Maryland Offshore Wind Project Biological Assessment

For the U.S. Fish and Wildlife Service
December 2023

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

Acronym	Definition
ADLS	aircraft detection lighting system
BA	biological assessment
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of Federal Regulations
COP	Construction and Operations Plan
CTV	crew transfer vessel
DOI	U.S. Department of the Interior
EIS	environmental impact statement
ESA	Endangered Species Act
FAA	Federal Aviation Administration
HDD	horizontal directional drilling
Lease Area	Lease Area OCS-A 0490
MW	megawatt
O&M	operations and maintenance
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OSSs	offshore substations
PATON	private aid to navigation
PDE	Project Design Envelope
POI	point of interconnection
ROW	right-of-way
rpm	revolutions per minute
RSA	rotor swept area
TCB	tri-colored bat
USFWS	U.S. Fish and Wildlife Service
U.S.	United States
WEA	Wind Energy Area
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 formal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding the species that may be affected by the approval of a construction and operations plan (COP) for the Maryland Offshore Wind Project (Proposed Action or Project) within the Maryland Lease Area on the Outer Continental Shelf (OCS) (Figure 1-1).

This biological assessment (BA) has been prepared pursuant to the ESA to evaluate potential impacts of the Proposed Action on ESA-listed species. This BA provides a comprehensive description of the Proposed Action, defines the Action Area, describes those species potentially affected by the Proposed Action, and provides an analysis and determination of how the Proposed Action may affect listed species and/or their habitats. The activity BOEM is considering includes approving the COP for the construction and installation (construction), operations and maintenance (operations), and conceptual decommissioning (decommissioning) of the proposed offshore wind energy facility with a maximum nameplate capacity of up to 2,000 megawatts (MW), as well as associated submarine and upland cables connecting the wind facility to the proposed substations located in Sussex County, Delaware. Onshore support facilities would be located at existing waterfront industrial or commercial sites within the Ocean City, Maryland area. This document assesses impacts on endangered and threatened species listed under the ESA that are under the oversight of the USFWS from the construction, operations, and decommissioning of a proposed Project located within all of BOEM's Renewable Energy Lease Area OCS-A 0490 (Lease Area).

The lease between US Wind Inc. (applicant) and BOEM (Lease OCS-A 0490) has an operations term of 25 years that commences on the date of COP approval; see also Code of Federal Regulations, Title 30, Section 585.235(a)(3) (30 CFR § 585.235(a)(3)). The operations term includes the construction, operations, and decommissioning stages of the Proposed Action.

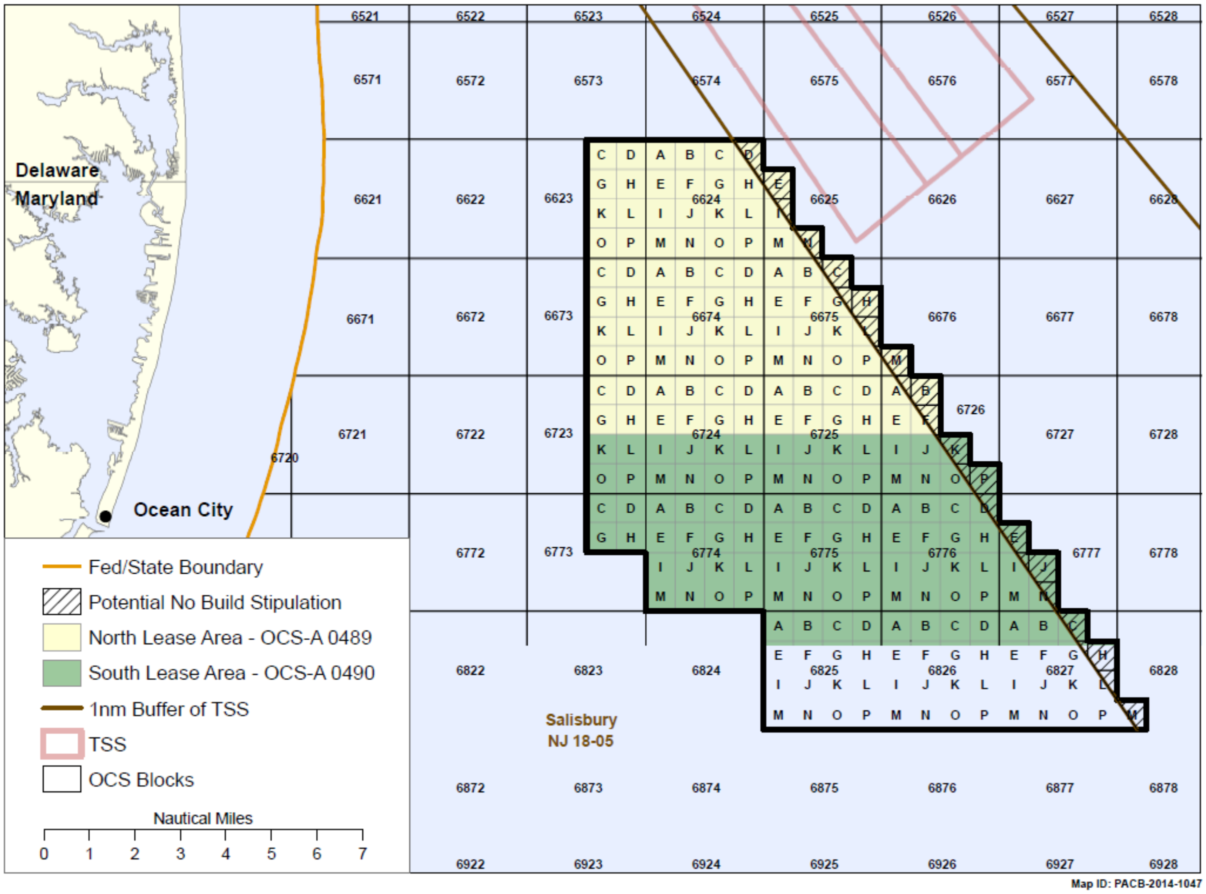

Figure 1-1. Maryland Lease Area

1.1 Background

BOEM's evaluation of the Atlantic coast for offshore wind development began in 2009 with public stakeholder outreach and desktop screening analysis. As part of this effort, BOEM began an initiative to identify areas compatible with offshore wind energy on a state-by-state basis. After these initial efforts, BOEM conducted the following activities related to the planning and leasing on the OCS offshore Maryland:

- In December 2010, BOEM published a Request for Interest in the Federal Register to determine commercial interest in wind energy development offshore Maryland (75 Fed. Reg. 68824 [November 29, 2010]). BOEM invited the public to comment and provide information on environmental issues and data for consideration in the Request for Interest area and solicit interest in offshore wind energy development. In total, BOEM received nine indications of interest from eight companies interested in obtaining a commercial lease. BOEM also received 12 public comments; in response to those comments and after taking into consideration navigation and commercial fisheries concerns, BOEM modified the planning area by making approximately 45 percent smaller than the original area.

- In February 2012, BOEM published a Call for Information and Nominations in the Federal Register to identify lease block locations in which there was industry interest to seek commercial leases for developing wind energy projects (77 Fed. Reg. 5552 [February 3, 2012]). In the same month, BOEM published a Notice of Availability of an environmental assessment for commercial wind leasing and site assessment activities offshore New Jersey, Delaware, Maryland, and Virginia. The comment period for the Call for Information and Nominations yielded six nominations of interest. As a result of the environmental assessment process, BOEM issued a "Finding of No Significant Impact," which concluded that reasonably foreseeable environmental impacts associated with the commercial wind lease issuance and related activities would not significantly affect the environment.
- In June 2012, BOEM published a "Finding of No Historic Properties Affected for the Issuance of Commercial Leases within the Maryland Wind Energy Area," which concluded that no historic properties will be affected by the lease issuance undertaking, consistent with 36 CFR 800.4(d).
- In December 2013, the U.S. Secretary of Interior and BOEM's Acting Director joined the Maryland Governor to announce that nearly 80,000 acres (32,374.8 hectares) offshore of Maryland in federal waters would be available for commercial wind energy leasing. This area is referred to as the Maryland Wind Energy Area (WEA). In response to the Public Sale Notice, BOEM received 19 comment submissions and seven additional qualifications packages from companies wishing to participate in the auction.
- In August 2014, BOEM held a competitive lease sale for the two lease areas within BOEM's Maryland WEA, referred to as the North Lease Area and South Lease Area. US Wind Inc. (US Wind) won both lease areas (Lease Area OCS-A 0489 and OCS-A 0490) in the auction. The North Lease Area was 32,737 acres (13,248.2 hectares) and the South Lease Area was 46,970 acres (19,008.1 hectares).
- On December 1, 2014, the commercial wind energy leases (Lease Area OCS-A 0489 and OCS-A 0490) with US Wind Inc. went into effect.
- In January 2018 BOEM approved the request to merge US Wind's commercial leases into a single lease. Made effective March 1, 2018, by Lease Amendment, US Wind's commercial leases OCS-A 0489 and OCS-A 0490 were merged into a single lease, retaining lease number OCS-A 0490, and Lease OCS-A 0489 automatically terminated. This amended lease area is approximately 79,707 acres (32,256.3 hectares) (Figure 1-1).
- On June 8, 2022, BOEM published a Notice of Intent to Prepare an Environmental Impact Statement (EIS) for the review of a COP for US Wind's wind project offshore Maryland.

US Wind submitted its COP for the Proposed Action to BOEM for review in August 2020. US Wind resubmitted an updated COP in November 2021, March 2022, May 2022, November 30, 2022, and July 2023. The COP is available for viewing at BOEM's Project-specific website.[1] Additional details regarding the Proposed Action are included in the Draft EIS Chapter 2, Proposed Action and Alternatives (BOEM 2023).

1.2 Consultation History

This formal consultation for the Proposed Action builds on BOEM's experience with similar but larger-scale offshore wind development projects on the Atlantic coast.

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,

[1] The COP can be reviewed at https://www.boem.gov/renewable-energy/state-activities/us-wind.

2011, the USFWS concurred with BOEM's determinations that the risk to the Roseate Tern (*Sterna dougallii*), Piping Plover (*Charadrius melodus*), Bermuda Petrel (*Pterodroma cahow*), and Rufa Red Knot (*Calidris canutus rufa*) regarding lease issuance, associated site characterization (survey work), and site assessment activities (construction, operations, and decommission of buoys and meteorological towers (Met Towers) was "small and insignificant" and, therefore, **not likely to adversely affect** the three ESA-listed species and one candidate species.

On August 16, 2023, in preparation for the Draft EIS for the Proposed Action and this BA, BOEM used USFWS's Information for Planning and Consultation (IPaC) system to determine if any ESA-listed, proposed, or candidate species may be present in the proposed Action Area. The IPaC reports identified six ESA-listed species with potential to occur in the Action Area: Eastern Black Rail (*Laterallus jamaicensis ssp. jamaicensis*), Piping Plover, Roseate Tern, Rufa Red Knot, monarch butterfly (*Danaus plexippus*), and seabeach amaranth (*Amaranthus pumilus*). On November 29, 2023, BOEM used the USFWS's IPaC system to generate new reports at the request of the USFWS and using updated GIS shapefiles for the Proposed Action. The November 2023 IPaC report contained the same six species as the August 2023 report (Appendix A, USFWS Information for Planning and Consultation (IPaC) Threatened and Endangered Species Results and Consistency Letter). Northern long-eared bat (*Myotis septentrionalis*), tri-colored bat (*Perimyotis subflavus*), and Bethany Beach firefly (*Photuris bethaniensis*) are included in the BA as there are records in the vicinity of the proposed Action Area.

This BA assesses all aspects of the Proposed Action, including construction, operations, and decommissioning on USFWS-listed species. BOEM is requesting concurrence (within 30 days) on BOEM's conclusions that the impacts of the proposed activities are expected to be discountable and insignificant, and, thus, **not likely to adversely affect** Eastern Black Rail, Roseate Terns, northern long-eared bats and tri-colored bats, and no critical habitat designated for these species would be affected by the proposed activities. Further, the impacts, if any, of the proposed activities are expected to be discountable and insignificant, and, thus, **not likely to adversely affect** monarch butterfly. The proposed activities would have **no effect** on the seabeach amaranth or Bethany Beach firefly. However, the potential modeled impacts of the proposed activities arising from interactions with operational WTGs on the OCS may rise to the level of take and thus, **likely to adversely affect** Piping Plover and Rufa Red Knot.

1.3 Action Agencies and Regulatory Authorities

BOEM is the lead federal agency for purposes of Section 7 consultation (50 Code of Federal Regulations [CFR] 402.07); the other co-action agencies include the Bureau of Safety and Environmental Enforcement (BSEE), and the United States Army Corps of Engineers (USACE); and other cooperating agencies include the United States Coast Guard (USCG), the United States Environmental Protection Agency (USEPA), and the National Marine Fisheries Service's Office of Protected Resources (NMFS OPR).. The additional agencies may coordinate with BOEM on issuance of permits related to the Proposed Action. These may include a Section 10/404 permit from USACE and an air permit from the EPA. Additional consultation may occur under Section 106 of the National Historic Preservation Act, as well as additional consultation with indigenous nations. The Applicant is also coordinating with NMFS and has applied for issuance of an LOA under the MMPA.

1.3.1 Bureau of Safety and Environmental Enforcement

BSEE's mission is to enforce safety, environmental, and conservation compliance with any associated legal and regulatory requirements during Project construction and future operations. The reorganization of the Renewable Energy rules (30 CFR Parts 285, 585, and 586) enacted on January 31, 2023) reassigned existing regulations governing safety and environmental oversight and enforcement of OCS renewable energy activities from BOEM to BSEE. BSEE would lead the review of post-COP plan submittals, Facility Design and Fabrication and Installation Reports, oversee inspections and enforcement actions, oversee closeout verification and decommissioning efforts, oversee facility removal inspections/ monitoring, and oversee environmental and safety confirmation. BSEE, with BOEM, would enforce the Outer Continental Shelf Lands Act (OSCLA), COP conditions, and ESA terms and conditions on the OCS.

1.3.2 U.S. Army Corps of Engineers

USACE regulates discharges of dredged or fill material into waters of the United States and structures or work in navigable waters of the United States under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act, which would include the construction of offshore WTGs, scour protection around the base of the WTGs, OSSs, inter-array cables, offshore export cables, and port modifications. US Wind appied for permits from USACE to construct up to 121 WTGs, scour protection around the base of the WTGs, four OSSs, one met tower, inter-array cables connecting the WTGs to the OSSs, and offshore export cables. The cable routes would originate from the OSSs and would make landfall at 3 R's Beach in Delaware. US Wind submitted the initial draft application materials for all required USACE permits and approvals to the USACE in February 2023. US Wind submitted the permit application materials to the USACE in October 2023. The USACE issues a public notice on the application with a public comment period from October 6 to December 5, 2023. The USACE would enforce ESA terms and conditions landward of the Submerged Lands Act boundary, including relevamt onshore portions of the proposed Project.

1.3.3 U.S. Coast Guard

The USCG administers the permits for Private Aids to Navigation (PATONs) located on structures positioned in or near navigable waters of the United States. PATONS and federal aids to navigation, including radar transponders, lights, sound signals, buoys, and lighthouses, are located throughout the Project area. It is anticipated that USCG approval of additional PATONs during construction of the WTGs, OSSs, and met tower, and along the offshore export cable corridors may be required. These aids serve as a visual reference to support safe maritime navigation. US Wind anticipates requesting PATON authorization; however, the timing of this request was unknown when the BA was published.

All Project vessels would also be required to follow existing state and federal regulations related to ballast and bilge water discharge, including USCG ballast discharge regulations (33 CFR 151.2025).

1.3.4 U.S. Environmental Protection Agency

The OCS Air Regulations, found at 40 CFR 55, establish the applicable air pollution control requirements, including provisions related to permitting, monitoring, reporting, fees, compliance, and enforcement, for facilities subject to Section 328 of the Clean Air Act (42 U.S.C. § 7401 et seq.). EPA issues OCS Air Permits. Emissions from Project activities on the OCS would be permitted as part of an OCS air permit and must demonstrate compliance with National Ambient Air Quality Standards. US Wind submitted a Notice of Intent to EPA for the OCS Air Permit on August 5, 2022 (87 Fed. Reg. 63465 [October 19, 2022]).

1.3.5 National Marine Fisheries Service

The MMPA of 1972 as amended and its implementing regulations (50 CFR 216) allow, upon request, the incidental take of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographic region. Incidental take is defined under the MMPA (50 CFR 216.3) as, "harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild."

NMFS received a request for authorization to incidentally take marine mammals resulting from construction activities related to the Project, which NMFS may authorize under the MMPA. NMFS's issuance of an MMPA incidental take authorization is a major federal action and, in relation to BOEM's action, is considered a connected action (40 CFR 1501.9I(1)). The purpose of the NMFS action—which is a direct outcome of US Wind's request for authorization to take marine mammals incidental to specified activities associated with the Project (e.g., pile driving)—is to evaluate US Wind's request under requirements of the MMPA (16 USC 1371(a)(5)(D)) and its implementing regulations administered by NMFS and to decide whether to issue the authorization.

On August 31, 2022, US Wind submitted a request for a rulemaking and LOA pursuant to Section 101(a)(5) of the MMPA and 50 CFR § 216 Subpart I to allow for the incidental harassment of marine mammals resulting from the installation of WTGs, OSSs, and met tower; and performance of high-resolution geophysical (HRG) surveys. US Wind is including activities in the LOA request that could cause acoustic disturbance to marine mammals during construction of the Project pursuant to 50 CFR § 216.104. The application was reviewed, revised and resubmitted on March 31, 2023, and considered complete on April 3, 2023. NMFS published a Notice of Receipt in the Federal Register on May 2, 2023 (88 Fed. Reg. 27463 [May 2, 2023]).

2 Description of the Proposed Action

The Proposed Action (Figure 2-1) would allow US Wind to construct, operate, maintain, and decommission an up to 2.2-GW wind energy facility in the Lease Area, 10.1 miles (16.2 kilometers) off the coast of Maryland. The project design envelope (PDE) would consist of up to 121 WTGs—ranging from 14 to 18 MW each, up to four offshore substations (OSSs), inter-array cables in strings of four to six linking the WTGs to the OSSs, and substation interconnector cables linking the OSSs to each other. The Proposed Action includes a 1 nautical mile (1.9 kilometer) setback from the traffic separation scheme (TSS) from Delaware Bay which removes 7 of the 121 WTG positions, resulting in a total of 114 WTGs in the Proposed Action (Figure 2-1). Up to four offshore export cables (installed within one Offshore Export Cable Route) would transition to a landfall at 3R's Beach via horizontal directional drilling (HDD). From the landfall, the cables would continue along the Inshore Export Cable Route within Indian River Bay to connect to an onshore substation adjacent to the point of interconnection (POI) at the Indian River substation owned by Delmarva Power and Light in Dagsboro, Delaware. The POI will include an expansion of the existing substation and construction of two new substations adjacent to or within 0.5 mile (0.8 kilometer) of the existing substation (US Wind 2023).

The Project includes MarWin, a wind farm of approximately 300 MW for which the State of Maryland awarded to US Wind ORECs in 2017; Momentum Wind, consisting of approximately 808 MW for which the State of Maryland awarded additional ORECs in 2021; and build-out of the remainder of the Lease Area to fulfill ongoing, government-sanctioned demands for offshore wind energy.

