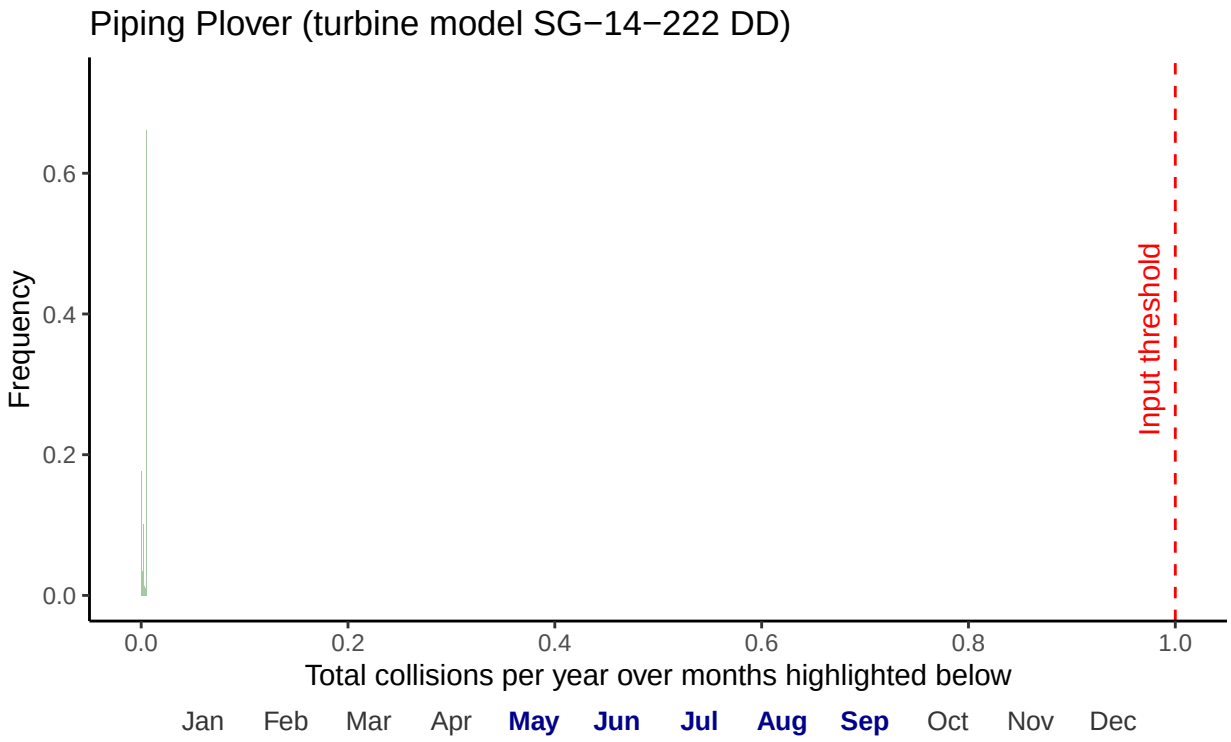


Figure 2: A frequency histogram of the total number of collisions per year. The heights of the bars show the relative frequency of each value. Months for which movement data were provided or available are shown in bold; only bold months are shown in histogram of annual collisions.