US Wind proposes the Project using a project design envelope (PDE) concept. This concept allows US Wind to define and bracket proposed Project characteristics for environmental review and permitting while maintaining a reasonable degree of flexibility for selection and purchase of Project components such as wind turbine generators (WTGs), foundations, export cables, and offshore substation (OSS).[2]

BOEM provides US Wind and other lessees with the option to submit COPs using the PDE concept—providing sufficiently detailed information within a reasonable range of parameters to analyze a "maximum-case scenario" within those parameters for each affected environmental resource. A summary of US Wind's PDE parameters is provided in Table 2-1 and details the full range of maximum-case design parameters for the proposed Project and which parameters are relevant to the analysis. BOEM may require a COP be revised if there is any significant changes in available information on onshore or offshore conditions affecting, or affected by, the activities conducted under the COP (30 CFR § 585.634).

2 Additional information and guidance related to the PDE concept can be found here: Draft Guidance Regarding the Use of a Project Design Envelope in a Construction and Operations Plan (boem.gov).

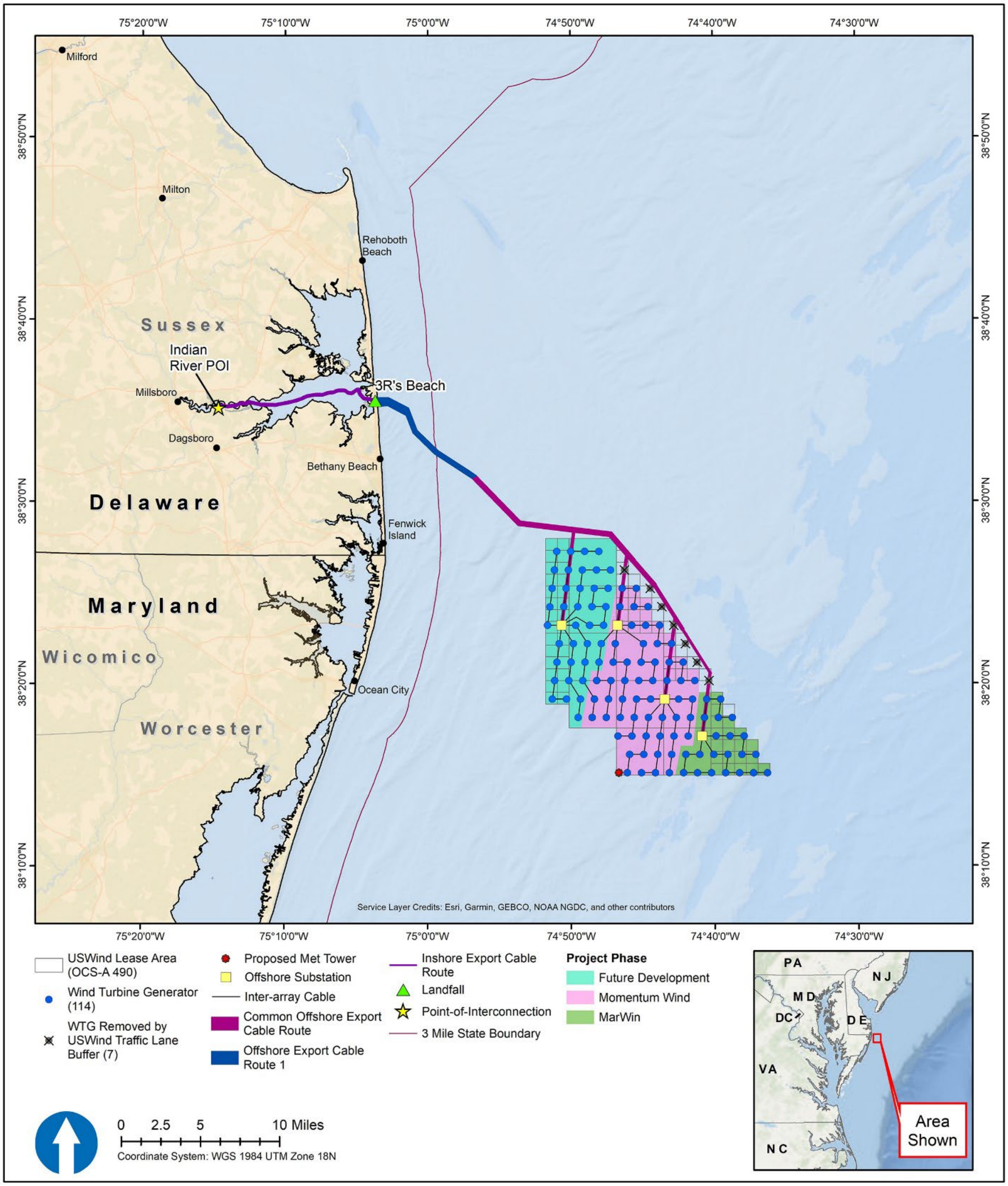

Figure 2-1. Maryland offshore wind Project area

Table 2-1. Proposed action design envelope parameters.

Project Parameter Details
General (Layout and Project Size)
• Up to 121 WTGs (Proposed Action 114). • Project phases up to approximately 2 gigawatts (GW) of nameplate capacity. • Target commercial operation date of MarWin is December 2025. • Target commercial operations for Momentum Wind and any future build out of the remaining Lease area is 2026 and 2027.
Wind Turbine Generators (WTGs)
• WTG Size - 14.7 to 18 MW. • Spacing - 0.77 nautical mile (1.43 kilometer) east to west and 1.02 nautical mile (1.89 kilometer) north to south. • Rotor Diameter - 722 to 820 feet (220 to 250 meters). • Hub Height - 456 to 528 feet (139 to 161 meters). • Height Tip of Blade - 817 to 938 feet (249 to 286 meters). • Air Gap - 118 feet (36 meters)
WTG Foundations
• Monopiles: large diameter coated steel tubes driven into the seabed. • Installation using hammered pile driving. • Layers of rock will be used for scour protection around the foundations.
Offshore Substations (OSSs) and Foundations
• Up to four OSSs. • OSS foundations will be monopiles, jackets on piles, or jackets on suction buckets.
Meteorological Tower (Met Tower)
• 328-foot (100-meter) tall mast on a 3,000 square foot (279 square meter) deck atop a Braced Caisson foundation - includes measurement devices to record winds and waves.
Inter-Array Cables
• 66 kV Alternating Current (AC), 3-core cable. • Maximum Length - 125.6 miles (202.2 kilometers). • Target burial depth - approximately 3.3 to 9.8 feet (1 to 3 meters), not more than 13.1 feet (4 meters). • Installed using towed or self-driving jet plow.
Offshore Export Cables
• Up to four 230 to 275 kV Alternating Current (AC), 3-core cable. • Maximum Length - 142.5 miles (229.3 kilometers). • Target burial depths - approximately 3.3 to 9.8 feet (1 to 3 miles), not more than 13.1 feet (4 meters). • Installed using towed or self-driving jet plow. • Cable crossings or hard bottoms may require additional protection such as mattresses, rock placement, or cable protection systems.
Landfall for the Offshore Export Cable
• Two potential landfall locations both in Delaware Seashore State Park parking lots at 3R's Beach and Tower Road. • Landfall cable transitions will be completed via horizontal directional drilling (HDD).

Project Parameter Details
Inshore Export Cable
• Up to four 3-phase 230 to 275 kV Alternating Current (AC) or 12 single-phase inshore export cables. • Maximum Length of Inshore Export Cables - 42.24 miles (68 kilometers). • Traverses Indian River Bay after landfall and connects to onshore substations next to the POI at Indian River Substation. • Inshore export cable installed using barge mounted vertical injector, which fluidizes the sediment. • Multiple barges and moved along the route using a six-point anchor system. • Target burial depths - approximately 3 to 7 feet (1 to 2 meters).
Onshore Facilities
• Expansion of existing Indian River substation. • Three proposed onshore substations in the vicinity of the existing Indian River Substation. • All onshore cable infrastructure will be buried.
Operations and Maintenance (O&M) Facility
• An O&M Facility is proposed in the Ocean City, Maryland.

OSS = offshore substation; WTG = wind turbine generator

2.1 Offshore Facilities

Proposed offshore Project components include WTGs and their foundations, OSSs and their foundations, scour protection for foundations, inter-array and offshore substation interconnection cables, and offshore and inshore export cables. These components collectively compose the Offshore/Inshore Project area. A Met Tower is also proposed to serve as a permanent metocean monitoring station outfitted with scientific instruments for recording empirical environmental and biological conditions. The proposed offshore/inshore Project components are on the OCS, as defined in the OCSLA, except for a portion of the export cables that would be within state waters.

2.1.1 Wind Turbine Generators

The Proposed Action includes the installation of up to 114 WTGs, extending up to 938 feet (286 meters) (height of tip blade) above the sea surface with an east-west spacing of 0.77 nautical mile (1.43 kilometers) and a north-south spacing of 1.02 nautical miles (1.89 kilometers). Figure 2-2 presents a schematic drawing of the maximum WTG design parameters. US Wind would install the WTGs on monopile foundations, which are large-diameter, coated steel tubes driven into the seabed. The diameter, weight, length, and wall thickness of the monopile vary based on water depth, geotechnical conditions, metocean conditions, and WTG size.

Monopile foundations will be transported to the installation site via self-floating or by using feeder vessels or direct installation vessels. The number of feeder vessels employed will be determined by foundation size and installation rate. US Wind anticipates up to four feeder vessels could be employed to support monopile installation. The feeder vessels may be jack-up vessels or tug and barge units. The feeder vessels may employ anchors for positioning, utilizing mid-line anchor buoys. The feeder vessels will sail from Baltimore, Maryland, to the Lease Area via the Chesapeake and Delaware Canal and Delaware Bay or via Chesapeake Bay. Installation of the monopile foundations offshore will be conducted using a dynamically positioned crane vessel or a jack-up style installation vessel equipped with a hydraulic impact hammer to drive the monopilIs into the seabed. Use of a vibratory hammer is also under evaluation.

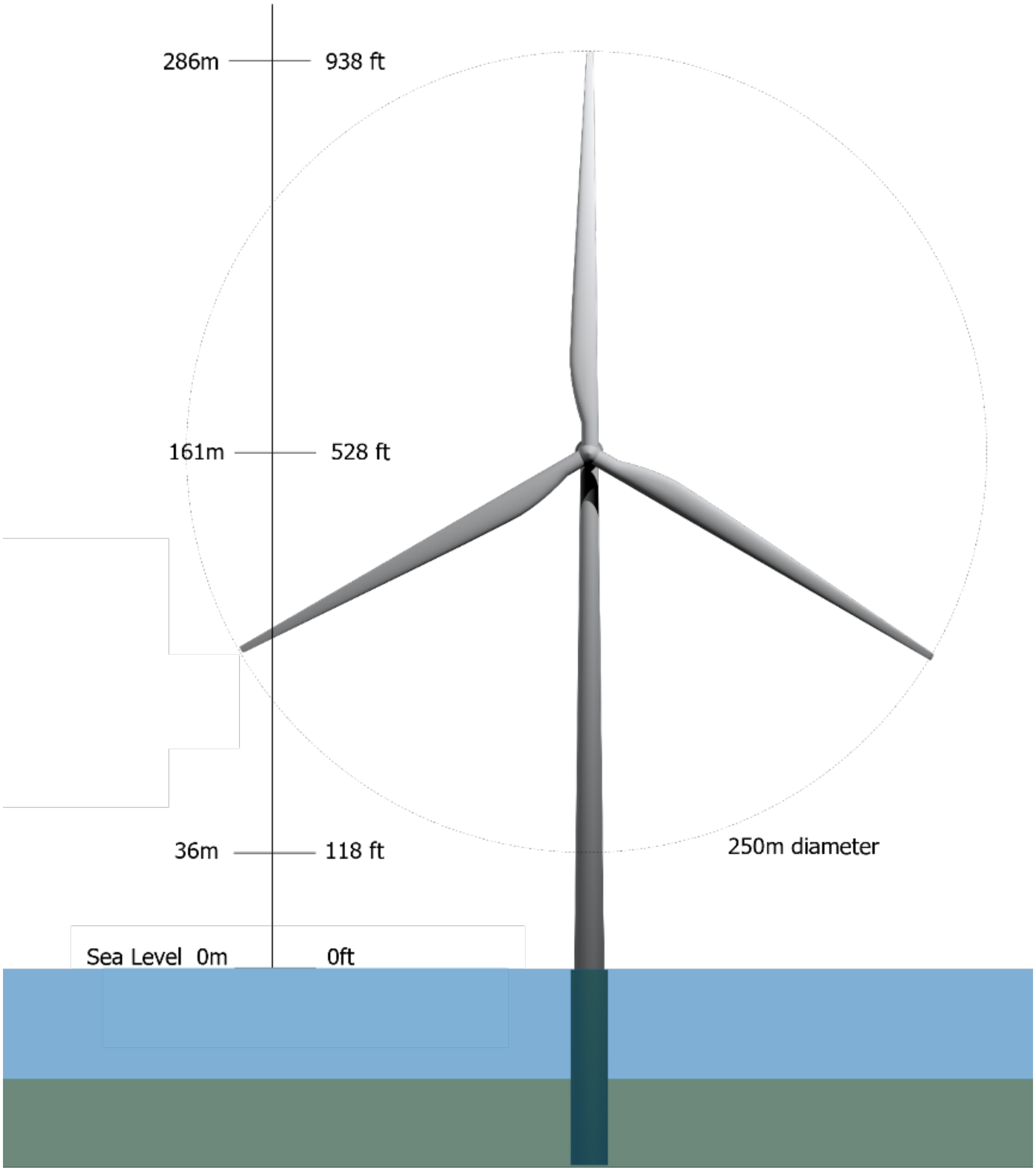

Figure 2-2. Wind turbine generator schematic (maximum design parameter)
Source: US Wind 2023

US Wind intends to include scour protection in the form of rock around the base of the WTG monopile foundations, an area approximately three times the diameter of the foundation. The first layer of scour protection rocks will be deployed in a circle around the pile location, with a layer thickness of up to 2 feet (0.5 meters). This layer of small rocks—the filter layer—will stabilize the sandy seafloor, avoiding the development of scour holes. The rocks will be placed by a specialized rock-dumping vessel. Once the inter-array cables have been pulled into the monopile, a 2- to 7-foot (1- to 2-meters) thick layer of larger rocks—the armor layer—will be placed to stabilize the filter layer around the monopile.

The WTGs would be lit and marked in accordance with Federal Aviation Administration (FAA) and U.S. Coast Guard lighting standards and consistent with BOEM best practices (BOEM 2021). Obstruction aviation lights are planned to be placed on the nacelle and tower of each WTG. US Wind expects to install two medium-intensity obstruction aviation lights on top of each nacelle and four low-intensity flashing obstruction lights midway up each tower (approximately 229.7 to 262.5 feet [70 to 80 meters] above mean sea level), as well as a helicopter hoist status light, which is a green status light that is flashing or steady burning to indicate the hoist status. Some helicopter hoist status lights are designed to incorporate a search and rescue operations light, which is a steady burning red light to indicate target turbines in emergency cases. To reduce the potential impacts on nocturnal migrant bird species, US Wind has committed to installing an aircraft detection lighting system (ADLS) on WTGs and OSS. ADLS would activate the hazard lighting system in response to detection of nearby aircraft but would leave the FAA warning lights off when no aircraft is nearby. Specifically, in accordance with FAA Advisory Circular 70/7460-1M (FAA 2020), lights controlled by an ADLS must activate and illuminate prior to an aircraft reaching 3 nautical miles (5.6 kilometers) from within 1,000 vertical feet (305 meters) of structures. Use of ADLS would reduce the duration of obstruction lighting system activation by more than 99 percent compared to continuously illuminated lights in a system without ADLS. As a result, ADLS for the Proposed Action would be activated for approximately 5 hours, 46 minutes, 22 seconds in a 1-year period (Capitol Airspace Group 2023), which is approximately 0.1 percent of all annual nighttime hours.

The applicant would paint WTGs no lighter than radar-activated light 9010 Pure White and no darker than radar-activated light 7035 Light Grey. In addition, the lower sections of each structure would be marked with high-visibility yellow paint (color name: radar-activated light 1023) from the water line to an approximate height of at least 50 feet (15 meters), consistent with International Association of Marine Aids to Navigation and Lighthouse Authorities guidance.

2.1.2 Offshore Substations

The Proposed Action includes the installation of up to four OSSs for the Project, one for each grouping of 300 to 400 MW of WTG capacity, deployed atop monopile or jacket foundations. US Wind is evaluating a modular configuration of the OSS topsides, which is intended to be standardized to the extent possible to reduce cost, simplify installation, and facilitate review and approval. US Wind is also evaluating the combination of some or all OSS components onto one or two larger platforms. For this approach, equipment serving two or more arrangements of 300 to 400 MW (up to the full capacity of the Project) would be combined onto one or two large jacket foundations.

OSS topside dimensions are anticipated to range from 98 by 141 feet and 164 feet high (30 by 43 meters and 50 meters high) for a single module OSS in multiple locations and up to 131 by 262 feet and 197 feet high (40 by 80 and 60 meters high) for an OSS topside if the modules are placed at a single location. Monopile or jacket foundations are being considered for the OSSs. US Wind expects to install two medium-intensity flashing red obstruction aviation lights (also controlled by ADLS), four low-intensity flashing red obstruction lights in a ring, and a helicopter hoist status light.

A monopile foundation for an OSS would be similar to a monopile for a WTG. A jacket is a multi-leg lattice structure that is connected to the seabed via piling or suction buckets. The PDE includes a three-, four-, or six-leg jacket structure for the OSSs, depending on capacity. Piles driven into the seabed or suction buckets are used as the foundation of the jacket and to support the topsides. For piles, these may be pre-installed using a temporary template on the seabed or post-installed through jacket pile guides. For the jacket on suction bucket configuration, the buckets are integrated into the jacket legs and the structure is installed as one piece. Preliminary design parameters for the pile and jacket features are provided in Table 2-2. OSS commissioning activities are expected to be supported from a floating hotel (Flotel) or jack-up vessel. US Wind intends to include scour protection in the form of rock around the base of the OSS foundation, an area approximately three times the diameter of the piles or buckets. Suction buckets with scour protection mats incorporated into the buckets may be used if available and feasible.

Table 2-2. Offshore Substation foundation design parameters

OSS Parameter	Monopiles	Jacket on Suction Buckets	Jacket on Piles
Diameter (each)	26–36 feet (8–11 meters)	33–49 feet (10–15 meters)	7–13 feet (2–4 meters)
Pile footprint (each)	165.0–312.0 square feet (50.3–95.1 square meters)	257.5–577.4 square feet (78.5–176.0 square meters)	10.2–23.3 square feet (3.1–7.1 square meters)
Pile penetration depth	98–131 feet (30–40 meters)	33–49 feet (10–15 meters)	98–262 feet (30–80 meters)

Source: US Wind 2023

2.1.3 Inter-array Cables

The Proposed Action includes inter-array cables connecting the WTGs to the OSSs that will run in a primarily north-south direction connecting four to six WTGs in a string. The cables will transition from their primary north-south direction to an east-west direction as required to connect the WTG strings to the OSSs. The inter-array cables will be 66 kV alternating current (AC), three-core cables with a maximum length of 125.6 miles (202.2 kilometers).

2.1.4 Offshore Export Cable Routes

The Proposed Action includes up to four offshore export cables, one originating from each OSS within a single 1,968-feet (600-meters) wide Offshore Export Cable Route to the planned landfall at 3R's Beach. The offshore export cables will include 230 to 275 kV AC, three-core cables with a combined length of approximately 142.5 miles (229.3 kilometers).

For both the inter-array and offshore export cables, a pre-lay grapnel run will be conducted to remove debris prior to cable installation. While the possibility exists that some seafloor leveling, pre-trenching, or boulder removal may be required, it is not expected. Based on the sandy seafloor observed along the route, the cables likely will be installed using a towed or self-driving jet plow, which allows for direct installation and burial of the cable. A jet plow uses a combination of high-pressure water to temporarily fluidize the sediment, and the cable settles into the area opened by the jets through a combination of its own weight and a depressor arm. The displaced sediment settles back over the cable, effectively burying the cable. If soil conditions do not permit the use of a jet plow, a mechanical cutting/trenching tool or conventional cable plow may be employed. US Wind plans to bury cables 3.3 to 6.6 feet (1 to 2 meters) deep, but no more than 13.1 feet (4 meters) deep. If post-lay surveys determine insufficient burial depth, concrete mattresses will be installed. US Wind estimates a maximum of 10 percent of the offshore export cable would require additional protection, and it is likely to be significantly less.

2.1.5 Inshore Export Cable Routes

The Proposed Action includes up to four inshore export cables connecting the planned landfall at 3R's Beach, traversing Indian River Bay, with the onshore Indian River substation (Figure 2-3). Similar to the offshore export cables, the inshore export cables will include 230 to 275 kV AC, three-core cables with a combined length across Indian River Bay of approximately 42.24 miles (68 kilometers). The entire length of the inshore export cables will be buried from the beach landfall to the onshore substation.

To achieve the target burial depth, US Wind and its contractors have determined dredging for barge access in locations along the Inshore Export Cable Routes would be necessarily preceding cable installation. US Wind assumes that cable installation in Indian River Bay would be occur over two construction seasons (Campaign 1 – one cable, associated with MarWin and Campaign 2 – up to three cables, associated with Momentum and future development). Dredging would be conducted using mechanical, or most likely, hydraulic means. The maximum volume of dredging, assuming all four cables were installed within both the northern and southern Inshore Export Cable Routes is estimated to approximately 390,648 cubic yards (298,6712 cubic meters). US Wind assumes all construction within Indian River Bay, including any dredging, would occur in October-March window, observing the general time of year restrictions for summer flounder and other species. Time of year restrictions would be determined through consultations with DNREC.

Under the Proposed Action it is anticipated that the dredged material would be deposited within the construction corridor of approximately 633 feet (193 meters) on either side of the centerline of the Inshore Export Cable Route using a floating pipeline system, barge, or scow. Dredge material disposal would occur within the surveyed Inshore Export Cable Route in areas with compatible physical and chemical characteristics. The entirely Inshore Export Cable Routes has been characterized as soft bottom habitat. Furthermore, the sediments will have to meet State standards prior to placement.

Seabed preparation for inshore cables including route clearance activities will be conducted prior to cable installation including a pre-installation survey and grapnel run. The pre-installation survey and grapnel run will be conducted along the cable routes to remove debris such as lost fishing nets or other objects that could impact the cable lay and burial. Collected debris will be recovered and disposed of in appropriate shore side facilities. Pre-installation seafloor preparation, such as levelling, pre-trenching or boulder removal, is not currently expected (COP, Volume I, Section 3.6.1; US Wind 2023).

The cable installation spread will be arranged to maintain a limited draft and may be arranged on multiple barges. A cable storage barge will be equipped with a turntable, loading arm, and cable roller highway (used to reduce cable tension) towards a cable installation barge. The barges would be suitable for positioning close to the HDD exit points (Old Basin Cove -Indian River Bay and Deep Hole – Indian River) due to the flat bottom and shallow draft. It is expected that the barge will be moved along the cable route using a six-point anchor system, assisted by an anchor handling tug, in combination with spud piles.

The inshore export cable will be fed to the HDD ducts using small boats and floatation where it will subsequently be pulled through the ducts into the jointing/transition bays. If necessary, a temporary cable roller highway will be pre-installed in shallow water. The cable barge will lay and bury the cable between the two end points maneuvering along the cable route using its anchoring system and positioned using spuds as required. Based on the sediments observed along Inshore Export Cable Route in Indian river Bay, it is assumed that a barge mounted vertical injector, which fluidizes the soil, will be the primary burial tool for the cable. The use of a cable plough or barge mounted excavator may be required in some areas. In shallow water, a self-driving or towed post-lay cable burial tool may be used.

No cable or pipeline crossings have currently been identified within the Inshore Export Cable Route based on currently available information. It is anticipated that the cable will be installed in a continuous length, however if operational needs warrant, the cable can be installed in smaller sections and spliced. US Wind will optimize the cable installation and construction methodologies and include the details in the Facility Design Report and Fabrication and Installation Report process.

With any of the cable burial methods within the Inshore Export Cable Route, the trench in the bay bottom would be narrow and would collapse immediately after the cable has been depressed into the trench. The required burial depth will be based on the anticipated long-term bay bottom morphology and is expected to be 3 to 7 feet (1 to 2 meters). Up to 4 export cables may be laid in Indian River Bay with spacing of 32 to 98 feet (10 to 30 meters) between the parallel alignments to allow for construction and any future maintenance. Construction would be confined to an approximately 1,640-foot (500-meter) corridor along the Inshore Export Cable Route within Indian River Bay.

US Wind assumes all construction within Indian River Bay, including any dredging, would occur in October-March window, observing the general time of year restrictions for summer flounder and other species. Time of year restrictions would be determined through consultations with DNREC.

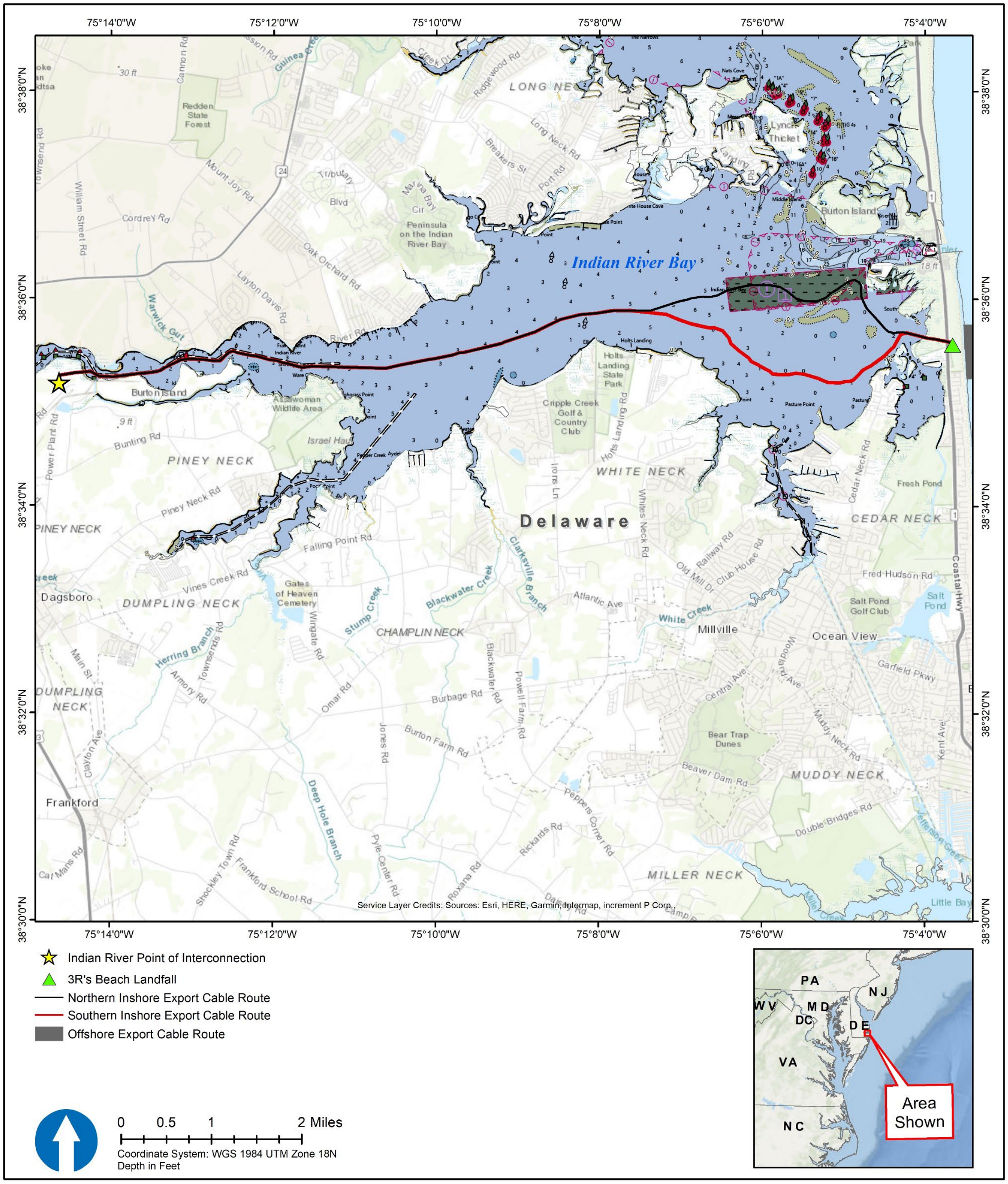

Figure 2-3. Inshore Export Cable Route

2.1.6 Landfall HDD Operations

For the 3R's Beach landfall (Figure 2-4), HDD operations will be employed to install cable ducts at up to three transition points between water and land: (1) between the Atlantic Ocean and landfall at 3R's Beach; (2) from 3R's Beach into Indian River Bay (Old Basin Cove); and (3) from the Indian River (Deep Hole) to the onshore substations. US Wind has committed to a construction schedule to minimize activities at the landfall during the peak summer recreation and tourism season and to coordinate with local municipalities to minimize impacts on popular events in the area during construction (COP, Volume II, Section 17.3.2.1; US Wind 2023). The HDD work may be conducted simultaneously or in stages, depending on the final design of the Project.

For the 3R's Beach landfall, the primary landside HDD equipment will be located in the parking lot, or other already developed areas such as access roads, and will consist of a drilling rig, mud pumps, drilling fluid cleaning systems, pipe-handling equipment, excavators, and support equipment such as generators and trucks. The approximate footprint required for HDD landside operations is 200 by 125 feet (60 by 38 meters). Prior to the commencement of drilling, a pit, potentially lined with sheet pile if needed for support, will be excavated at the drilling site for each bore. Alternatively, a casing pipe may be installed to help support the overlying soils. If sheet pile is required, it will be constructed of industry standard, interlocking sheet piling driven to design depth using a vibratory hammer. The pit will be excavated to the depth required to allow for HDD boring, avoiding bentonite flowing into the water. It is expected that the excavation will be to a depth of approximately 9.8 feet (3 meters). Any material from the excavation will be stockpiled in accordance with a stormwater management plan and used for backfill or repurposed as required. The Proposed Action will not include any above ground activities occuring within wetlands or beaches, including interdunal swale habitat. In addition, no clearing of vegetation will be required at the landfall location to accommodate the HDD operations (see Figure 2-4).

Waterside HDD equipment will vary based on the installation location but will generally consist of a work platform (e.g., barge, small jack-up) and associated support vessels (e.g., tugs, small work boats). The work platform will be equipped with a crane, excavator, winches, and auxiliary equipment, including generators and lights. The limited water depth in Indian River Bay is expected to require in-water operations be based on a barge equipped with spuds for positioning. An anchor spread may be employed if required. The offshore (ocean-based) HDD works may be supported by a jack-up or barge. Approximate dimensions of the proposed HDD works are provided in Table 2-3. Final HDD lengths will depend on factors such as soil conductivity, cable design, and available installation methods to minimize disturbance in the shallow areas of the bay close to the landfall locations. The water side of the HDD duct would employ gravity cells or a casing pipe to facilitate cable installation, retain cuttings and drilling fluids, and ensure the HDD duct remains free of debris prior to installation of the export cable. The gravity cells for in-water operations are expected to be up to 197 feet (60 meters) long and 33 feet (10 meters) wide. The gravity cells will be designed to minimize the release of drilling cuttings and fluids and would be open on the seaward (outbound) side to facilitate installation of the export cables.

Figure 2-4. 3R's Beach landfall: HDD with offshore/landfall transition along with adjacent wetlands

Table 2-3. Approximate HDD dimensions for the 3R's Beach landfall and Inshore Export Cable Route

Location	Length of HDD	Depth of Duct Below Grade	Water Depth Exit	Distance from Transition Vault to Shoreline
Atlantic Ocean (Offshore export cable and 3R's Beach landfall)	1,600–5,300 feet (488–1,600 meters)	8–60 feet (2–18 meters)	30 feet (9 meters)	550 feet (167 meters)
Old Basin Cove (3R's Beach landfall and inshore export cable in Indian River Bay)	1,700–6,500 feet (518–2,000 meters)	8–50 feet (2–15 meters)	>2–5 feet (>1–1.5 meters)	1,700 feet (518 meters)
Deep Hole (Inshore export cable and Indian River substation in Indian River)	1,600–3,200 feet (487–975 meters)	8–40 feet (2–12 meters)	>2–5 feet (>1–1.5 meters)	1,350 feet (411 meters)

Source: US Wind 2023

HDD = horizontal directional drilling

HDD operations commence with a pilot hole that is enlarged using progressively larger reaming tools. During HDD operations, drilling mud is injected to cool the drill bit, provide lubrication, and stabilize the borehole. The drilling mud is an inert bentonite slurry that carries cuttings back to the shoreside excavation pit for collection/removal and reuse. The HDD operation will include monitoring of the downhole water/bentonite slurry to minimize the potential of drilling fluid breakout. A drilling fluid fracture contingency plan will be in place prior to the start of HDD activities. Operations will be shut down immediately in the event a frac-out occurs.

A series of reamers will be added to the drill string, as soil conditions allow, to progressively increase the size of the borehole until it is large enough to accept the final export cable duct. When the required borehole diameter is achieved, a pulling head is attached to the drill string at the in-water end of the bore. Prefabricated sections of duct are attached to the drilling head and pulled into the borehole. The duct sections are expected to be fabricated onshore and floated to the barge or jack-up for installation. A duct approximately 24 inches (60 centimeters) in diameter is planned, and final sizing of the duct will be confirmed based on cable sizing and thermal properties of the soils.

2.1.7 Met Tower

The Proposed Action also includes installation of a Met Tower at three potential locations on the western edge of the southernmost row of the array (Figure 2-1). All locations under consideration would be the only structures considered outside of the Project's regular array layout with east-west spacing of 0.77 nautical mile (1.43 kilometers) and north-south spacing of 1.02 nautical miles (1.89 kilometers). The locations were selected to be in line with the east-west turbine row to limit any additional obstruction to fishing and other vessel traffic transiting across the Lease Area. The Met Tower will be equipped with a white marine lanterns with an operational range of 10 nautical miles. Perimeter structures, located on the corners or other significant peripheral points, will be marked with quick flashing yellow marine lanterns with 360° visibility and an operational range of at least 5 nautical miles. Directional fog signals will be placed on alternating perimeter structures. Each device will sound a 4-second prolonged blast at intervals not to exceed 30 seconds with a range of 2 nautical miles.

The Met Tower will serve as a permanent metocean monitoring station to support project operations and long-term monitoring and is planned to include a robust suite of monitoring, data logging, and remote communications equipment as well as associated power supply, lighting, and marking equipment. The Met Tower would be a bottom-fixed structure consisting of a steel lattice mast fixed to a steel deck supported by a steel braced caisson-style foundation. The main caisson is a 6-feet (1.8-meters) diameter pile that tapers to 5 feet (1.5 meters) in diameter above the mudline. The pile will be driven to an anticipated maximum depth of 175 feet (53 meters). The two bracing piles are each 5 feet (1.5 meters) in diameter. These piles will be driven to an anticipated maximum depth of 166 feet (51 meters). The height of the Met Tower, including the mast and foundation, will be approximately 328 feet (100 meters) above mean sea level and no higher than maximum hub height. The platform deck supporting the mast will be approximately 3,000 square feet (279 square meters).

In May 2021, US Wind deployed a meteorological and oceanographic (metocean) buoy to collect wind and marine life data off the coast of Ocean City, Maryland. The buoy uses Light Detection and Ranging (LiDAR) to collect an array of advanced environmental and wildlife monitoring data on bats, birds, fish, and other marine mammals to determine the presence, frequency, and distribution within the lease area.

US Wind has equipped the FLiDAR) with sensors, including: nanotag antennas and CTT Very High Frequency (VHF) receiver; Bird Mic-SM4-Acoustic sensors; Bat Mic-SM4BAT-Acoustic sensors; Marine Mammal Hydrophone-Loggerhead LS1-Acoustic sensors and Chelonia F-POD' VEMCO fish tag receivers; Nortek AWAC monitoring waves and currents qnd Seabird CTD monitoring salinity, temperature, and water-levels. This buoy will be used to inform US Wind's energy production estimates and overall project design (US Wind 2021).

2.2 Onshore Facilities

Proposed onshore Project components include the landfall site, the transition vaults that connect the offshore export cable to the inshore export cable (Indian River Bay route), the connections to the onshore substations, and the connection from the onshore substation to the existing grid. These components collectively compose the Onshore Project area. The COP Appendix C, *Project Design Envelope and Maximum-Case Scenario*, describes the PDE for onshore activities and facilities and the COP (Volume I; US Wind 2023) provides additional details on construction and installation methods. The onshore components of the Proposed Action are included in the EIS to support BOEM's analysis of a complete Project; however, BOEM's authority under the OCSLA only extends to the activities on the OCS.

2.2.1 Landfall Site

The proposed offshore export cables would make landfall south of the Indian River Inlet at 3R's Beach, located within Delaware Seashore State Park. The proposed scenario is a landfall location in the vicinity of the 3R's Beach parking lot approximately 1 mile (1.6 kilometers) south of the Indian River Inlet (Figure 2-4). When the offshore cables reach the landfall, they will be pulled into a cable duct that positions the cables under 3R's Beach to subterranean transition vaults. The transition vaults would be located in existing developed areas such as the adjacent parking area. Up to four HDD ducts and subterranean transition vaults may be installed at the landfall location. When fully installed, the shore end of the HDD ducts will terminate in a transition vault, and the water end will be sealed and buried to the installation depth of the offshore export cables. The proposed vaults are each approximately 40 feet (12 meters) long, 10 feet (3 meters) wide, and 10 feet (3 meters) deep. The HDD ducts will be connected to the transition vaults and backfilled. The transition vaults, when fully installed, will be accessed from ground-level access points. The Proposed Action will not include any above ground activities occuring within wetlands or beaches.

2.2.2 Onshore Export Cable Routes

There are no terestrial Onshore Export Cable Routes associated with the Proposed Action. The route connecting the landfall at 3R's Beach with the onshore substation at the Indian River substation is characterized as the Inshore Export Cable Route.

2.2.3 Onshore Substations

The existing 230 kV Indian River substation, owned by Delmarva Power and Light and located in Dagsboro, Delaware, is the proposed POI for the Project. The Indian River substation is adjacent to the NRG Energy Inc. Indian River Power Plant. During construction the Project is anticipated to permanently alter disturb approximately 13.57 acres (4.75 hectares) at the onshore substation location associated with the expansion of the existing Indian River substation at 1.84 acres (0.74 hectares) and three proposed substations totaling 10.3 acres (4.2 hectares) and a permanent access road of 1.43 acres (0.58 hectares). Construction of the interconnection facilities also includes the temporary construction laydown area of 4.02 acres (1.63 hectares), and a temporary access road of 0.76 acres (0.31 hectares) and 0.69 acres (0.23 hectares) at the landfall (see DEIS Appendix C, Table C-2). Figure 2-5 shows a preliminary arrangement of the substations; however, the final design may vary within the shown footprint. The new substations would be constructed to the northwest and southwest of the Indian River substation.

The proposed arrangement of the new substations allows for expansion of the Indian River substation and sequential construction of the new substations. The inshore export cables in Indian River Bay would exit the HDD duct into underground transition vaults approximately the same size as transition vaults at 3R's Beach landfall, and traverse underground to be terminated at the respective new substation block. The new substations would connect to the Indian River substation via a short overhead line approximately 500 feet (152 meter) long.