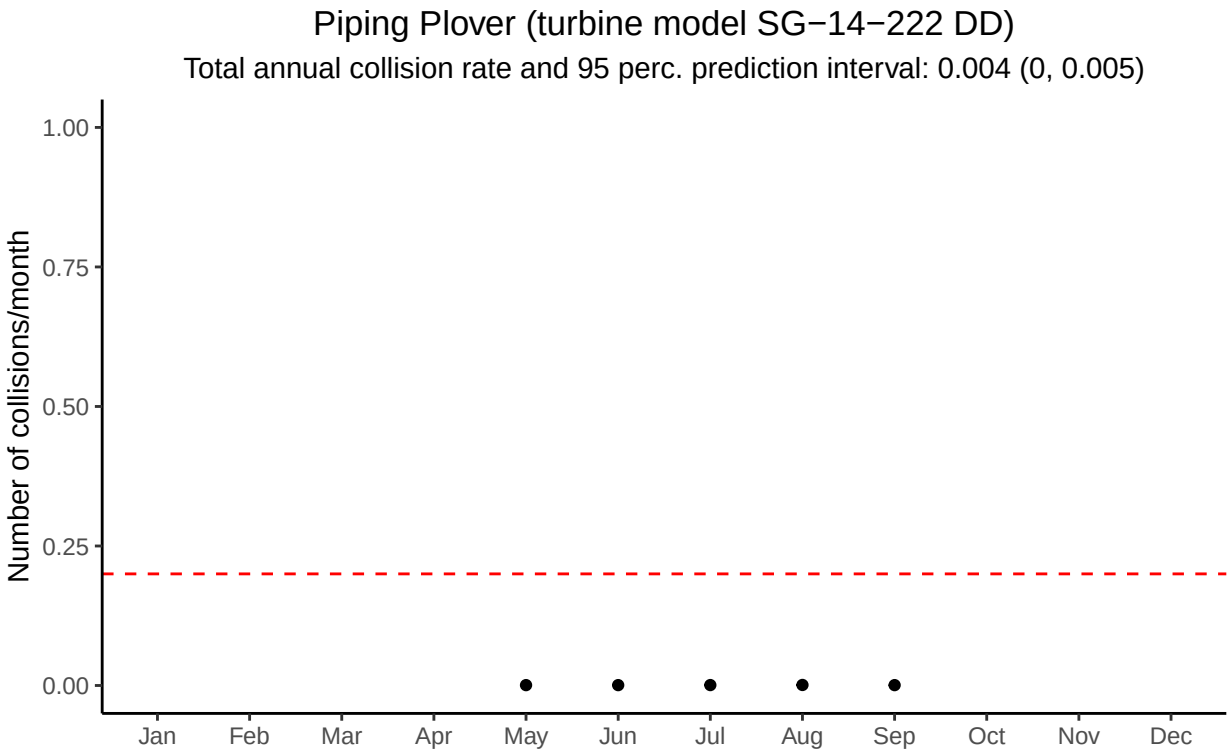


Figure 3: The predicted mean and 95 perc. prediction intervals of the number of collisions per month. Results are not shown for months that do not have movement data. Total annual collision rate and 95 perc. prediction interval are given at top. The threshold is shown divided by the number of months that movement data were available.

Summary of simulation results from SCRAM: a stochastic collision risk assessment for movement data

01 December 2022

SCRAM was developed by Biodiversity Research Institute, the University of Rhode Island, and the U.S. Fish and Wildlife Service with funding from the Bureau of Ocean Energy Management.

SCRAM run details

```
## SCRAM - the Stochastic Collision Risk Assessment for Movement version
## Version: 0.91.1 - Lyrical Brachycarpus
## Iterations: 1000
## Model option: Option 3: slower but more accurate assessment
## Project: CVOW-C
## Modeler: David Bigger
## The model run was started at: Thu Dec 01 12:04:15 2022 EST
## The model run was completed at: Thu Dec 01 12:26:04 2022 EST
## Run 1: the probability of exceeding specified threshold (1) is < 0.001.
```

Model inputs used for this analysis

Table 1: Species input parameters (mean and 95 perc. range).

Species	Turbine model	Avoidance	Wing span	Body length	Speed
Red Knot	SG-14-222 DD	0.93 (0.92, 0.94)	0.5 (0.45, 0.54)	0.24 (0.23, 0.25)	20.06 (16.43, 23.67)

Table 2: Species monthly (Jan-Jun) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jan	Feb	Mar	Apr	May	Jun
Red Knot	10400 ± 0	10400 ± 0	10400 ± 0	10400 ± 0	59200 ± 0	59200 ± 0

Table 3: Species monthly (Jul-Dec) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jul	Aug	Sep	Oct	Nov	Dec
Red Knot	59200 ± 0	59200 ± 0	72520 ± 0	54720 ± 0	41400 ± 0	10400 ± 0

Population data assumptions/limitations:
1) All pass through in spring - #s consistent w/Lyons et al super-population estimate for 2020 in DE Bay: 40,444 (95 perc. credible interval: 33,627–49,966).
2) Winter population estimates represent the total # of adults and sub-adults (in general).
3) Southern and northern wintering birds could be present during July - Sept.
4) Only northern wintering birds could be present during Oct - Nov.
5) Only southeast US and Caribbean birds could be present during Dec.
6) Birds from western Gulf population are excluded from totals in Atlantic region due to lack of information on extent to which they use the Atlantic region.
7) Numbers do not include HY birds in fall.
8) Dec number coming from Lyons et al 2017. Just includes SE US Birds, not Caribbean.
9) Issues with double counting addressed because birds may be present in different areas of Atlantic region for weeks to months.