US Wind is evaluating gas- and air-insulated substations for the Project, which have different maximum footprints and tallest structures within the substation. Ground disturbance below the new substations is estimated to extend 12 feet (4 meters) below grade.

Ground disturbance below the onshore substation is estimated to extend 12 feet below grade. At any of the other substation locations under consideration, US Wind's substations are planned to have the same footprint and configuration as would be constructed adjacent to the Indian River Substation. Construction of the onshore substation would take approximately 18 months.

Ground-disturbing activities during onshore substation construction include excavation and grading. Tree clearing and ground disturbance would be limited to the footprint of the substation. Ground disturbance is estimated to extend 12 feet (3.7 meters) below grade. A planned construction laydown area of approximately 350 by 500 feet (106.7 to 152.4 meters) is planned. If feasible, US Wind will use an area already disturbed for construction laydown activities instead of the Temporary Construction Workspace shown in Figure 2-5 and no additional tree clearing beyond the substation expansion would be required. Table 2-4 lists the amount of habitat that would be impated by the proposed onshore substation construction activities. Based on aerial imagery, upland forest would be the only habitat type impacted by onshore substation construction activities.

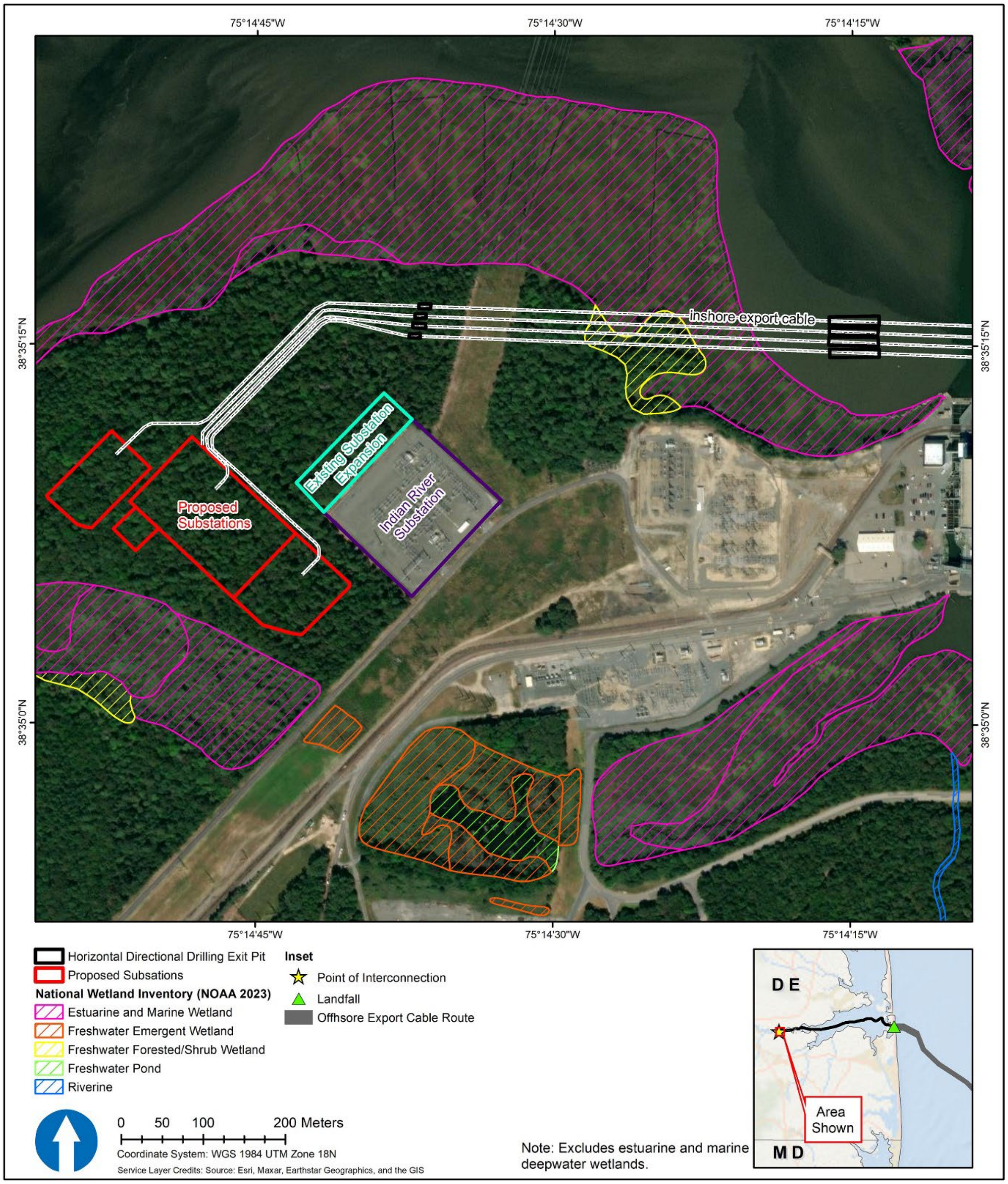

Figure 2-5. Onshore Indian River substation expansion and new (gas-insulated) US Wind substations along with associated wetlands

Source: US Wind 2023

Table 2-4. Area of habitat impacted by the Onshore Substation construction activities [a]

Feature	Area (acres)	Temporary Alteration/ Restore and allow to Revegetate (acres)	Permanent Alteration (acres)
Existing substation expansion	1.83	__	1.83
Proposed substations	10.3	__	10.3
Permanent access road	1.43	__	1.43
Temporary construction workspace	4.02	4.02	__
Temporary access road	0.76	0.76	__
Totals		**4.78**	**13.57**

[a] Based on aerial imagery, upland forest would be the only habitat type impacted.

2.2.4 Onshore Operations and Maintenance Facility

US Wind's operations and maintenance facility (O&M Facility) will provide a suitable location to plan and coordinate WTG and OSS maintenance and servicing operations for the Project from the Ocean City, Maryland region. The O&M Facility will be comprised of onshore office, crew support, and warehouse spaces with associated parking in the Ocean City commercial harbor and will include quayside and berthing areas for four or more crew transfer vessels (CTVs). The O&M Facility will also house a Marine Coordination Center, which will serve to monitor the status of the WTGs and OSSs via SCADA systems, plan maintenance operations and dispatch CTVs, monitor marine activity in the Project area, coordinate drills and exercises, and communicate with outside agencies.

The proposed O&M facility location is likely to be located on two adjacent sites on the waterfront in West Ocean City, Maryland. The waterfront sites together are approximately 1.5 acres (0.61 hectares) in size. Specifically, both potential parcels are waterfront properties with suitable water depth and mooring space in the commercial harbor to safely support four or more CTVs. The two waterfront properties currently under consideration are 12933 Harbor Road and 12929 Harbor Road.

US Wind would grade portions of the sites to prepare for construction of new buildings approximately three stories and no more than 45 feet (13.7 meters) high, set back at least 25 feet (7.6 meters) from the tidal waters. New buildings would include a crew support facility and a temporary warehouse, as well as a combined administrative building and warehouse to be completed later in the Project. Expansion or replacement of the existing waterfront access points would be undertaken in consultation with the Maryland Department of the Environment (MDE) and U.S. Army Corps of Engineers (USACE), including for the replacement or expansion of pavement to allow for vehicle parking and vehicular/forklift access to new cranes or davits that would load materials onto the CTVs stationed at the berth/quayside.

The waterfront property will support the onloading and offloading of parts, tools, and personnel needed for operations and maintenance on the WTGs and OSSs with ingress/egress to the Project area via the Ocean City Inlet. Site improvements would include the replacement of a timber pier and the existing bulkhead/quay wall. The pier is anticipated to be up to 625 feet (191 meters) long and 28 feet wide (8.5 meters). The existing bulkhead/quay wall would be replaced from the end of the pier to 175 feet (53 meters) west. Equipment deployed on the pier deck would include jib cranes and mooring hardware to allow for CTVs to dock and receive the necessary crew and equipment. The 28-foot (8.5-meters) wide pier would allow for a truck to assist in loading equipment on to vessels.

It is anticipated that any construction related to the O&M facility will occur on previously disturbed land and that no dredging will be required for vessel berthing. Larger deep draft vessels needed to support routine or unplanned maintenance activities would likely mobilize from ports in Baltimore, Maryland; Portsmouth, Virginia; or Lewes, Delaware.

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 offshore areas where WTGs, OSS, inter-array cables, and offshore export cables would be located, as described above in Section 2.1; and the onshore areas where Project activities and facilities would occur, as described above in Section 2.2.

The Action Area encompasses the areas affected by the landfall site, the transition vaults that connect the offshore export cable to the inshore export cable (Indian River Bay route), the connections to the onshore substations, and the connection from the onshore substation to the existing grid. These onshore areas, inclusive of all Onshore Project Components from the cable landfall 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, is hereafter referred to as the Offshore Project Area.

4 Covered Species

This section describes the nine threatened, endangered, or candidate species under the USFWS' jurisdiction that may occur in the Action Area or may be affected by the Proposed Action. There are no critical habitats listed for these or any other species within the Action Area. A description of each species and the potential occurrence in the Action Area is provided in Sections 4.1 through 4.7.

Four federally listed birds have the potential to occur within the proposed Action Area: Eastern Black Rail (*Laterallus jamaicensis* ssp. *Jamaicensis*), Piping Plover (*Charadrius melodus*), Roseate Tern (*Sterna dougallii dougallii*), and Rufa Red Knot (*Calidris canutus rufa)*. In addition, the northern long-eared bat (*Myotis septentrionalis*), tri-colored bat (*Perimyotis subflavus*), and monarch butterfly (*Danaus plexippus*) are included within this BA, as the species have the potential to occur within the onshore portions of the Action Area. Figure 4-1 shows avian surveys that intersect the Lease Area.

The flowering plant species listed in the Information for Planning and Consultation report is not expected to be affected by Project activities. Seabeach amaranth (*Amaranthus pumilus*) has the potential to occur within the landfall areas of the proposed Project. However, no appropriate habitat for this species, which is described as "overwash flats at the ends of islands that are accumulating sand and lower developing dunes and upper strands of non-eroding beaches" (USFWS 1995), would be disturbed as part of the Proposed Action. Similarly, the Bethany Beach firefly (*Photuris bethaniensis*) is known to occur in the vicinity of the proposed landfall site of the offshore export cables; however, no impacts to appropriate habitat, described as freshwater interdunal swale habitats along the Atlantic coast in Delaware and Maryland (Heckscher et al. 2021), are expected. The HDD operation will include monitoring of the downhole water/bentonite slurry to minimize the potential of drilling fluid fracture. A drilling fluid fracture contingency plan will be in place prior to the start of HDD activities. Operations will be shut down immediately in the event a frac-out occurs. As such, no impacts to these species are expected and these species are not addressed further in this document.

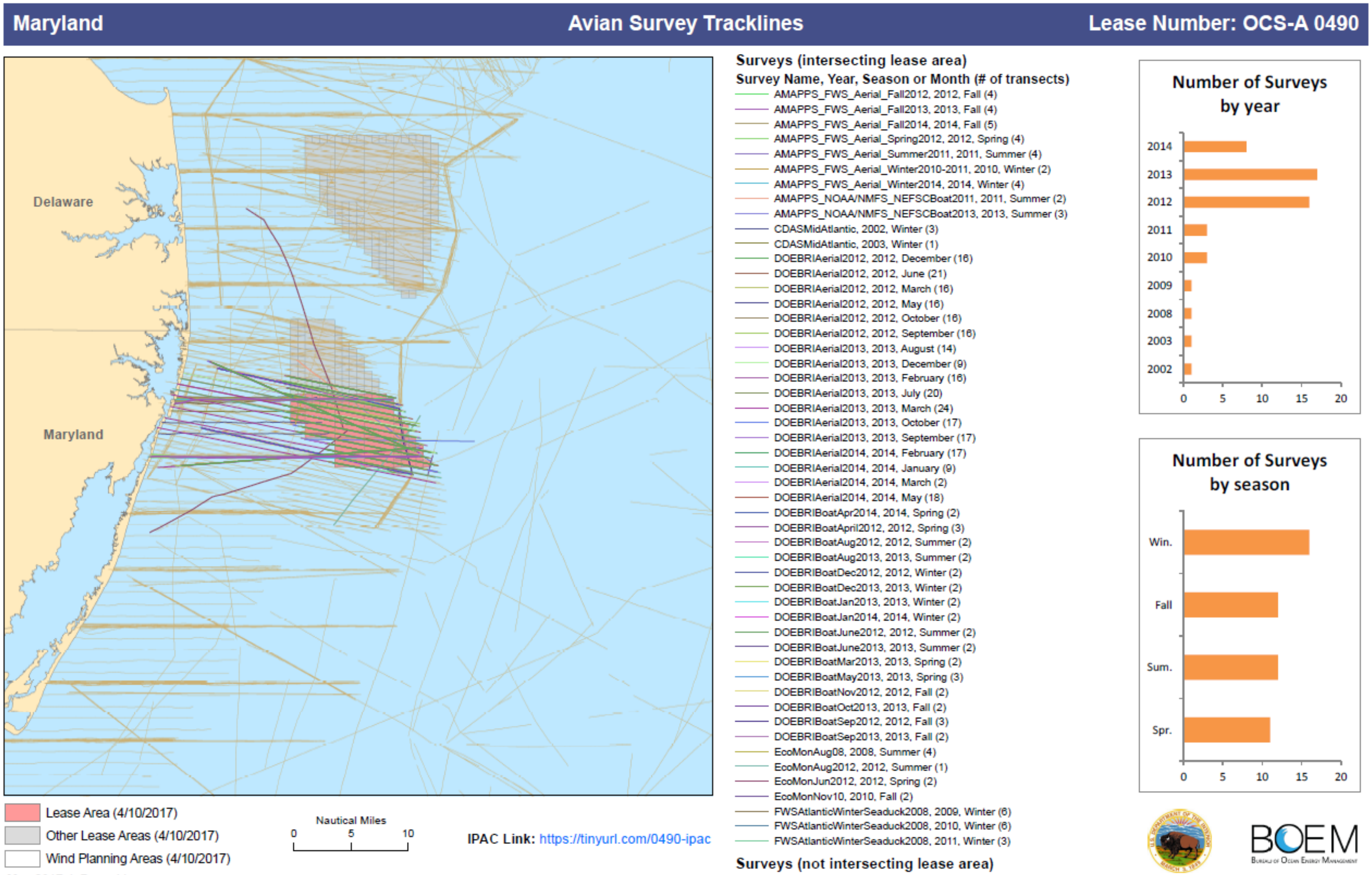

Figure 4-1. Avian surveys intersecting the Lease Area

4.1 Eastern Black Rail

The Eastern Black Rail is a subspecies of black rail, a small, cryptic, marsh bird that occurs in salt, brackish, and freshwater wetlands in the eastern United States (U.S.) (east of the Rocky Mountains), Mexico, Brazil, Central America, and the Caribbean (USFWS 2019). The USFWS listed Eastern Black Rails as threatened on October 8, 2020, and included a 4(d) rule for incidental take (86 Fed. Reg. 196 [October 8, 2020]). However, USFWS included a prohibition in the 4(d) rule that prohibits incidental take resulting from long-term or permanent conversion, fragmentation, or damage of persistent emergent wetland habitat and the contiguous wetland-upland transition zone to other habitat types or land uses. Critical habitat has not been established for Eastern Black Rail. A recovery plan is in progress; an outline was released on March 18, 2021.

Eastern Black Rails nest in tidally affected or non-affected areas and require moist-to-saturated soil in the wetland-upland transition zone. They select gentle slopes that permit occasional shallow (≤3 centimeters) sheet flooding and fast draining. Fast draining is especially important during incubation, as flooding is a frequent cause of nest failure. Nest success for Eastern Black Rails depends upon nests being hidden beneath dense clumps of vegetation over moist soil or shallow water for a) protection from the elements, b) concealment from predators, and c) optimal foraging and chick-rearing habitat. Since adult and juvenile Eastern Black Rails tend to walk or run rather than fly, and because chicks are unable to fly, nests must be located near higher-elevation areas with dense vegetation to facilitate escape from high water events (USFWS 2019).

Historically, approximately 90 percent of Eastern Black Rail observations occurred in coastal areas, versus 10 percent in inland areas; 60 percent of inland observations occurred prior to 1950 (Watts 2016). Population estimates vary in quantity and quality between the northeastern, southeastern, and interior of the U.S. However, range contraction and site abandonment are evident throughout the eastern U.S. Although regional strongholds exist in the Southeast and Southwest, available data suggest a relatively small total population. Prior to Hurricane Harvey in 2017, the upper Texas coast was estimated to support 1,299 individuals. The Atlantic coast from New Jersey to the Gulf Coast of Florida was estimated to support 355–815 breeding pairs prior to multiple recent major hurricanes (USFWS 2019). As of 2016, the coastal region near the present project supports an estimated 55-100 breeding pairs (New Jersey: 40-60; Delaware: 0-10; Maryland: 15-30; Virginia: 0-10; Watts 2016). In Delaware, the Black Rail appears to be restricted to tidal salt marshes with dense mats of dead vegetation and may occasionally occur in the higher parts of the marshes with scattered shrubs (Watts 2016), and no Black Rails have been documented in Delaware's freshwater marshes. Migration routes follow the distribution of available habitat and also include stopover habitat in wet prairies, wet meadows, or hay fields (USFWS 2020c). There is no evidence of the species migrating or otherwise occurring within the offshore portions of the Action Area. Given the paucity of records within both the onshore and offshore portions of the Action Area, impacts to the species as a result of the Proposed Action are not expected.

4.2 Roseate Tern

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 Fed. Reg. 42064 [November 2, 1987]). The USFWS has recently initiated a 5-year review for this species (83 Fed. Reg. 39113–39115 [November 13, 2020] and 86 Fed. Reg. 32965–32968 [June 23, 2021]).

Watt (2010) identified the species as having relatively low limits of sustainable incidental mortality. The Roseate Tern is one among 61 species (out of 177 species 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 northwest Atlantic Ocean population of Roseate Tern 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 breeding population of Roseate Terns is currently restricted to a small number of colonies located on islands managed to limit predators from Nova Scotia to Long Island, New York, with as many as 87 percent breeding within just three colonies on islands off Massachusetts and New York (BOEM 2012; USFWS 2010). Since 2010, the number of breeding pairs of Roseate Terns in the U.S. and Canada has increased 50 percent from 3,219 to 4,824 in 2017 (C. Mostello, unpublished data). In April 2017, the Bird Island Habitat Restoration Project was completed and given the documented high productivity of Bird Island, restoration and enhancement of potentially suitable habitat is likely to have measurable beneficial impacts on Roseate Tern populations (USFWS 2008).

Roseate tern foraging behavior and ecology in the region is well described in existing literature (USFWS 1998; Kress and Hall 2004). Roseate terns dive less than 1.6 feet (0.49 meters) into the water to forage, primarily on the American 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 9.8 to 39.3 feet (3 to 12 meters) above the ocean surface. In sharp contrast to Common Terns, Roseate Terns are dietary specialists, exhibit strong fidelity to foraging sites, and avoid clusters of other feeding tern species (Goyert 2015).

The American sand lance is the primary forage fish for Roseate Terns that is small to medium sized (1.9 to 6.6 inches [4.8 to 16.8 centermeters), chiefly found in shallow (less than 6.5 feet [2 meters]) coastal waters and estuaries, and not found offshore (Collette and Klein-MacPhee 2002). The average size of American sand lance delivered by Roseate Terns to chicks is 2.3 inches (Safina et al. 1990). This contrasts with the northern sand lance (*A. dubius*), which is larger (3.0 to 9.9 inches) and found offshoreand stays on the bottom during the day (Collette and Klein-MacPhee 2002). While, Roseate Terns typically forage in nearshore areas close to breeding colonies, they have been shown to forage as far as 60 miles (96.6 kilometers) offshore, where they have been found to forage in the presence of tuna and dolphins (Goyert 2014, Goyert and Nevins 2016, Loring et al. 2019, Nisbet et al. 2014, Robards et al. 2000). However, given that the species tends to travel and forage at less than 40 feet (12.2 meters) above the water, interactions with operating WTGs would not be expected as the lowest tip height would be 118 feet (36 meters) above the surface.

Roseate tern breeding colonies once existed on Assateague Island in Maryland (Stewart and Robbins 1958); however, there are currently no Roseate Tern breeding colonies in Maryland or Delaware and the species is assumed to be absent from the onshore portions of the Action Area. During boat and aerial surveys conducted between 1978 and 2009 this species was observed in Maryland and Delaware waters during spring months (O’Connell et al. 2009). There are three recent records of Roseate Terns in Maryland (Ocean City and Tingles Island) near the area proposed for offshore wind turbines (Maryland Biodiversity Project 2023a). No Roseate Terns were detected in the Lease Area or in the proposed offshore Action Area during the boat surveys conducted as part of the Baseline Wildlife Studies in Altantic Waters Offshore Maryland (2013-2014) (Williams et al. 2015). Modeling efforts based on previous boat and aerial survey data predict that Roseate Terns are virtually absent from the offshore Action Area (Figure 4-2). 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 Roseate Terns from the Buzzards Bay colonies tracked during post-breeding period crossed the Lease Area (Loring et al. 2019). However, there is a large amount of uncertainty regarding Roseate Tern migratory flight paths, stopover use and duration along the Alantic coast during spring and fall migration, as well as use of the Lease Area both during the breeding season as well as during migration. However, as discussed above, travel and foraging behavior exhibited by Roseate Terns would likely limit the species exposure to operating WTGs on the OCS.

On shore, there were 41 Roseate Terns reported in the vicinity of the proposed landfall site from Cape Henelope State Park south to Bethany Beach; these individuals, typically represented by single individuals or small groups (i.e.three or less) were observed between May and Septembver and range from 1977 to 2023 (eBird 2023).

Based on the behavioral and foraging ecology of the species, the radio telemetry data, and the survey data, very little, if any, Roseate Tern activity is expected within marine waters in and around the Lease Area. Should individuals pass through the area, they likely would be flying below the RSA, relatively close to the ocean surface during good weather conditions.

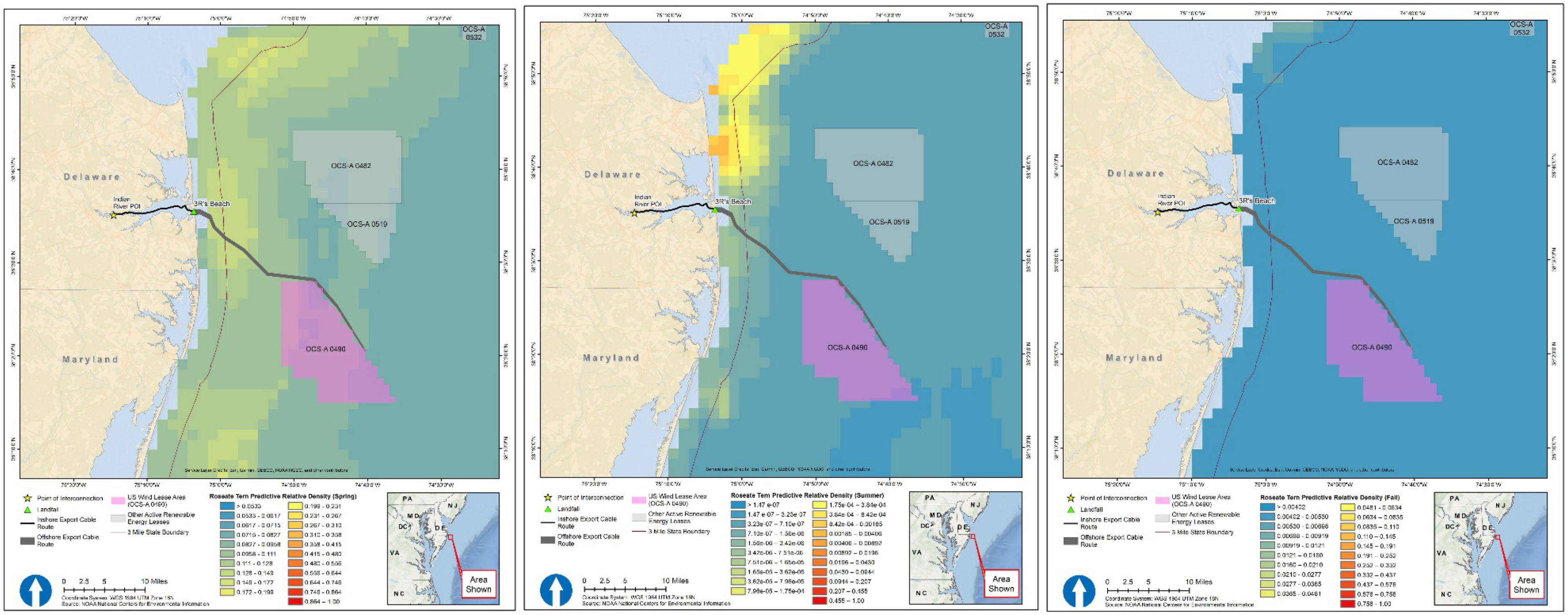

Figure 4-2. Predicted Relative Density of Roseate Terns during spring, summer, and fall (left to right)

Source: Winship, et al. 2018

4.3 Piping Plover

The Piping Plover is a small migratory shorebird that breeds along the Atlantic coast, the Great Lakes, and the Great Plains regions of the U.S. and winters in coastal habitats of the southeastern U.S., 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. Critical wintering habitat has been established along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (66 Fed. Reg. 36038 [July 10, 2001]). 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. Coastal development is the primary anthropogenic threat to Piping Plovers. Other threats include disturbance by humans, dogs, and vehicles on sandy beaches and dune habitats (Elliott-Smith and Haig 2004; USFWS 2009). Despite these population pressures, there is little risk of near-term extinction of the Atlantic Coast population of Piping Plovers (Plissner and Haig 2000), and the Atlantic coast population has been steadily growing. Since the time of its listing in 1985, the Atlantic coast Piping Plover population has increased 290 percent from a low of 790 breeding pairs to an estimated 2,289 breeding pairs in 2021 (USFWS 2022). Watt (2010) identified the species as having relatively low limits of sustainable incidental mortality. 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).

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 individuals arriving at breeding locations in mid-March and into April. Post-breeding staging in preparation for migration extends from July through September (Loring et al. 2020, 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 wash-over areas to which they are restricted (USFWS 1996, 2009). Nest 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, wash over areas, mudflats, and 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). Given the use of HDD to install the inshore export cables and timing of construction during non nesting periods, no Piping Plovers would be impact during construction of the onshore components of the Proposed Action.

Based on counts in 2021, there were 24 breeding pairs recorded in Delaware, 22 in Maryland, 576 in NY-NJ, 1,264 in New England, and 180 in eastern Canada (USFWS 2022), for a total of 4,132 adult birds, plus 2,458 fledglings (calculated from productivity data from USFWS 2022). Fledglings comprise less than half of the fall migrants and the likelihood of a fledgling from the southern Atlantic area surviving to the next breeding season is quite low (48 percent, compared to adults 71 percent; USFWS 2009). While the precise migratory pathways along the Atlantic coast and to the Bahamas are not well known (USFWS 2009; Normandeau Associates, Inc. 2011), both spring and fall migration routes are believed to follow a narrow strip along the Atlantic coast. Because the migratory flights are assumed to occur at night and at high-elevation, detecting Piping Plovers in the offshore environment during migration is difficult and there are no definitive observations of this species in offshore environments greater than 3 miles (4.8 kilometers) from the Atlantic coast (Normandeau Associates, Inc. 2011). 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. Loring et al. (2020) found that 29.4 percent (5 out of 17) of the tagged plovers leaving breeding areas in Massachusetts and Rhode Island during fall migration flew over or near the Lease Area (Figure 4-4). Of course, given the 20 km detection range of land based telemetry systems used by

Loring et al. (2019), it is possible that some tagged individuals may have evaded dedection and could have flown through the Lease Area.

During migration, most flights were above the turbine height with 15.2 percent of the Piping Plover flights within the RSA associated with WEA on the OCS (Loring et al. 2019, Figure 4-3). The green-dashed-lines in Figure 4-3 represent the lower and upper limits of the rotor-swept zone (82 to 820 feet [25 to 250 meters]. Note: the rotor swept zone is different for this project (36 to 286 meters; Figure 2-2), so the precent flying at RSA in the proposed project may not 15.2.

In spring, a pilot study found that Piping Plovers (*N*=10) fitted with transmitters in the Bahamas crossed the Atlantic and New York Bights rather than a longer route along the coast as they traveled northward (Loring et al. 2019). Of the 10 tagged individuals, only 6 were detected, possibly because many Motus towers are only operational in the summer and fall, or due low transmitter retention. In that study, one individual was detected flying over WEAs off North Carolina and Virginia, but not the Action Area. Although little data are available related to the migratory pathways of Piping Plovers, these results represent a risk of offshore wind development to the species (Figure 4-4).

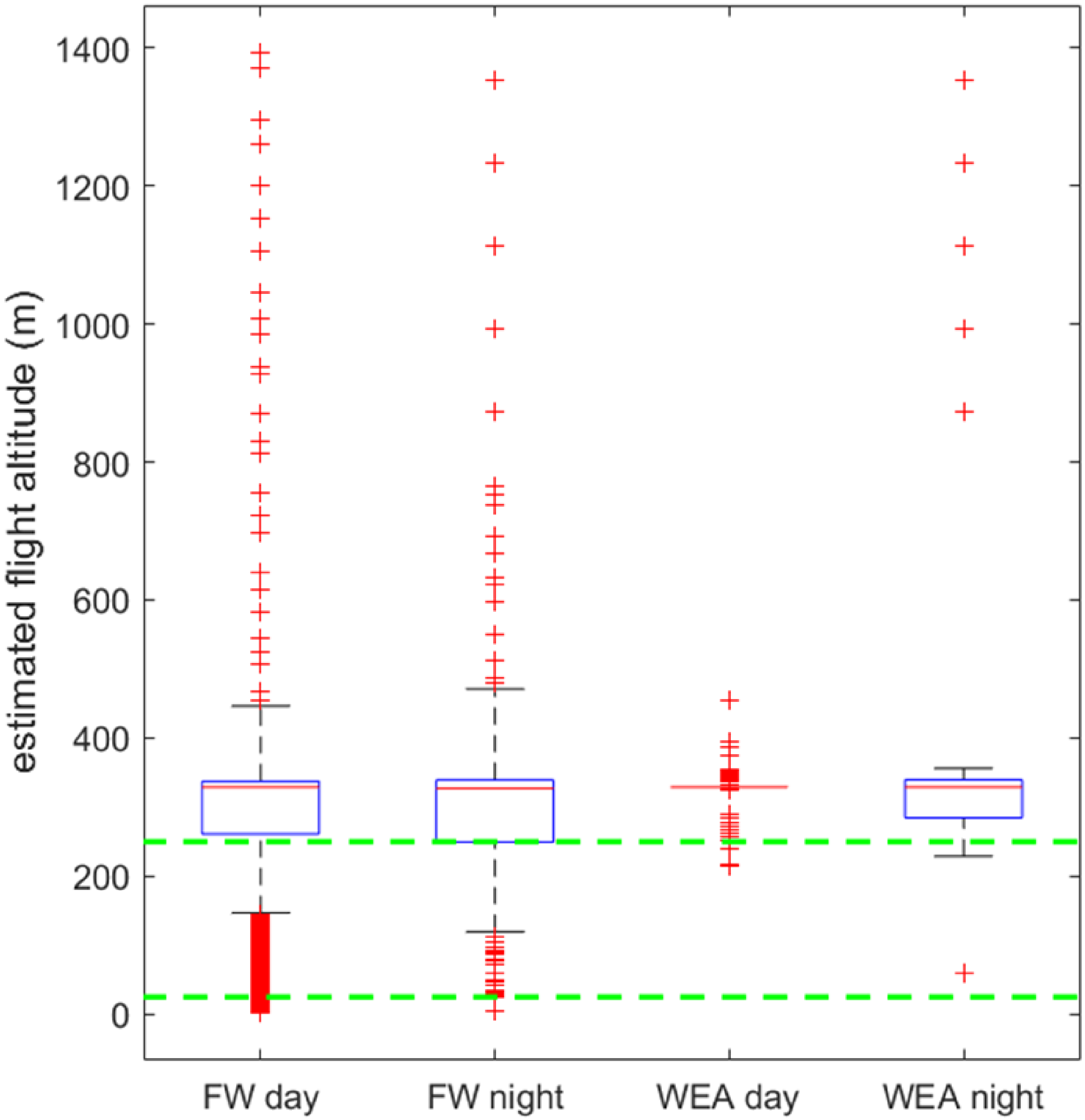

Figure 4-3. Estimated Flight Altitude Ranges (meters) of Piping Plovers During Exposure to Federal Waters (altitude when crossing from state into federal waters) and Wind Energy Areas (altitude when flying day and night)

Source: Loring et al. 2019

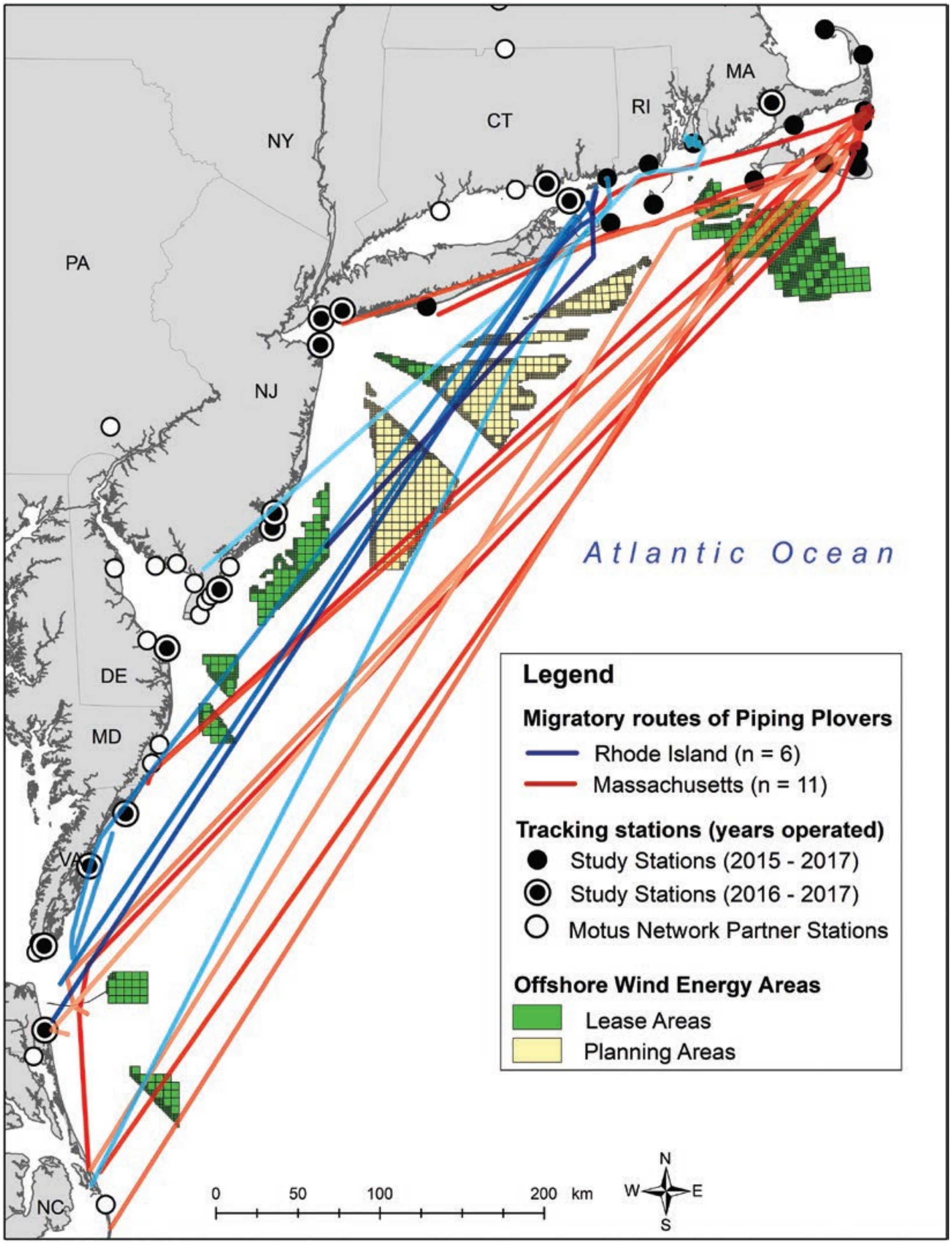

Figure 4-4. Modeled Migratory Routes of Tagged Piping Plovers from Breeding Areas in Rhode Island (n = 6) and Massachusetts (n = 11), Tracked Across a Broader Portion of the Mid-Atlantic Bight

Source: Loring et al. 2020

4.4 Rufa Red Knot

The Rufa Red Knot is a medium-sized member of the sandpiper family that breeds in the Canadian Arctic and winters along the northwestern coast of the Gulf of Mexico, along the U.S. Atlantic coast from Florida to North Carolina, and along the Atlantic coasts of Argentina and Chile (USFWS 2014). Over the last 20 years, the Rufa Red Knot has declined from a population estimated at 100,000 to 150,000, down to 18,000 to 33,000 (Niles et al. 2008), with a current USFWS estimate of 64,000 individuals rangewide. The primary threats to the species include loss of habitat (both breeding and non-breeding), disruption of natural predetor/prey cyles on the breeding grounds, and increasing frequency and severity of misalignment of annual migratory cyles with favarable prey and weather conditions (UFWS 2020b). While the aboundance of horseshoe crab eggs was once considered a primary threat to the speices and reduced availablility at key migratory stopover sites was considered a likely cause of recent species declines (Niles et al. 2008; USFWS 2014), currently harvest of horeshoe crabs is not currently considered a threat to the speices due to management by the Atlantic States Marine Fisheries Council (ASMFC). As discussed in the Maryland Offshore Wind DEIS and the Essentail Fish Habitat (EFH) Assessment, approximately 41.9 sqaure miles (108.5 square kilometers) of the 1,593 square mile (4,125.8 square kilometers) Carl N. Schuster Jr. Horseshoe Crab Reserve will be impacted by the project. The reserve is a marine protected area where harvest of horseshoe crabs is prohibited in an effort to maintain sufficient numbers of horseshoe crab eggs for migratory shorebirds, including red knots (Walls et al. 2002). The EFH Assessment for the Maryalnd Offshore Wind Project concluded that Proposed Action would result in the minor short term and permanent impacst on horseshoe crabs. Horseshoe crabs are known to occur within the Project area and adults may use the habitat for spawning. Dredging associated with the Project would annually impact a minute portion of soft bottom habitat. Jet plow impacts could include increased local turbidity, loss of larvae due to entrainment, or short-term displacement of individuals. However, these impacts are either short-term, limited in spatial extent, or insignificant to the success of the species.

The USFWS considers the four red knot wintering locations (North Coast of South America, Southern, Southeast US/Carribean, and Western) to be distinct populations with diet and habitats varying widely (USFWS 2014, 2020b). Due to observed population declines, the USFWS listed the Rufa Red Knot as threatened. The USFWS has proposed critical habitat for Rufa Red Knot along the Atlantic coast and gulf coast, from northern Massachusetts to southern Texas (86 Fed. Reg. 133 [July 15, 2021]).