Table 4: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Num. turbines	Rotor radius	Hub height (m)	Blade width (m)	Wind speed (mps)
Red Knot	SG-14-222 DD	176 (176, 176)	108 (108, 108)	141 (141, 141)	5.77 (5.77, 5.77)	10.1 (9.14, 11.09)

Table 5: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Prop. upwind	Rotor speed (rpm)	Pitch (radians)	Farm width (km)	Lat.	Long.
Red Knot	SG-14-222 DD	1 (1, 1)	4.91 (4.45, 5.39)	0.03 (0.03, 0.04)	19 (19, 19)	36.91	-75.35

Table 6: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jan Op.	Feb Op.	Mar Op.	Apr Op.	May Op.	Jun Op.
Red Knot	SG-14-222 DD	95.2 (91.5, 98.9)	95.3 (91.7, 98.6)	95.2 (92.1, 98.1)	95.2 (92.2, 98.2)	94 (88.3, 99)	90.7 (85.4, 95.6)

Table 7: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jul Op.	Aug Op.	Sep Op.	Oct Op.	Nov Op.	Dec Op.
Red Knot	SG-14-222 DD	89.1 (85.4, 92.8)	88.1 (81.8, 94.3)	90.6 (83.3, 98.6)	92.8 (86.7, 99)	92.5 (86.3, 98.5)	94.9 (90.6, 99.1)

Results for the SCRAM simulation

Table 8: The predicted mean and 95 perc. prediction intervals of the number of collisions per month and the total summed monthly number of collisions and 95 perc. prediction interval. Results are not shown for months that do not have movement data.

Species	Turbine model	month	Mean number of collisions	Lower pred. interval	Upper pred. interval
Red Knot	SG-14-222 DD	Jan			
Red Knot	SG-14-222 DD	Feb			
Red Knot	SG-14-222 DD	Mar			
Red Knot	SG-14-222 DD	Apr			
Red Knot	SG-14-222 DD	May			
Red Knot	SG-14-222 DD	Jun			
Red Knot	SG-14-222 DD	Jul			
Red Knot	SG-14-222 DD	Aug	0.001	0	0.001
Red Knot	SG-14-222 DD	Sep	0.001	0	0.001
Red Knot	SG-14-222 DD	Oct	0.001	0	0.001
Red Knot	SG-14-222 DD	Nov	0.002	0.001	0.015
Red Knot	SG-14-222 DD	Dec			
Red Knot	SG-14-222 DD	annual	0.005	0.004	0.016

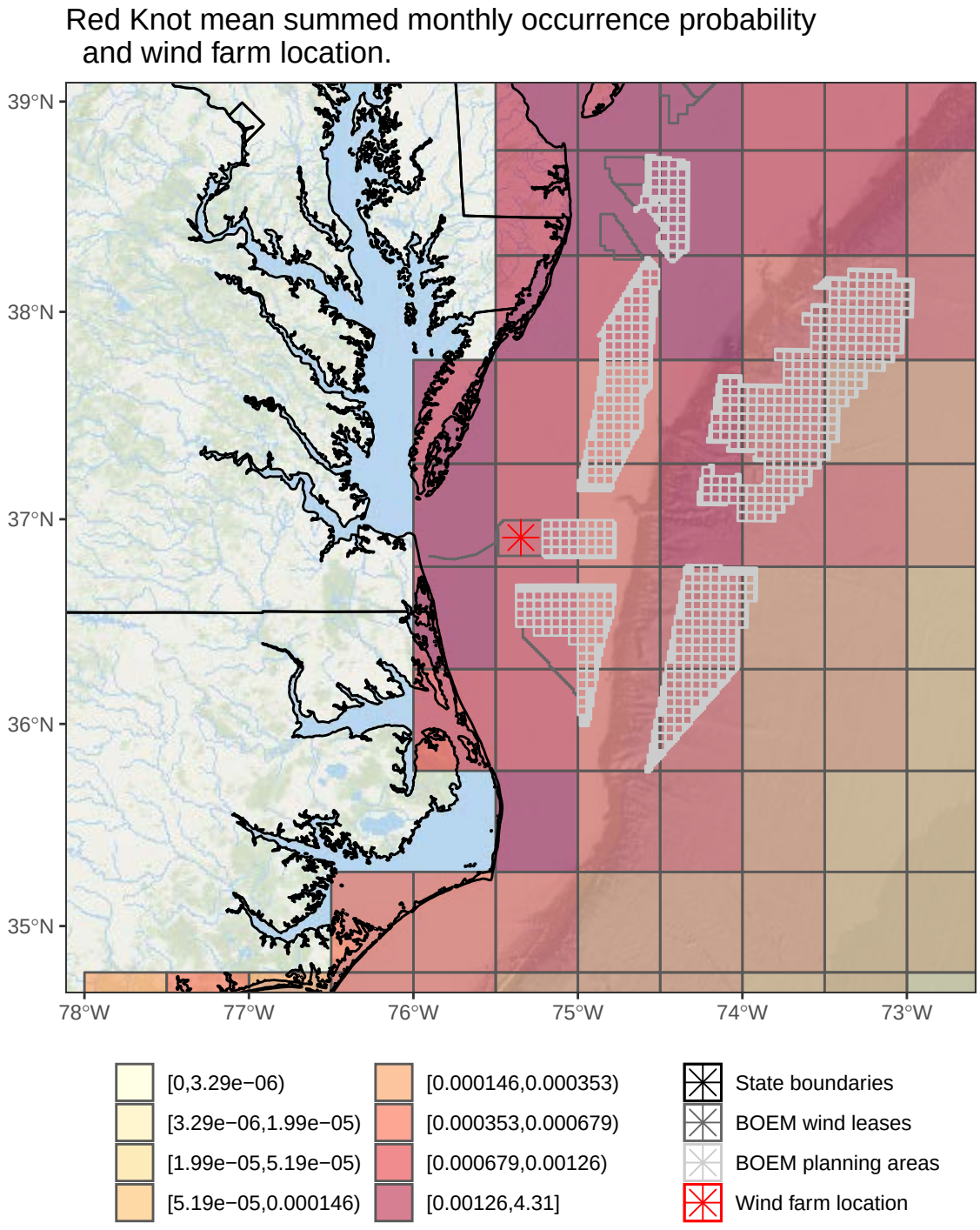


Figure 1: A map of the species occurrence probabities and wind farm location.

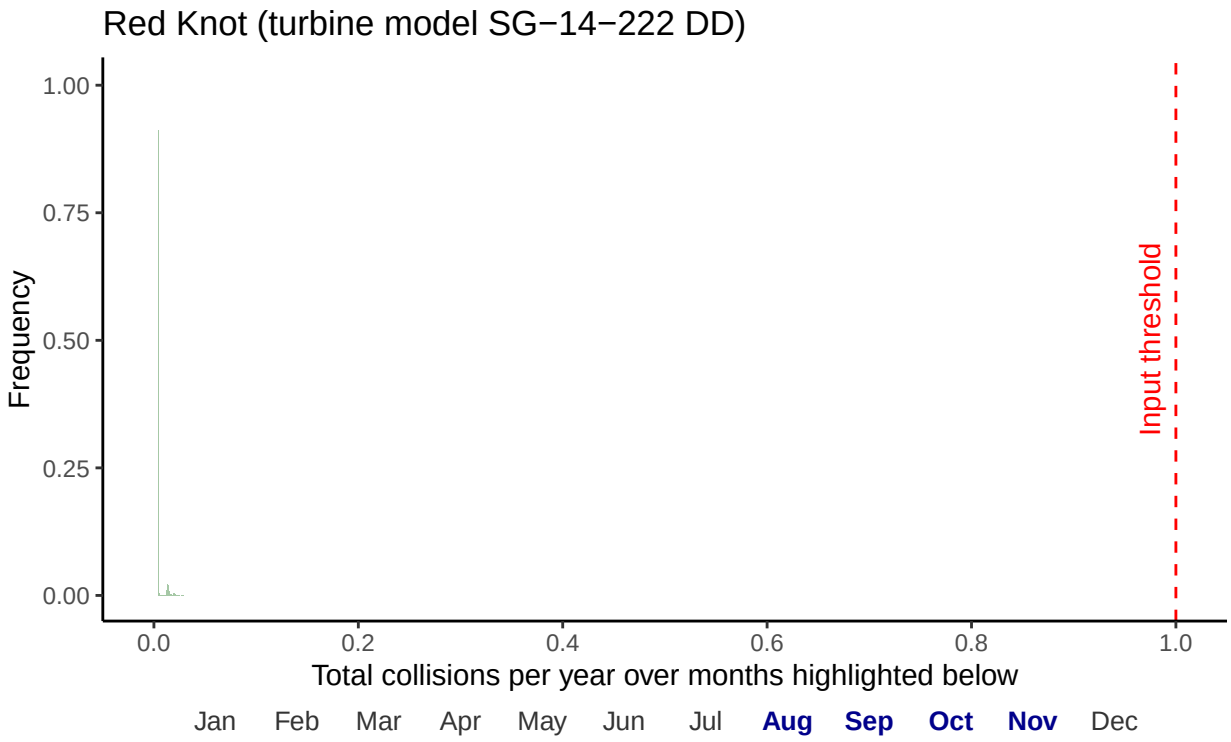


Figure 2: A frequency histogram of the total number of collisions per year. The heights of the bars show the relative frequency of each value. Months for which movement data were provided or available are shown in bold; only bold months are shown in histogram of annual collisions.