Watt (2010) identified the species as having relatively low limits of sustainable incidental mortality. The Rufa Red Knot is one of 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 the presence of many onshore turbines along the Rufa Red Knot's overland migration route (Diffendorfer et al. 2017), there are no records of knots colliding with turbines (78 Fed. Reg. 60024 [May 14, 2014]).

Recent studies of Rufa Red Knot migratory patterns have shown great variation in routes, but with more Mid-Atlantic to southerly concentrations during spring migration and more northerly concentrations during fall migration, including Massachusetts (Burger et al. 2012a, 2012b; Niles et al. 2010; Normandeau Associates, Inc. 2011).

The number of Rufa Red Knots passing through the Lease Area can be estimated based on what is known about 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. This stopover is used by a majority (50-80%) of the Rufa Red Knot population as a final stopover site to rest and gain weight to fuel the final migratory flight and the physiological change to breeding condition before arriving on the arctic breeding grounds (Brown et al. 2001; Clark et al. 2009; USFWS 2014, 2020b). Additional well known stopover locations include the southeastern US (North Carlolina to

Florida) and the Virginia barrier islands. Additionally, large and small groups of red knots may utilize suitagble habitat all along the Atlantic and Gulf coasts from Argentina to Massachussetss (Niles et al. 2008). 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 4-1) 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 Project overlaps with 15 miles (24 kilometers) (1.1 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 (0.011). A total of 390 birds could pass through the Lease Area in spring (42,600 total birds × 0.833 proportion of birds making landfall between Cape May and Key West × 0.011 proportion of migration front).

Table 4-1. Spring Migration Landfall Sites of Nano-Tagged Red Knots from the Bahia Loma Shorebird Project in South America

Tag ID (all hyperlinked)	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
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

Tag ID (all hyperlinked)	Landfall Date	Location
20912	5/15/19	Cape May, NJ
15651	5/29/18	Pennsylvania
20958	5/23/19	Long Island, NY

The southbound migration period is generally July through October but may extend as late as November for some individuals (Loring et al. 2018). Well known stopover sites during the southbound migration include the Nelson River delta, James Bay, and the Mingan Archipelego in Canda; the coasts of Massachussets and New Jersey, and the mouth of the Altamaha River in the United States; the Caribbean; and the northern coast of South America from Guyanna to Brazil (USFWS 2014; 2020b). While some red knot individuals may stopever in the vicinity of the proposed onshore components (i.e. the coast of New Jersey), none would be expected to encounter onshore portions of the Action Area.

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 4-5) or 2,335 (48,650 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 (2 out of 146) may pass through the area (Figure 4-6).

Results from a 2020 telemetry study appear to support this observation where 2 out of the 11 red knots fitted with GPS tags were tracked passing through the Lease Area (Figure 4-7) (Feigin et al. 2022). In 2021, the combined results from two studies found 3 out of 29 red knots fitted with GPS tags may have passed through the Lease Area (Figure 4-8) (Feigin et al. 2022, BRI and Wildlife Restoration Partners 2022). Averaging the results of these studies, 10 percent (3 of 29 tagged individuals) of the tracked birds may have passed though the Lease Area (Feigin et al. 2022, BRI and Wildlife Restoration Partners 2022). A total of 701 birds could pass through the Lease Area in the fall (48,650 birds on the Atlantic coast × 0.048 proportion of population stagging from Maine through Virginia × 3-month fall migration period × 0.10 average proportion of tracked birds potentially passing through the Lease Area).

Contrary to previous assumptions (e.g., Gordon and Nations 2016), fall migration flights occurred when visibility was approximately 12 miles (19.3 kilometers) with little or no precipitation (Loring et al. 2018; Feigin et al. 2022). Rufa Red Knots, particularly long-distance migrants, migrate at high altitudes from 1,640 to 3,281 feet (500 to meters 1,000 meters) (Alerstam et al. 1990; Gordon and Nations 2016), above the highest proposed RSA. In contrast to these observations, a study that estimated flights heights from telemetry data found that 83 percent of the 25 modeled flight paths occurred much lower and within approximately 39 to 656 feet above water (11.9 to 200 meters) (Loring et al. 2018). Yet, the confidence intervals around the estimated flight heights were very broad and, in several cases, spanning from near the ocean surface to over 328 feet (100 meters) (Loring et al. 2018).

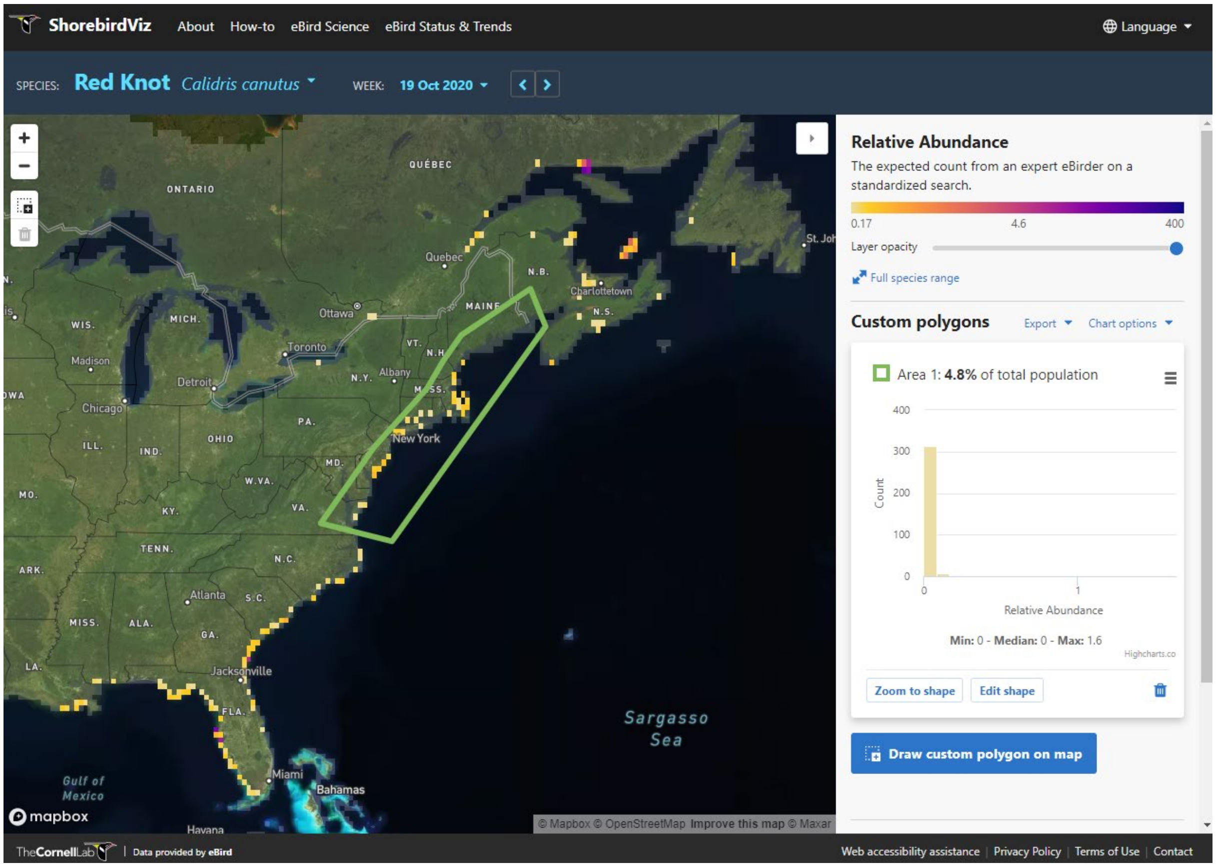

Figure 4-5. Rufa Red Knot staging areas representing the percentage of the population during the week of October 19, 2020

Source: Fink et al. 2021

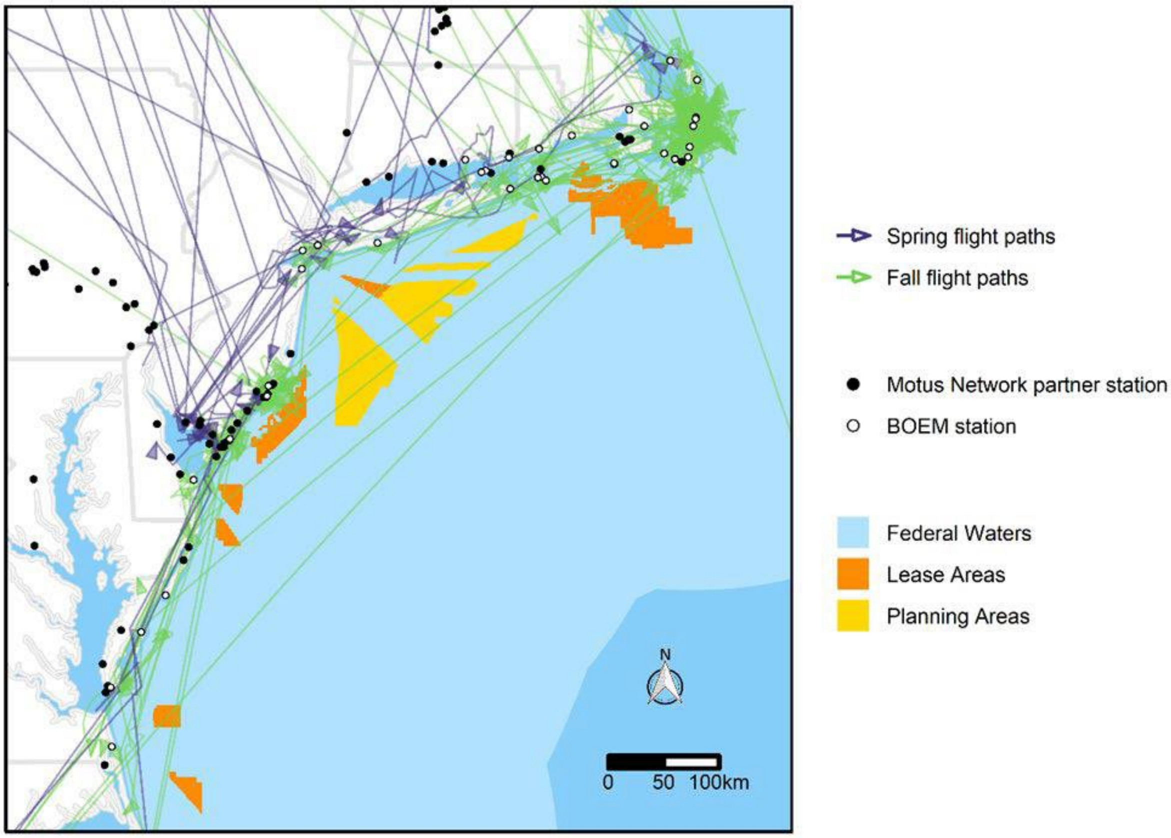

Figure 4-6. Modeled flight paths of Rufa Red Knots crossing the study area during Spring (n=31) and Fall (n=146 migration) from 2014 to 2017

Source: Loring et al. 2020

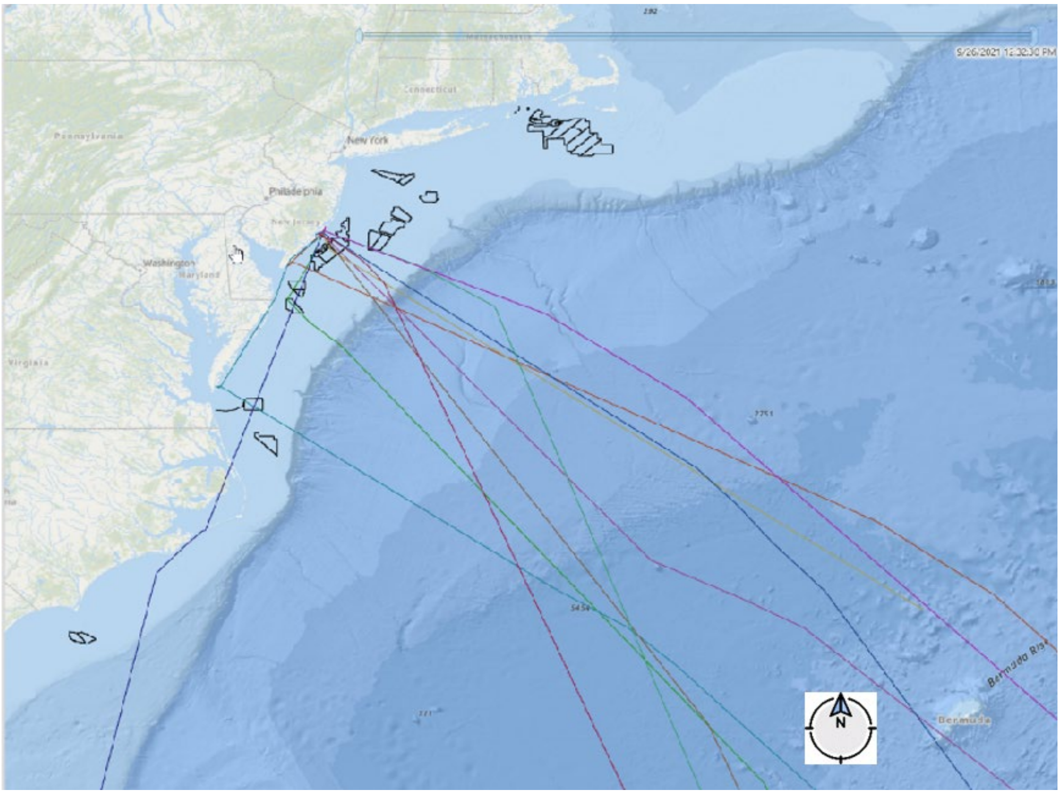

Figure 4-7. 2020 Routes of Rufa Red Knot (adapted from Feigin et al. 2022)

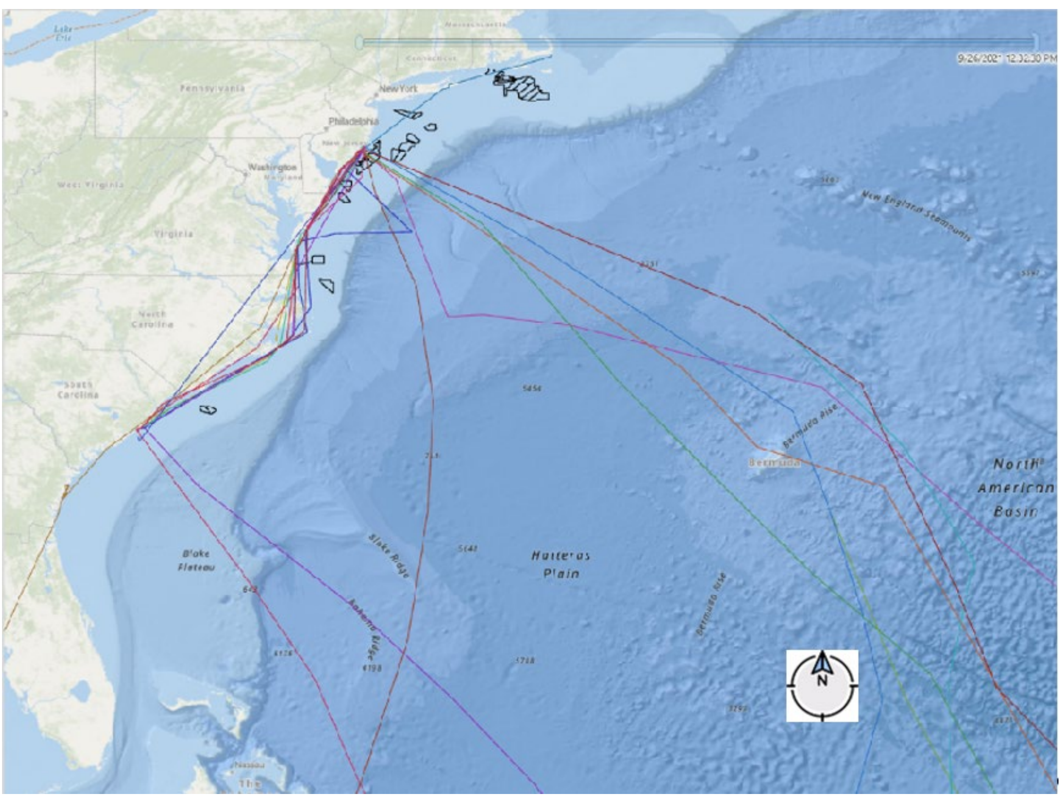

Figure 4-8. 2020 Routes of Rufa Red Knot (adapted from Feigin et al. 2022)

4.5 Northern Long-Eared Bat

The federally endangered northern long-eared bat occurs throughout Maryland and Delaware. Its native range includes all or part of 37 U.S. States, the District of Columbia, and a large part of Canada (87 Fed. Reg. 229 [November 30, 2022]). White-nose syndrome, a fungal disease of hibernating bats, has devastated this wide-ranging species, once common throughout eastern North America, particularly in the northeast (Turner et al. 2011). Given observed drastic population declines, the USFWS originally listed the northern long-eared bat as threatened. On November 30, 2022, the USFWS reclassified the northern long-eared bat as endangered and rescinded the species-specific incidental take exemption under the previously issued 4(d) rule (87 Fed. Reg. 229 [November 30, 2022]). The effective date for these changes was originally scheduled for January 31, 2023, but was delayed to March 31, 2023 (87 Fed. Reg. 4908 [January 26, 2023]).

The annual life cycle of the northern long-eared bat includes winter hibernation (caves, mines, and cave-like structures), spring staging, spring migration, summer birth of young, fall migration, and fall swarming and mating. Northern long-eared bats are often overlooked during surveys in hibernacula because they typically roost singly or in small groups in crevices and cracks in cave or mine walls with only the nose and ears exposed (Caceres and Pybus 1997). In spring, the bats leave the hibernacula to roost in trees and forage near the hibernaculum in preparation for migration. Northern long-eared bats exhibit relative ly short-distance migrantory movements between summer and winter habitat, ranging from 35 to 55 miles (56.5 to 88.5 kilometers) (Griffin 1940, Caire et al. 1979, Nagorsen and Brigham 1993). From approximately mid-May through mid-August, northern long-eared bats occupy summer habitat. Northern long-eared bats 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; Sasse and Perkins 1996), as well as in anthropogenic structures (Amelon and Burhans 2006; Timpone et al. 2010). 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; Timpone et al. 2010). Most foraging occurs up to 9.8 feet (3 meters) off the ground and between the understory and forest canopy (Brack and Whitaker 2001). Northern long-eared bats forage relatively close (approximately 1 mile) to their roost sites (Sasse and Perkins 1996; Timpone et al. 2010).

A review of Maryland Biodiversity Project's online database of known records of northern long-eared bat indicates that there are no records of this species on the eastern shore of Maryland (Maryland Biodiversity Project 2023b). However, DNREC installed acoustic detectors in six locations around Indian River Bay (Figure 4-9) and collected acoustic data during the 2019–2021 summer maternity season (DNRC 2021). Based on an analysis of the recorded data, northern long-eared bats may be present in the vicinity of the proposed onshore substation area. Northern long-eared bats are found in Delaware (Delaware Division of Fish and Wildlife 2012), but the state does not have a list of publicly available maternity roost locations.