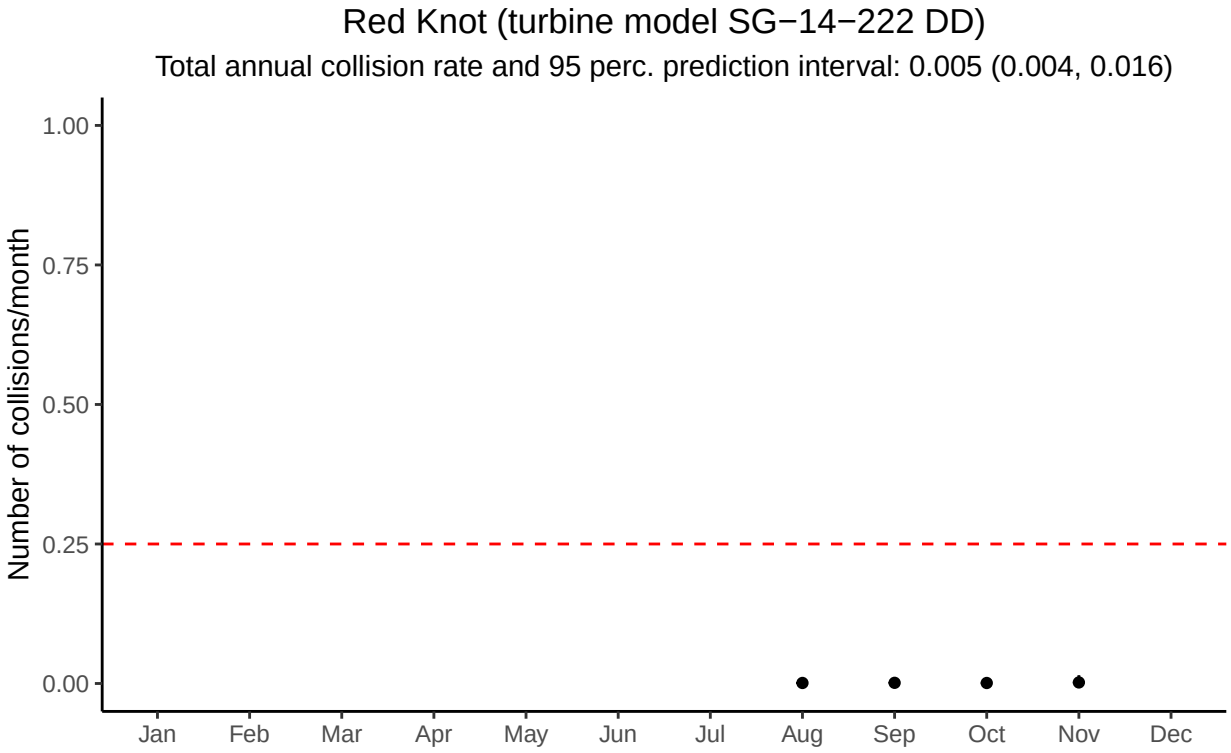


Figure 3: The predicted mean and 95 perc. prediction intervals of the number of collisions per month. Results are not shown for months that do not have movement data. Total annual collision rate and 95 perc. prediction interval are given at top. The threshold is shown divided by the number of months that movement data were available.

Summary of simulation results from SCRAM: a stochastic collision risk assessment for movement data

01 December 2022

SCRAM was developed by Biodiversity Research Institute, the University of Rhode Island, and the U.S. Fish and Wildlife Service with funding from the Bureau of Ocean Energy Management.

SCRAM run details

```
## SCRAM - the Stochastic Collision Risk Assessment for Movement version
## Version: 0.91.1 - Lyrical Brachycarpus
## Iterations: 1000
## Model option: Option 3: slower but more accurate assessment
## Project: CVOW-C
## Modeler: David Bigger
## The model run was started at: Thu Dec 01 12:37:30 2022 EST
## The model run was completed at: Thu Dec 01 12:59:23 2022 EST
## Run 1: the probability of exceeding specified threshold (1) is < 0.001.
```

Model inputs used for this analysis

Table 1: Species input parameters (mean and 95 perc. range).

Species	Turbine model	Avoidance	Wing span	Body length	Speed
Roseate Tern	SG-14-222 DD	0.93 (0.92, 0.94)	0.76 (0.72, 0.8)	0.37 (0.33, 0.41)	12.62 (3.52, 21.81)

Table 2: Species monthly (Jan-Jun) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jan	Feb	Mar	Apr	May	Jun
Roseate Tern	0 ± 0	0 ± 0	0 ± 0	10916 ± 0	10916 ± 0	10916 ± 0

Table 3: Species monthly (Jul-Dec) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jul	Aug	Sep	Oct	Nov	Dec
Roseate Tern	16251 ± 0	16251 ± 0	16251 ± 0	16251 ± 0	0 ± 0	0 ± 0

Population data assumptions/limitations:
1) Entire NW Atlantic pop could be present in area during months listed.
2) Average of most recent (2018 and 2019) productivity data from three largest colonies (representing >90 perc. of population) representative of entire population.
3) Fledging and post-breeding dispersal period occurs from July through Sept.
4) Numbers of non-breeding adults are not included.
5) Does not include non-breeding 1 and 2 year old birds that return but do not breed.
6) From Gochfeld and Burger (2020): Northeastern birds first arrive at Nantucket and Martha's Vineyard, MA, in large flocks, then disperse north as well as west. They arrive 26 Apr-20 May at Bird I., MA (Nisbet 1980, Nisbet 1981b, Nisbet 1989b), slightly later at Falkner I., CT, and Great Gull I., NY.
7) From Gochfeld and Burger (2020): Apparently all birds migrate directly from the staging area around Cape Cod across the w. North Atlantic to the West Indies (Nisbet 1984, C. Mostello). Very small numbers occur at sea off N. Carolina from late Aug to late Sep, with a peak in early Sep; the latest date was 28 Oct (D. Lee).

Table 4: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Num. turbines	Rotor radius	Hub height (m)	Blade width (m)	Wind speed (mps)
Roseate Tern	SG-14-222 DD	176 (176, 176)	108 (108, 108)	141 (141, 141)	5.77 (5.77, 5.77)	10.14 (9.16, 11.06)

Table 5: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Prop. upwind	Rotor speed (rpm)	Pitch (radians)	Farm width (km)	Lat.	Long.
Roseate Tern	SG-14-222 DD	1 (1, 1)	4.93 (4.46, 5.38)	0.03 (0.03, 0.04)	19 (19, 19)	36.91	-75.35

Table 6: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jan Op.	Feb Op.	Mar Op.	Apr Op.	May Op.	Jun Op.
Roseate Tern	SG-14-222 DD	95.3 (91.5, 98.9)	95.4 (91.9, 98.4)	95 (92.3, 98)	95.3 (92.2, 98.4)	94 (88.4, 99.9)	90.8 (86.3, 95.9)

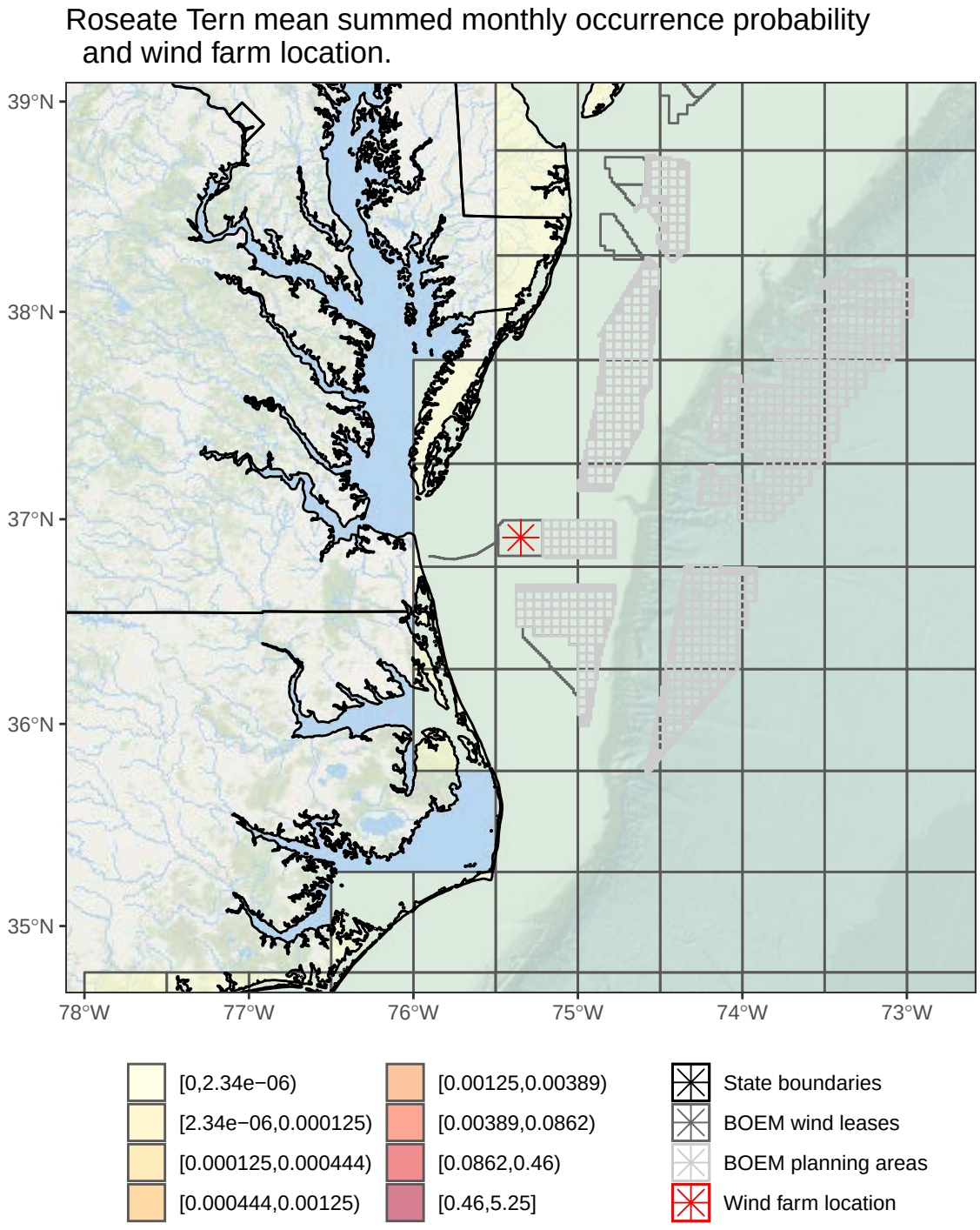
Table 7: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jul Op.	Aug Op.	Sep Op.	Oct Op.	Nov Op.	Dec Op.
Roseate Tern	SG-14-222 DD	89.1 (85.4, 92.8)	88 (82.3, 94.4)	90.7 (83.7, 98.2)	92.5 (86.8, 98.5)	92.6 (86.1, 98.7)	94.8 (90.9, 98.8)