There are only a few older records of northern long-eared bat passes at five sites on the Mid-Atlantic OCS (Pelletier et al. 2013; Peterson and Pelletier 2016; Stantec 2016). However, most recent surveys did not document the presence of northern long-eared bats over open water habitats. For example, during the construction of the Block Island Wind Farm, vessel-based acoustic monitoring for bats was conducted. Of the 1,546 bat passes that were recorded, none were identified as northern long-eared bats (Stantec 2018). Additionally, recent data from 3 years of post-construction monitoring at the Block Island Wind Farm indicate low numbers of bats present offshore only during fall migration, with no detections of northern long-eared bats (Stantec 2020). Similarly, no northern long-eared bats were detected at the Coastal Virginia Offshore Wind Project (Dominion 2022). Therefore, given the rarity of the bat in the region, its ecology, and its habitat requirements, it is unlikely that northern long-eared bats would traverse the offshore portions of the Action Area.

Figure 4-9. Locations of Bat Detectors around Indian River Bay

4.6 Tri-Colored Bat

The tri-colored bat (TCB) is a small, wide-ranging bat species that occurs in 39 US states, Mexico, Belize, Guatemala, Honduras, Nicaragua, and four Canadian provinces. It is one of the smallest bat species in North America and is distinguished by its unique fur coloration that is dark at the base, lighter in the middle, and dark at the tip. The USFWS proposed listing the TCB as endangered on September 14, 2022, and found that designating critical habitat is not prudent for this species (87 Fed. Reg. 177 [September 14, 2022]).

The annual life cycle of the TCB includes winter hibernation (caves, or similar structures), spring migration, summer birth of young, fall migration, and fall swarming and mating. During the spring, summer, and fall, TCB primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees. In the summer TCB have also been found roosting among pine needles and within artificial roosts (barns, beneath porch roofs, bridges, and concrete bunkers). Female TCBs exhibit high site fidelity, returning to the same summer roosting locations every year. While female TCBs form maternity colonies male TCBs roost singly (USFWS 2023).

There is no definitive estimate of population size for TCB across the species range. A review of Maryland Biodiversity Project's online database of known records of TCB indicates that this species has been observed on the eastern shore of Maryland in Cecil County (Maryland Biodiversity Project 2023c). TCBs are also found in Delaware (Delaware Division of Fish and Wildlife 2012). Given this, individual TCBs may be exposed to onshore components of the Proposed Action.

The greatest threat to TCB is white-nose syndrome. The effect of white-nose syndrome on TCB has been extreme. A recent study using data from 27 states and 2 provinces estimated that TCB colonies declined by 90 to100 percent after being infected with *Pd*, across 59 percent of the species' range (Cheng et al. 2021).

Although overshadowed by the impacts of white-nose syndrome, annual fatalities from land-based wind energy is estimated at 3,327 individuals (USFWS 2021). However, the offshore risk to the TCB seems to be minimal, because they appear to be less active offshore and are one of the least common species documented in studies at offshore sites, and are not expected to be exposed to operating WTGs assoicated with the offhore portions of the Proposed Action (Stantec 2016; Solick and Newman 2021). A long-term acoustic study in the Great Lakes (n = 6 sites), Gulf of Maine (n = 24), and Mid-Atlantic (n = 8) coastal regions from 2009–2014 detected 565,158 bat passes during 17,730 detector nights. Of those, only 12 passes were identified as tri-colored bats. TCB passes were recorded at the Coastal Studiest Institute in North Carolina (n = 6), Manitou Island, Michigan (n = 5), and Ocracoke Light in North Carolina (n = 1) (Stantec 2016).

4.7 Monarch Butterfly

The monarch butterfly (*Danaus plexippus*) occurs throughout the United States during the spring, summer, fall and is a Candidate species for federal listing (79 Fed. Reg. 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 2020b). USFWS (2020b) 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 Fed. Reg. 81813). The species is not listed as a special status species in Maryland (Maryland Natural Heritage Program 2021); however, it is listed as Endangered under the IUCN Red List (Walker et al. 2022). The IUCN Red List status of this species has been reassessed by the Standards and Petitions Committee (SPC), which ruled that the status will be corrected to Vulnerable in the 2023-1 Red List planned for release on December 11, 2023 (SPC 2023; IUCN 2023). 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 2020b). 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 match in timing of both plants and the monarchs is critical for the species' survival (USFWS 2020b).

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 2020b). 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 Fed. Reg. 81813).

Monarch butterflies arrive in the Mid-Atlantic region, including Maryland and Delaware, 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 32 miles (51 kilometers) south of Ocean City. 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 portions of Delaware Seashore State Park (located 1 mile north of 3R's Beach parking lot), First Monarch Waystation (located 3.5 miles [5.6 kilometers] southwest of 3R's Beach parking lot), and Baywood Butterfly Meadow in Longneck (located 5.5 miles [8.9 kilometers] east of 3R's Beach parking lot) as stopover sites during fall migrations (Monarch Watch 2023). Given that migrating monarchs may follow the coastline southward, the species is therefore expected to pass through the onshore Action Area during fall migrations.

5 Effects of Proposed Action

Pursuant to ESA requirements, this BA analyzes the potential direct, indirect, and cumulative impacts of the Proposed Action on northern long-eared bat, tri-colored bat, Eastern Black Rail, Roseate Terns, Piping Plovers, Rufa Red Knots, and monarch butterflies and/or their habitats to determine if the Proposed Action is likely to adversely affect these species or their habitats (50 CFR § 402.12). This analysis uses the following definitions in the effects determination:

- **No effect:** Generally, a listed resource is not exposed to the Proposed Action and, therefore, no impacts (positive or negative) will occur.
- **May affect, but is not likely to adversely affect:** This is the appropriate determination if effects on listed resources are either:
  - Beneficial, meaning entirely positive, with no adverse effects;
  - Insignificant, which are related to the size of the impact and include effects that are too small to be measured, evaluated, or are otherwise undetectable; or

- Discountable, which are effects that are extremely unlikely to occur.

- **May affect and is likely to adversely affect:** This is the appropriate determination if any direct or indirect adverse effects on listed resources that are not entirely beneficial, insignificant, or discountable will occur as a result of the Proposed Action.

The Proposed Action, as described herein, has the potential to affect the following ESA-listed species or species proposed for listing under the jurisdiction of the USFWS: northern long-eared bat, tri-colored bat, Eastern Black Rail, Roseate Tern, Piping Plover, Rufa Red Knot, and monarch butterfly. Previous assessments of Project-related impacts on avian and bat resources resulting from a variety of actions associated with the construction, operations, and decommissioning of an offshore wind facility have been completed by BOEM.

BOEM 2012, 2014, and 2016 and USFWS 2008 provide an assessment of these impacts and are summarized below. Impacts resulting from the above covered actions are expected to be insignificant and discountable for northern long-eared bat, tri-colored bat, Eastern Black Rail, Roseate Tern, and monarch butterfly; and therefore, the Proposed Action ***may affect, but is not likely to adversely affect*** these species. Potential modeled impacts of the proposed activities arising from interactions with operational WTGs on the OCS may rise to the level of take and thus, ***likely to adversely affect*** Piping Plover and Rufa Red Knot.

5.1 Bats (Northern Long-Eared Bat and Tri-Colored Bat)

5.1.1 Direct Effects

The Proposed Action would remove up to approximately18.35 acres (7.43 hectares) of forest for the expansion of the existing Indian River substation, three proposed substations, the temporary construction laydown area and two access roads. A review of known occupied northern long-eared bat roost trees or TCB roost areas was conducted near the proposed substation site where forest removal would occur (Figure 2-5.). No known occupied hibernacula are located within 0.25 mile of the Action Area, and there is no publicly available information on known occupied maternity roosts in the states of Maryland or Delaware.

For the purposes of this analysis, BOEM will require that US Wind will conduct required tree clearing activities for the onshore portions of the Project during the seasonal tree clearing window of November 1 to March 31. As such, no direct impacts on northern long-eared bats or TCBs would be expected to occur. Should tree clearing activities be required outside of this timeframe, US Wind will be required to conduct presence / probable absence surveys in coordination with USFWS to satisfy regulatory concerns relative to listed bat species.

Auditory impacts are not anticipated, as recent research suggests bats are less susceptible to temporary or permanent hearing loss from exposure to intense sounds than other terrestrial mammals (Simmons et al. 2016). Habitat-related impacts (i.e., displacement from potentially suitable habitats) may occur as a result of construction activities, which could generate sufficient noise to cause avoidance behavior by individual bats (CDOT 2016). These impacts would likely be limited to behavioral avoidance of pile-driving or construction activity, and no temporary or permanent loss of hearing would be expected (Simmons et al. 2016). These impacts are very unlikely to occur, as little use of the OCS by bats is expected, and only during spring and fall migration periods. Short-term, localized habitat impacts arising from onshore construction noise could occur, though no auditory impacts on bats would be anticipated. As outlined in Appendix G of the Maryland Offshore Wind DEIS, US Wind is not proposing to conduct any onshore contruction activites from June 1 to July 31. Given this timing pups would be volant and no direct impacts to any bats as a result of roost removal would be expected. Some short term displacement or avoidance of potentially suitable foraging habitat could occur, but these impacts would not be expected to be biologically substantial and not expected to rise to the level of take. Some bats roosting near construction activities may be disturbed during construction but would be expected to move to a different roost away from construction noise. These impacts, if any, would be localized and temporary and would not be expected to rise to the level of take.

The maximum distance *Mytois* ssp. bats were detected offshore in the mid Atlantic was 7.2 miles (11.5 kilometers) (Sjollema et al. 2014). Given that acoustic studies indicate lower use of the offshore environment, and that *Mytois* ssp.bats do not appear to utilize offshore open water habitats fro foraging, exposure to wind projects offshore of the mid-Atlantic states is not likely for *Mytois* ssp.bats (Sjollema et al. 2014). There is little risk that northern long-eared bats or TCBs would collide with wind turbines because the species are not expected to occur within the offshore portion of the Action Area..

No effects to bats would be expected from the operational phase of the Proposed Action as no additional tree clearing would be required. Potential impacts to bats as a result of project decommissioning would be expected to be simlar to those described above for construction related activites.

For these reasons, BOEM anticipates that the Proposed Action ***may affect, but is not likely to adversely affect*** northern long-eared bat and TCB

5.1.2 Indirect Effects

Given the amount of forested habitat removal required and the presence of suitable forested habitat within the vicinity of the proposed onshore Project components, indirect impacts resulting from the removal of potentially suitable habitat ***may affect but are not likely to adversely affect*** northern long-eared bats or TCBs. Should tree clearing be necessary outside of the seasonal clearing window as described above, presence/probable absence surveys and associated consultation with the USFWS would be completed and ESA compliance achieved through that additional consultation.

5.2 Birds (Eastern Black Rail, Piping Plover, Roseate Tern, and Rufa Red Knot)

5.2.1 Direct Effects

Direct effects include onshore construction, drilling and cable laying, pile driving and construction, lighting, collision with structures, decommissioning, and discharge of waste and accidental fuel leaks. US Wind will be required to conduct presence / probable absence surveys in coordination with USFWS to satisfy regulatory concerns relative to listed bird species.

5.2.1.1 Onshore Substation Construction

The proposed onshore substation area is an existing substation, Indian River Substation, and does not provide potentially suitable habitat for nesting or foraging Eastern Black Rails, Roseate Terns, Piping Plovers, and knotRufa Red Knots. An expansion of the substation of up to 2 acres (0.8 hectares) is expected to accommodate the new capacity and required transformers, breakers, switch and control gear. US Wind proposes to expand the existing Indian River substation and construct up top three onshore substations adjacent (northwest and southwest) to the Indian River Substation encompassing approximately 11.9 aces (4.8 hectares). None of the shorebirds (Eastern Black Rail, Rufa Red Knot, Roseate Tern, or Piping Plover) use urban forests for nesting, foraging, or roosting. Therefore, substation construction is expected to have ***no effect*** on Roseate Terns, Piping Plovers, or Rufa Red Knots. As discusssed in Section 2.2.3 above, the inshore export cable will connect to the proposed onshore substation underground and wetland impacts would be avoided. Given the lack of wetland habitats at the proposed substation site and the lack of occurrence records of the species in the Action Area, construction of the proposed substation ***may affect but is not likely to adversely affect*** the Eastern Black Rail.

5.2.1.2 Landfall Construction

Eastern Black Rail, Roseate Terns, Piping Plovers, and Rufa Red Knots do not nest in any of the potential landfall sites. Construction is unlikely to disturb coastal habitat in the vicinity of the 3R's Beach landfall site (barrier beach) due to the proposed use of HDD methods to make the offshore to landfall transition. US Wind has committed to a construction schedule to minimize activities at the landfall during the peak summer recreation and tourism season and to coordinate with local municipalities to minimize impacts on popular events in the area during construction (COP, Volume II, Section 17.3.2.1; US Wind 2023). The 3R's Beach Landfall is already developed roadways or existing parking lots. Piping plovers are not known to nest at this location. Any disturbances associated with construction would be short-term and limited to the daytime hours. Therefore, impacts associated with landfall construction is expected to be insignificant and discountable on Roseate Terns, Piping Plovers, or Rufa Red Knots.

5.2.1.3 Inshore Export Cable Installation

Channel floor disturbance resulting from the installation of the inshore export cables from the 3R's Beach, traversing Indian River Bay, to the onshore substation (Figure 2-3) would not affect Piping Plovers and Rufa Red Knots, as these species are strictly terrestrial foragers and do not use aquatic habitats for foraging. Further, Roseate Tern use of inshore habitat would not be expected. While disturbance to individual foraging Eastern Black Rail may occur as a result of inshore export cable installation in appropriate habitat, the disturbance is not expected to be different from typical construction equipment (barges and/or dredges) and is not expected to affect Eastern Black Rails.

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 (i.e., jet plow, cable plough, or barge-mounted excavator), impacts such as increased turbidity would be short-term and localized in nature and would not directly affect terns because the activity is underwater. Water quality impacts and disturbance to Roseate Terns resulting from construction and decommissioning of inshore export cables are not expected (USFWS 2008). It is estimated that water turbidity conditions would return to normal within a few hours of cable installation (USFWS 2008). As such, impacts on Eastern Black Rail and Roseate Terns, if any, resulting from installation of the inshore export cables would be insignificant and discountable (USFWS 2008), and ***no effect*** on Piping Plovers and Rufa Red Knots would occur.

Roseate terns, Piping Plovers, and Rufa Red Knots do not nest in any of the potential inshore export cable landfall sites. Construction is unlikely to disturb coastal habitat in the vicinity of the 3R's Beach landfall site (barrier beach) due to the proposed use of HDD methods for the installation of the inshore export cables. Typical maximum sound levels from HDD beach construction activities are expected to be approximately 100-110 dB. HDD construction may be conducted 24 hours per day, 7 days per week with rotating shifts, depending on state and local construction approval. The 3Rs Beach Landfall is already developed roadways or existing parking lots. Piping plovers are not known to nest at this location. The landfall site near the Indian River substation crosses wetlands (estuarine and marine wetland as well as freshwater forested/shrub wetland). Eastern Black Rails (Watts 2016), Roseate Terns, Piping Plovers, and Rufa Red Knots are not known to nest at this location. Installation of the inshore export cables may affect individual foraging Piping Plover, Rufa Red Knot, Eastern Black Rail, and Roseate Tern in appropriate terrestial habitat. Any disturbances associated with construction would be short-term and limited to the daytime hours. Therefore, impacts on Eastern Black Rail, Roseate Terns, Piping Plovers, or Rufa Red Knots, if any, resulting from installation of the inshore export cables would be insignificant and discountable.

5.2.1.4 Offshore Export Cable Installation

Seafloor disturbance resulting from the installation of the offshore export cables would not affect Piping Plovers and Rufa Red Knots, as these species are strictly terrestrial foragers and do not use aquatic habitats for foraging. While disturbance to individual foraging Eastern Black Rail, and Roseate Tern may occur as a result of offshore export cable installation in appropriate habitat, the disturbance is not expected to be different from typical construction equipment (barges and/or dredges), and cable installation would not affect Roseate Terns (USFWS 2008) and is not expected to affect Eastern Black Rails. Jet-plowing activities that occur from July to mid-September have the potential to result in short-term disturbance of individual staging Roseate Terns (USFWS 2008).

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 (i.e., jet plow), impacts such as increased turbidity would be short-term and localized in nature and would not directly affect terns because the activity is underwater. Water quality impacts and disturbance resulting from construction and decommissioning of offshore export cables are not expected (USFWS 2008). It is estimated that water turbidity conditions would return to normal within a few hours of cable installation (USFWS 2008). As such, impacts on Eastern Black Rail and Roseate Terns, if any, resulting from installation of the offshore export cables would be **insignificant and discountable** (USFWS 2008), and **no effect** on Piping Plovers and Rufa Red Knots would occur.

5.2.1.5 Construction and Pile Driving

Construction of the Proposed Action would result in increased noise levels, primarily from HDD operations and pile-driving activities.

The primary HDD drilling equipment would be located on land and would consist of a drilling rig, mud pumps, drilling fluid cleaning systems, pipe handling equipment, excavators, and support equipment such as generators and trucks. Land side operations would be in existing parking areas or other already developed areas such as access roads to avoid impacts to sensitive coastal habitats. Typical maximum sound levels from HDD beach construction activities are expected to be approximately 100-110 dB. HDD construction may be conducted 24 hours per day, 7 days per week with rotating shifts, depending on state and local construction approval.

The type and intensity of the sound and the distance it travels can vary greatly and are dependent on multiple factors including, but not limited to, atmospheric conditions, the type and size of the pile, the type of substrate, the depth of the water, and the type and size of the impact hammer. Overall, the duration of impact pile-driving activities under the Proposed Action would be relatively short-term (up to 2 hours per day for the WTG monopiles; 8 hours per day for the OSS jacket piles; and up to 6 hours per day for the Met Tower caisson) and once construction is complete and pile driving has ceased impacts would dissipate.

If present in the area, Eastern Black Rails as well as migrating Roseate Terns, Piping Plovers, and Rufa Red Knots may be exposed to increased noise levels due to construction activities. Species responses may range from escape behavior to mild annoyance (BOEM 2014, 2016). However, the potential noise impacts would be short-term, lasting only for the duration of the HDD operations and pile-driving activity . In addition, these species are highly mobile and would be able to avoid the construction area; the noise from pile driving is not anticipated to affect the migratory movements or behaviors of these species through the area. Therefore, pile-driving -related construction noise may affect these bird species, but the impact would be **insignificant and discountable.**

5.2.1.6 Lighting Effects

Under poor visibility conditions (fog and rain), some migrating birds may become disoriented and circle lighted communication towers instead of continuing on their migratory path, greatly increasing their risk of collision (Hüppop 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 songbird mortality compared with unlit turbine towers (Kerlinger et al. 2010). The Proposed Action includes the use of red flashing aviation obstruction lights on WTGs and OSSs in accordance with FAA and BOEM requirements (COP Volume III; US Wind 2023), and ADLS may also be installed so that obstruction lights would only be activated when an aircraft are near the turbines. The use of ADLS would dramatically reduce the amount of time the obstruction lights are operating. Therefore, the potential impacts from artificial lighting of structures during construction, operations, and decommissioning of the Proposed Action on federally listed bird species would be insignificant and discountable.

5.2.1.7 Collision Effects

This section discusses the potential for impacts on federally listed species (Piping Plover, Red Knot and Roseate Tern) resulting from collisions with fixed structures like the met tower, wind turbine towers, and OSSs, aswell as the construction/operations vessels associated with the Proposed Action. Three species are agile flyers and rarely collide with stationary structures such as bridges, lighthouses, light poles, or moving vessels (e.g., boats). These species are expected to avoid colliding with fixed structures including the proposed met tower, WTG towers, OSSs, and vessels. As such, the likelihood of collisions with fixed structures or vessels associated with the Proposed Action is insignificant and discountable.