Results for the SCRAM simulation

Table 8: The predicted mean and 95 perc. prediction intervals of the number of collisions per month and the total summed monthly number of collisions and 95 perc. prediction interval. Results are not shown for months that do not have movement data.

Species	Turbine model	month	Mean number of collisions	Lower pred. interval	Upper pred. interval
Roseate Tern	SG-14-222 DD	Jan			
Roseate Tern	SG-14-222 DD	Feb			
Roseate Tern	SG-14-222 DD	Mar			
Roseate Tern	SG-14-222 DD	Apr			
Roseate Tern	SG-14-222 DD	May			
Roseate Tern	SG-14-222 DD	Jun	0.001	0.001	0.001
Roseate Tern	SG-14-222 DD	Jul	0.001	0.001	0.001
Roseate Tern	SG-14-222 DD	Aug	0.001	0.001	0.001
Roseate Tern	SG-14-222 DD	Sep	0.001	0.001	0.001
Roseate Tern	SG-14-222 DD	Oct			
Roseate Tern	SG-14-222 DD	Nov			
Roseate Tern	SG-14-222 DD	Dec			
Roseate Tern	SG-14-222 DD	annual	0.004	0.004	0.004



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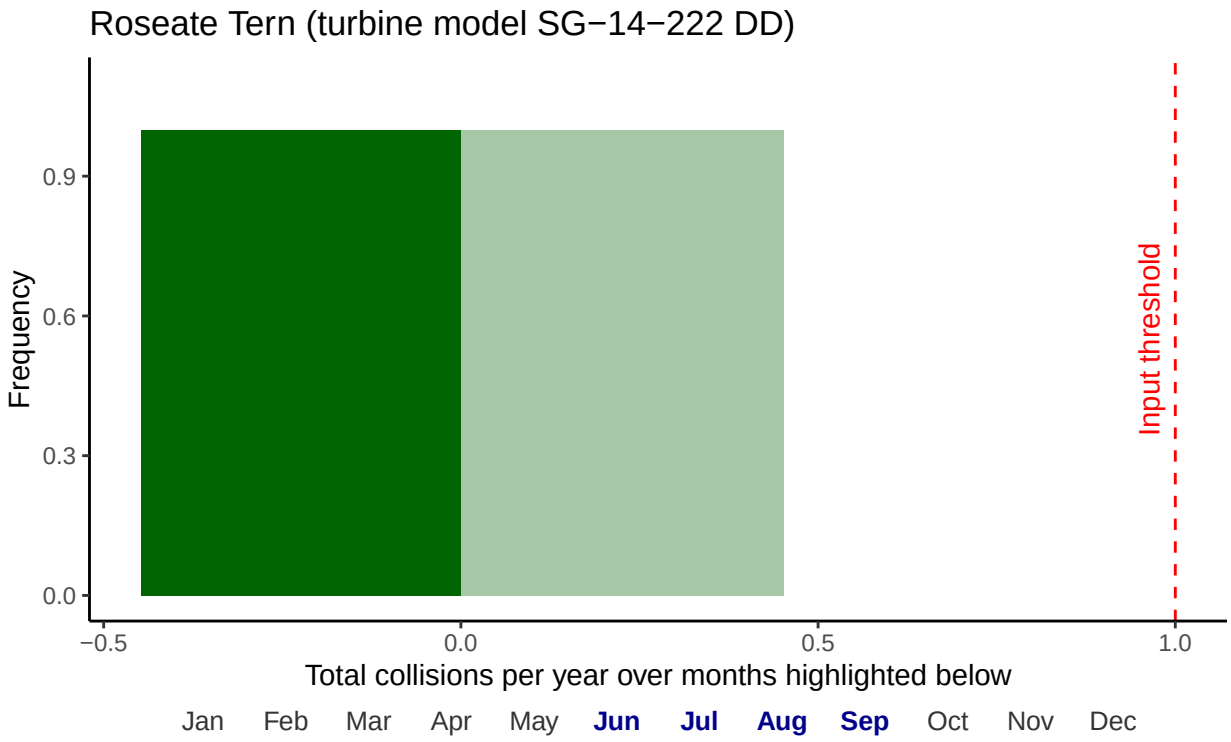
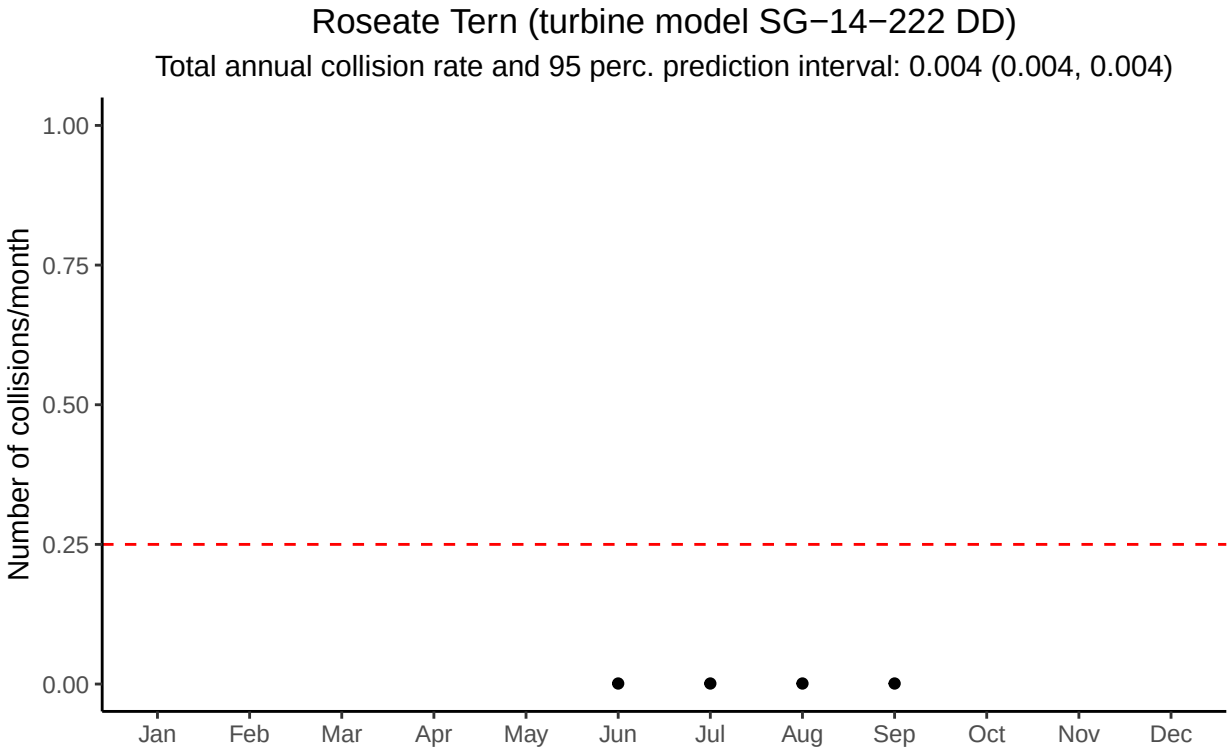


Figure 2: A frequency histogram of the total number of collisions per year. The heights of the bars show the relative frequency of each value. Months for which movement data were provided or available are shown in bold; only bold months are shown in histogram of annual collisions.



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