The primary hazard posed to federally listed birds from offshore wind energy development would be collision mortality associated with operating WTGs on the OCS (Everaert and Stienen 2007; Furness et al. 2013; Robinson Willmott et al. 2013). 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 potential risk of bird collision with operating WTGs. These models factor bird size and flight behavior, number of individuals passing through the migratory corridor, migratory corridor and wind farm width, number of WTGs, rotor swept zone (RSZ), 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. Most of the model inputs (e.g., proportion flying in the RSA, turbine specifications, and facility dimensions) were obtained or calculated from the Draft EIS.

For the following analyses, the Lease Area included 114 operating 14-18 MW WTGs, and the monthly proportion of time the turbines were operational was based on the estimate time the wind was above turbine cut-in and below cut-out speeds from weather data. (See Appendix B, Band Model Inputs and Outputs, and Appendix C Stochastic Collision Risk Assessment for Movement Inputs and Outputs, for individual parameters used the Band and SCRAM models, respectively).

5.2.1.7.1 ROSEATE TERNS

The Roseate Tern is one among 61 species populations (out of 177 on the Atlantic OCS) that was ranked "higher" in its relative vulnerability to collision with WTGs (Robinson Willmott et al. 2013). This ranking is partially driven by the amount of time the species spends foraging on the ocean; if time on the ocean was restricted to migration, the population would be ranked "medium."

Roseate terns are unlikely to collide with turbines in the proposed Project for several reasons. First, there are no known nesting Roseate Terns south of New York, and the Action Area is not within the range of foraging Roseate Terns that nest in the region. Relatively few Roseate Terns are predicted to occur near the Lease Area according to Marine-life Data and Analysis Team models (Winship et al. 2018). Second, it is unlikely that the few individuals predicted near shore will traverse the Lease Area for foraging because this species typically forages in shallow water. Third, the offshore migratory routes dervived from telemtry studies suggest Roseate Terns are farther offshore than the Lease Area. For exmaple, geolocator data from six Roseate Terns tagged at Bird Island, Massachusetts, suggest that southbound migration flight paths are transoceanic until reaching the Caribbean, where terns may stop over for a period of time (Mostello et al. 2014). In another telemetry study that tracked 150 Roseate Terns from their breeding grounds in New York and New England, only one tagged Roseate Tern was detected in coastal New Jersey during mid-August of 2016, suggesting flights of the other birds were far enough offshore to be out of range of the land-based receiver network). Fourth, the roseate terns typically migrates under high-visibility conditions, during day light hours, and when winds are typically below turbine cut-in speed (Loring et al. 2019), under such conditions terns would be able to see and avoid the WTGs from considerable distance without significantly modifying their flight path. Finally, flights of breeding and post-breeding Roseate Terns in federal waters were found to be at low heights and only reach an RSZ of 82 to 820 feet (25 to 250 meters) 6.4 percent of the time (Loring et al. 2019). This is consistant with other tern species like the closely related (congeneric) common tern (*Sterna hirundo*) (Burger et al. 2011). Based on the above information above, the chance of Roseate Terns colliding with the WTGs is extremely unlikely. In conclusion, the collision risk for Roseate Terns would be *insignificant.*

To further inform this ESA consultation, BOEM used SCRAM to estimate the annual likelihood of collision and the annual number of collisions with rotating turbine blades. The Band model was not used because few birds are expected to transit the Lease Area. However, 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. 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, representing a collision of one or more individuals.

SCRAM estimates the average annual number of collisions with a 95 percent prediction interval (any value less than one is also biologically nonsensical). SCRAM does not estimate the probability of a collision or the number of collisions for the life of a project. However, the probability of a collision and number of collisions during the life of the project can be estimated (with additional biological and statistical assumptions) by extrapolating from the SCRAM annual estimates.

SCRAM predicts that the annual probability of a collision was <0.001, thus a single collision during fall migration is extremely unlikely (Table 5-1). SCRAM also predicts that the average annual number of collisions and 95 percent prediction interval is well below 1 (Table 5-1). Based on this information, the probability of a collision event during the 35-year operational period is also very small 0.034 ($= 1-(1-0.001)^{35 \text{ years}}$) (Table 5-2).

Based on the results of the SCRAM model, the chance of a Roseate Tern fatality due to collision is extremely unlikely. The estimated annual number of fatalities for Roseate Terns is zero, and thus, the estimated number of fatalities during the 35-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*** Roseate Terns.

5.2.1.7.2 PIPING PLOVER

The distance from shore to the offshore portions of the Action Area precludes use by nesting and foraging Piping Plovers. As discussed previously, migration occurs mostly along the coast during favorable weather conditions and thus are likely to see and avoid WTGs.

BOEM used the Band Model (Band 2012) to estimate the risk of Piping Plover collision with the proposed WTGs in the Lease Area. A snapshot of the Band model input parameters used to estimate Piping Plover collision risk for the Proposed Action is presented in Appendix B. Radio telemetry studies of Piping Plover migratory behavior in the vicinity of the Action Area indicate that Piping Plover could fly through the Project area. Based on data from Loring et al. (2020) 29.4 percent (5 out of 17) of tagged plovers leaving breeding areas in Massachusetts and Rhode Island during fall migration flew through the

Maryland WEA. Extrapolating that percentage to recent population size[3] an estimated 3,153 Piping Plovers could have migrated through the Lease Area, 1,215 adults in spring and 1,938 adults and subadults in fall. BOEM is using the best available information and scientific judgement to quantify the number of birds that could pass through the wind farm to input into the Band Model.

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 or from the developer. Turbine avoidance rate of 95.01 percent was used for the Piping Plover (Cook 2021). A total of 114 operating turbines was used in the model. The developer provided project and turbine specifications and turbine operational information. 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. 2019). Given that the flight height distribution is known for this species, fatalities estimated are based on calculations from the extended model (Option 3).

To further inform this ESA consultation, BOEM also used SCRAM (as described for Roseate Terns above) to estimate the annual likelihood of collision and the annual number of collisions with rotating turbine blades.

The Band model predicted that there would be 3 collisions with turbines annually. In contrast, the SCRAM predicts that the annual probability of a collision in each scenario was <0.001, thus, a single collision during fall migration is extremely unlikely (Table 5-1). SCRAM also predicts that the average annual number collisions is less than 1 (Table 5-1). Based on this information, the probability of a collision event during the 35-year operational period is also unlikely, 0.034 (= 1- $(1-0.001)^{35 \text{ years}}$). Similarly, the average number of collisions is less than one (Table 5-2).

Based on the conflicting results between Band and SCRAM models, a fatality due to collision is possible, and thus the estimated annual number of fatalities for migrating Piping Plovers was greater than one**.** Likewise, the estimated number of fatalities during the 35-year operations term was also greater than one. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action is possible, and is ***likely to adversely affect*** Piping Plovers.

5.2.1.7.3 RUFA RED KNOT

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. 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, Feigin et al. 2022, BRI and Wildlife Restoration Partners 2022). 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 4.4), 390 red knots could pass through the Lease Area during spring migration, and 701 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 2014), recent telemetry studies suggest that red knots 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

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[3] Based on a breeding population abundance of 2,066 pairs in Canada, New England region, New York - New Jersey region, Delaware, and Maryland an abundance-weighted mean productivity of 1.19 chicks fledged per pair (USFWS 2022b), equating to 4,132 adults in spring and 6,590 adults and subadults in fall.

using data collected from red knots fitted with nanotags. The flight height distribution was derived from the midpoints of 379, 10-minute observations of 51 Rufa Red Knots flying non-stop over federal waters (Loring et al. 2018). However, 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. Red knots also 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, a species that can forage at night can easily see and avoid the turbines especially during daylight hours and is not as challenged during night time migration as a diural species.

Given that the flight height distribution is known for this species, fatalities estimated are based on calculations from the extended model (Option 3), and the fatality estimates are based on the large array correction factor because the turbines are in rows (Band 2012). Based on the Band Model outputs, the estimated annual number of fatalities for migrating Rufa Red Knots was zero (Figure 5-6 for model outputs).

To further inform this ESA consultation, BOEM also used the SCRAM Model to estimate the annual likelihood of collision and the annual number of collisions with rotating turbine blades. The probability of at least one collision from the SCRAM model for was 0.934, indicating that a single collision during fall migration is likely—with an estimated annual number of collisions of 1.2 per year (95% Prediction Interval [0.964, 1.65]). (Appendix C). During the 35-year operational period, he probability of a collision event during is 1.00 (calculated as 1- $(1\text{-}0.001)^{35\ \text{years}}$) with a total of 42 collisions over the life of the project. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action is possible, and is ***likely to adversely affect*** Rufa Red Knots.

Table 5-1. SCRAM model estimates: Annual probability of collision and number of collisions

Species	Probability of collision [a]	Collisions (95% Prediction Interval) [b]
Piping Plover	<0.001	0.004 (0.000–0.022)
Red Knot	0.934	1.2 (1.0–1.7)
Roseate Tern	<0.001	0.000 (0.000–0.000)

[a] SCRAM report, SCRAM run details, p. 2.

[b] SCRAM report, Table 9

Table 5-2. Life of project (35 years) estimates: Probability of collision and number of collisions [a]

Species	Probability of collision [b]	Collisions (95% Prediction Interval) [c]
Piping Plover	0.034	0.1 (0.0–0.8)
Red Knot	1.000	42 (33.7–57.8)
Roseate Tern	0.034	0.0 (0.0–0.0)

[a] Values are extrapolated from SCRAM model Annual probability outputs (Table 5-1)

[b] $\text{Probability}_{\text{life}} = 1\text{-}(1\text{-Probability}_{\text{annual}})^{\text{Years}}$

[c] Collisions life = Collisions annual × Years

5.2.1.8 Decommissioning

It is expected that noise levels associated with WTG and OSS 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 short-term, lasting only for the duration of structure removal. If these activities were to occur during migration period, most Rufa Red Knots and Piping Plovers in the area would be flying above the Action Area during removal, while others, including Roseate Terns, are not expected to be in the area. However, should Roseate Terns or others be in the area, they would be expected to simply fly around the noise source; therefore, the noise generated is not anticipated to affect the migratory movement or migratory behavior through the area. As such, the Proposed Action may affect migrating Roseate Terns, Piping Plovers, and Rufa Red Knots, but the impacts, if any, would be **insignificant and discountable**. Similar to the impacts described above under the onshore substation construction, given the lack of wetland habitats at the proposed substation site and the lack of occurrence records of the species in the Action Area, decomissioning of the proposed substation ***may affect but is not likely to adversely affect*** the Eastern Black Rail.

5.2.2 Indirect Effects

Indirect effects include impacts such as displacement from habitat and barrier to migration that could occur as a result of the Proposed Action but at a later time. Displacement from suitable habitat is unlikely because the WTGs associated with the Proposed Action are located far from potentially suitable nesting and foraging habitat for Roseate Terns, Piping Plovers, and Rufa Red Knots. Given the lack of suitable habitat for these species and the highly disturbed nature of the onshore portions of the Action Area, **no indirect effects** in the form of displacement are expected to occur as a result of construction, operations, and decommissioning of the onshore portions of the Proposed Action.

Some migrating birds may encounter the offshore portion of Action Area, and barrier impacts from the Proposed Action could result in longer migration flights for birds avoiding the offshore portions of the Action Area during migration. The Roseate Tern, Piping Plover, and Rufa Red Knot are long-distance migrants capable of sustained over-water migration. It is reasonable to assume that any extra energy expenditure, if any, resulting from making a relatively minor course correction to avoid of the offshore portions of the Action Area would be inconsequential and would not result in a measurable impact. Based on the information above, indirect impacts due to barrier impacts on migrating Piping Plovers, Roseate Terns, or Rufa Red Knots in from increased energy expenditure would be **insignificant and discountable**.

5.3 Monarch Butterfly

5.3.1 Direct Effects

Direct effects include collision with structures and construction vehicle traffic.

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 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; Grealey and Stephenson 2007), 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 to1,200 feet (244 to 366 meters; Gibo 1981; Monarch joint Venture 2023). 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. 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. As such, the Proposed Action may affect migrating monarch butterflies, but the impacts, if any, would be **insignificant and discountable**.

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 return 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. Therefore, BOEM anticipates that the Proposed Action **may affect, but is not likely to adversely affect** monarch butterfly.

5.3.2 Indirect Effects

Indirect effects include upland habitat disturbance and could occur as a result of construction of the Proposed Action as well as during decommissioning. Impacts on monarch butterflies from habitat disturbance, including habitat fragmentation, is possible if Project activities occur 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 proposed onshore substation construction would occur, the small permanent loss of habitat would be considered insignificant. Additionally, construction of the inshore export cable route could convert some forested areas to herbaceous areas, potentially resulting in a beneficial effect to monarch butterfly by creating suitable habitat. Indirect effects to upland habitat during decommissioning would be similar as to described for construction. Upland habitat disturbance is not anticipated during operations and maintenance since the areas around the substations would be gravel or converted to gravel and not be planted. Based on the information above, indirect impacts due to upland habitat disturbance on monarch butterfly would be **insignificant and discountable**.

6 Determination of Effects

BOEM has concluded that the construction and O&M of the proposed Project would have ***no effect*** on the following species: seabeach amareanth and Bethany Beach firefly. BOEM concluded the Project may affect all remaining ESA-listed threatened or endangered species under USFWS jurisdiction that may occur in the Action Area. Of these, BOEM has determined that the Proposed Action is ***not likely to adversely affect*** nothern long-eared bat, Eastern Black Rail, Roseate Tern, and monarch butterfly and is ***likely to adversely affect*** Piping Plover and Rufa Red Knot. 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
Northern long-eared bat (*Myotis septentrionalis*)	E	Not likely to adversely affect
Tri-colored bat (*Perimyotis subflavus*)	P	Not likely to adversely affect
Eastern Black Rail (*Laterallus jamaicensis jamaicensis)*	T	Not likely to adversely affect
Piping Plover (*Charadrius melodus*)	T	Likely to adversely affect
Roseate Tern (*Sterna dougallii dougallii*)	E	Not likely to adversely affect

Species	Status	Effect Determination
Rufa Red Knot (*Calidris canutus rufa*)	T	Likely to adversely affect
Bethany Beach firefly (*Photuris bethaniensis)*	C	No effect
Monarch butterfly (*Dnaus plexippus*)	C	Not likely to adversely affect
Seabeach Amaranth (*Amaranthus pumilus*)	T	No effect

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

Given that the northern long-eared bat and tricolored bat have been documented in the vicinity of the Onshore Project area, the proposed Project may affect these species, with the greatest level of potential impact occurring during installation of the onshore project components. Required tree clearing will occur during the seasonal clearing window of November 1 through March 31 to avoid direct impacts to these species. If tree clearing is required outside of this window, species-specific presence / probable absence surveys will be conducted in coordination with appropriate resource agencies to provide protection to these species. Indirect impacts on northern long-eared bat and tricolored bat habitat are expected to be negligible. Furthermore, there is little to no risk that northern long-eared bats or tricolored bats would collide with operating WTGs on the OCS because these 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*** northern long-eared bat and tricolored bat.

6.2 Birds (Eastern Black Rail, Piping Plover, Rufa Red Knot, Roseate Tern)

The effect to Eastern Black Rails and Roseate Terns 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*** Eastern Black Rails, and Roseate Terns. While there is some uncertainty as to the magnitude of take of Piping Plover and Rufa Red Knots based upon collision risk modeling, BOEM expects that some take would occur and as such the Proposed Action ***may affect, and is likely to adversely affect*** Piping Plover and Rufa Red Knots.

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.

7 Avoidance, Minimization, and Mitigation Measures

This chapter highlights the proposed avoidance, minimization, and mitigation measures to be carried out by US Wind that would minimize or eliminate potential impacts on ESA-listed species of birds and bats. These measures would be similar to other offshore projects approved by BOEM. The following measures are to be required by BOEM as conditions of COP approval:

- **Bird deterrent devices:** To minimize attracting birds to operating turbines, US Wind must install bird deterrent devices on WTGs and OSSs. The location of bird deterrent devices must be proposed by US Wind based on best management practices applicable to the appropriate operation and safe installation of the devices. US Wind must confirm the locations of bird deterrent devices with a monitoring plan to track the efficacy of the deterrents as part of the documentation it must submit with its facility design report. BOEM has been requiring that Lessees provide the monitoring plan with the submission of the Facility Design Report (FDR) after the COP is approved.
- **Avian and bat monitoring program:** Prior to, or concurrent with, offshore construction activities, including seabed preparation activities, US Wind must complete, obtain concurrence from the U.S. Department of the Interior (DOI), and adopt an avian and bat monitoring plan, including coordination with interested stakeholders. The DOI will review the avian and bat monitoring plan and provide any comments on the plan within 60 calendar days of its submittal. US Wind must resolve all comments on the avian and bat monitoring plan to DOI's satisfaction before implementing the plan. US Wind may conclude that DOI has concurred in the avian and bat monitoring plan if DOI provides no comments on the plan within 60 calendar days of its submittal date.
- **Monitoring:** At this time, US Wind is proposing to conduct acoustic monitoring at select WTGs and/or OSSs, implement a radio tagging and telemetry program, and record incidental observations of dead or injured birds and bats. The specific monitoring components will be dependent upon research priorities and available technologies and developed as part of consultation with BOEM and USFWS.
- **Annual monitoring reports:** US Wind must submit to BOEM (at renewable_reporting@boem.gov), USFWS, and BSEE (via TIMSWeb and notification email at protectedspecies@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.
- **Post-construction quarterly progress reports:** US Wind must submit quarterly progress reports during the implementation of the avian and bat monitoring plan 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 proposed Project is operational. The progress reports must include a summary of all work performed, an explanation of overall progress, and any technical problems encountered.
- **Monitoring plan revisions:** At BOEM's request, and within 15 calendar days of submitting the annual monitoring report, US Wind must meet with BOEM and USFWS to discuss the following: the monitoring results; the potential need for revisions to the avian and bat monitoring plan, including technical refinements or additional monitoring; and the potential need for any additional efforts to reduce impacts.

- **Operational reporting:** US Wind must submit to BOEM (at renewable_reporting@boem.gov) and BSEE (via TIMSWeb) an annual report summarizing monthly operational data calculated from 10-minute supervisory control and data acquisition for all turbines together in tabular format: the proportion of time the turbines were operational (spinning at or above a threshold of rpm defined as part of consultation with BOEM, BSEE, and USFWS) each month, the average rotor speed (monthly rpm) of spinning turbines plus 1 standard deviation, and the average pitch angle of blades (degrees relative to rotor plane) plus 1 standard deviation.
- **Raw data:** US Wind 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 DOI and USFWS, upon request for the duration of the lease. US Wind 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.
- **Annual bird and bat mortality reporting:** US Wind must submit an annual report covering each calendar year, due by January 31 of the following year, documenting any dead (or injured) birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must be submitted to BOEM (at renewable_reporting@boem.gov), BSEE (via TIMSWeb and notification email at protectedspecies@bsee.gov) and USFWS. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the U.S. Geological Survey Bird Band Laboratory (https://www.usgs.gov/labs/bird-banding-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, if practicable, carefully collect and preserve the dead specimen in the best possible state.
- **Immediate bird and bat injury/mortality reporting:** Any occurrence of dead or injured ESA birds or bats must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), ideally within 24 hours and no more than 3 days after the sighting. If practicable, the Lessee must carefully collect the dead specimen and preserve the material in the best possible state, contingent on the acquisition of any necessary wildlife permits and compliance with the Lessee's health and safety standards.US Wind will be required to 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.
- **ADLS:** US Wind must use an FAA-approved vendor for the 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. US Wind must confirm the use of an FAA-approved vendor for ADLS on WTGs and OSSs in US Wind's fabrication and installation report.

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Appendix A: USFWS Information for Planning and Consultation (IPaC) Threatened and Endangered Species Results and Consistency Letter

Appendix B: Band Model Inputs and Outputs

APPENDIX C: Stochastic Collision Risk Assessment for Movement Inputs and Outputs